

QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Mathematics Department
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Study plan No.	2021/2022		University Specialization		Bachelor of Mathematics	
Course No.	0101353		Course name		Real Analysis (2)	
Credit Hours	3		Prerequisite/ Co-requisite		Real Analysis (1)	
Course type	<input type="checkbox"/> MANDATORY UNIVERSITY REQUIREMENT	<input type="checkbox"/> UNIVERSITY ELECTIVE REQUIREMENTS	<input type="checkbox"/> FACULTY MANDATORY REQUIREMENT	<input type="checkbox"/> Support course family requirements	<input checked="" type="checkbox"/> Mandatory requirements	<input type="checkbox"/> Elective requirements
Teaching style	<input type="checkbox"/> Full online learning		<input checked="" type="checkbox"/> Blended learning		<input type="checkbox"/> Traditional learning	
Teaching model	<input type="checkbox"/> 1 Synchronous: 1 asynchronous		<input checked="" type="checkbox"/> 1 face to face : 1 asynchronous		<input type="checkbox"/> 2 Traditional	

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Division number	Time	Place	Number of students	Teaching style	Approved model

Brief description

Derivatives, Derivative rules, Chain rule, Local extrema, Monotonic functions, Rolle's theorem, Mean-value theorem, Generalized mean-value theorem, Taylor's theorem. Riemann integral and its properties, Upper and lower sums, Integration by parts, Fundamental theorems of calculus, Bounded functions, Pointwise and uniform convergence of sequences and series of functions, Power series.
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Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	<ol style="list-style-type: none"> <li>1. "Introduction to Real Analysis". By: R. Bartle and D. Sherbert. John Wiley &amp; Sons, Third Edition (2000).</li> <li>2. "Mathematical Analysis". By: T. Apostol Addison-Wesley Publishing Company, Second Edition (1974).</li> </ol>				
Supportive learning resources (Books, databases, periodicals, software, applications, others)	<ol style="list-style-type: none"> <li>1. "Introduction to Mathematical Analysis". By: S. Douglass Pearson, 3<sup>rd</sup> Edition (1996).</li> <li>2. "The Elements of Real Analysis". By: R. Bartle John Wiley &amp; Sons, 2<sup>nd</sup> Edition (1975).</li> <li>3. "Principals of Mathematical Analysis. By: W. Rudin McGraw Hill, 3<sup>rd</sup> Edition (1976)</li> </ol>				
Supporting websites	<a href="http://www.freebookcentre.net/Mathematics/Real-Analysis-Books.html">http://www.freebookcentre.net/Mathematics/Real-Analysis-Books.html</a> <a href="http://www.jirka.org/ra/realanal.pdf">www.jirka.org/ra/realanal.pdf</a>				
The physical environment for teaching	<input checked="" type="checkbox"/> Class room	<input type="checkbox"/> labs	<input checked="" type="checkbox"/> Virtual educational platform	<input type="checkbox"/> Others	
Necessary equipment and software					

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Supporting people with special needs	
For technical support	

### Course learning outcomes (S= Skills, C= Competences K= Knowledge.)

No.	Course learning outcomes	The associated program learning output code
<b>Knowledge</b>		
<b>K1</b>	Know, understand and apply the definitions and theorems in Rolle's theorem, Mean-value theorem, Taylor's theorem.	<b>MK 2</b>
<b>K2</b>	Understand the basic facts about derivatives and Riemann integral.	<b>MK 1</b>
<b>Skills</b>		
<b>S1</b>	Student is expected to understand the structure of functions on compact intervals of the real line in relation to differentiability and integrability.	<b>MS 2</b>
<b>S2</b>	Comprehend the main theorems concerning continuity and differentiability: Extrem value theorem, intermediate value theorem, Mean value theorem, Rolle's theorem, of the Fundamental Theorem of Calculus.	<b>MS 2</b>
<b>Competences</b>		
<b>C1</b>	Cooperate to work effectively in the group assignments.	<b>MC 1</b>
<b>C2</b>	Be able to think in mathematical analysis.	<b>MC 2</b>

### Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm exam	30%	30%	40%	30%
Participation / practical applications	0	0	10%	30%
Asynchronous interactive activities	30%	30%	0	0
Final exam	40%	40%	50%	40%

### Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style	Reference
1	Preliminaries, Continuous Functions	Lecture	124-153
2	The derivative The basic properties of the derivative	Lecture	161-171
3	Rolle's Theorem, Mean Value Theorem	Lecture	172-175
4	Further Applications of the Mean Value Theorem	Lecture	175-179
5	L'Hospital's Rules	Lecture	180-187
6	Taylor's Theorem, Applications of Taylor's Theorem	Lecture	188-197
7	Partitions and Tagged Partitions <b>Midterm exam</b>	Lecture	198-195
8	Riemann Integral	Lecture	195-207

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9	Riemann Integrable Functions	Lecture	208-215
10	Fundamental Theorem of Calculus (First Form) Fundamental Theorem (Second Form)	Lecture	215-220
11	Substitution Theorem	Lecture	220-222
12	Lebesgue's Integrability Criterion Integration by Parts	Lecture	222-225
13	Sequences of functions	Lecture	241-243
14	Pointwise, Uniform Convergence	Lecture	243-246
15	Infinite series	Lecture	267-276
16	<b>Final Exam</b>		

### Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1	Background	Real Analysis 1	Self-reading and Discussion
2	Video 1 Solving exercises	E-learning	Discussion in the class
3	Home work 1: On the subjects studied on the first three weeks	(Lecture notes and Ref.1)	Submit a pdf or word sheet
4	Quiz 1	On the subjects studied on the first three weeks	Submitting on the E-learning
5	Assignment 1	Internet sources and the other Supportive learning resources	Presentation
6	Video 2	Solving exercises	Discussion in the class
7	Home work 2 On the subjects studied in the weeks 4,5 and 6	(Lecture notes and Ref.1)	Submit a pdf or word sheet
8	Assignment 2	Internet sources and the other Supportive learning resources	Submitted with the mid exam
9	Self-reading for selected topic	(Ref.2)	Talk
10	Video3 Solving exercises	E-learning	Discussion in the class
11	Home work 3: On the subjects studied after the Midterm exam	(Lecture notes and Ref.1)	Submit a pdf or word sheet
12	Self-reading for selected topic	(Ref.2)	Talk
13	Quiz 2	On the subjects studied on the subject studied after Midterm exam	Submitting on the E-learning
14	Presentation of the selected subject	Internet sources and the reference book	Video
15	Video 4 Revision of all the course	E-learning	
16	<b>Final Exam</b>	-	