

## ACKNOWLEDGEMENT

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UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the  $x^w m\theta k^w \acute{a}y\acute{a}m$  (Musqueam) people. The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on in their culture, history, and traditions from one generation to the next on this site.

## COURSE INFORMATION

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Course Title	Course Code Number	Credit Value
Real Analysis II / Functional Analysis	MATH 421/460F MATH 510/601F	3

Time and Room: MWF 11am-12pm in MATH 126

## PREREQUISITES

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MATH 420, Measure Theory

## CONTACTS

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Course Instructor(s)	Contact Details	Office Location	Office Hours
Sven Bachmann	By email: sbach@math.ubc.ca Skype: svenbac	MATH 228	Wed 2-3

## OTHER INSTRUCTIONAL STAFF

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TA: Manuel Ruivo De Oliveira, m.oliveira@math.ubc.ca

## SCHEDULE OF TOPICS

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1. Topological spaces
  - Basic definitions
  - Continuity

- Compactness
  - The Stone-Weierstrass Theorem
  - Urysohn's Lemma
2. Banach spaces
    - Metric and normed spaces
    - $L^p$  spaces and their dual
    - The Hahn-Banach Theorem and consequences
    - The Baire Category Theorem and consequences
  3. Hilbert spaces
    - Inner products
    - Orthonormal bases
    - The Riesz Lemma
  4. Radon measures and the Riesz-Markov Theorem

## LEARNING MATERIALS

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There will be lecture notes posted on the course's website. The weekly homework assignments and their solutions will be posted there. All important announcements will be communicated through the website.

We will not use Canvas at all.

We will not follow any textbook explicitly. There are many excellent books, among which

1. G.B. Folland  
Real Analysis, Modern Techniques and Their Applications
2. M. Reed and B. Simon  
Methods of Modern Mathematical Physics I: Functional Analysis
3. P. Lax  
Functional Analysis

the first of which being the main reference for the course.

## ASSESSMENTS OF LEARNING

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Update on March 23, 2020.

This grading scheme below has been imposed by the Faculty of Science and supersedes the grading schemes below. There will be a final exam. The course grade  $G$  is computed out the homework grade  $g_{HW}$  (dropping the lowest homework score) and the final grade  $g_F$  as

$$G = \max \{0.05g_F + 0.95g_{HW}, 0.3g_F + 0.7g_{HW}\}.$$

Update on March 18, 2020.

There will be no final exam. The final grade  $G$  will be given by the homework grade  $g_{HW}$  (dropping the lowest homework score) as

$$G = \max\{g_{HW}, 50\%\}.$$

There will be

1. weekly homework assignments made available on Fridays and due a week later,
2. one final exam to be scheduled in the exam period.

### *Final Grade*

The final grade is computed as such:

Homework: 50%;      Final: 50%.

In calculating your score for the homework, I will drop your lowest score. These include missed assignment. You must finish a significant amount of term work in order to pass.

A missed final will be handled in a formal way.

### *On submitted work:*

All assertions require an argument unless the problem states otherwise. No matter the operative word ('find', 'solve', 'establish', 'calculate', 'determine',...), you must justify your answer.

Written work should be presented carefully, in complete English sentences, and with sufficient detail. A correct sequence of formulas will only receive partial credit, an unstructured cloud of formulas and incoherent text will receive none.

When writing your solution to the problems, keep the following in mind: 'What is conceived well is expressed clearly, And the words to say it arrive without difficulty.' (N. Boileau, 1674) This in turns means that if you find yourself unable to express what you have in mind, then your ideas are most probably not clear yet.

## UNIVERSITY POLICIES

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UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community. Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available on the UBC Senate website.

## OTHER COURSE POLICIES

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Recording of the lectures and taking photos during or after the lectures is prohibited. If you have special needs requiring a technological assistance, please briefly notice the instructor.

## COPYRIGHT

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*Version: March 23, 2020*