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Seminar on Continued Fractions

in the FSS 2021

The seminar will be held in English. It will follow the book

[O63] C.D. Olds, Continued Fractions, The Mathematical Association of America, 1963.

The continued fractions provide much insight into many mathematical problems. It strongly enables us to study the nature of numbers.

The book above is ideal for a seminar. The material can be taken for seminar talks as it is. The book contains the following topics:

Chapter 1: History of discovery, general notation, and proof of preliminary theorems.
Chapter 2: Focus on the solution of linear Diophantine equations.
Chapter 3: The expansion of irrational numbers into infinite continued fractions
              and the idea of limits.
Chapter 4: The periodic properties of continued fractions,
              and Lagrange's theorem and Pell's equation.
Chapter 5: The theorem of Hurwitz and the suggestion of further study.

The seminar will take place

as a block seminar by Zoom sessions,

probably on some Saturdays: 17.04.21., 24.04.21, ...
The number of days needed will depend on the number of talks.
In the moment, up to 7 talks are planned (but it could be less or more).

The seminar aims at students in the Bachelor or Master *Mathematics in Business and Economics* and in the Bachelor or Master *Education Mathematics*.

If you are interested in a talk, please contact Dr. Mase,
                    mmase@mail.uni-mannheim.de,
until the end of the first teaching week in the FSS 2021, so until 05.03.2021.

The seminar has several aims.

(1) One is that the participants give a good talk and during preparation learn, how to achieve this. This means that one has to digest the material well, to choose well what to tell in detail and what not, and how to tell it. The talks shall take 90 minutes. Longer is forbidden absolutely, but much shorter is also bad. There is definitely for each talk enough material to fill 90 minutes (if the material in the main part should not be enough, one could add material from some exercises).

(2) All participants shall learn from all talks (not only their own one). It is good to prepare also for the other talks, by reading the relevant chapter. Doing that one could note some good questions which one can then pose during the talk if they are not answered anyway in the talk. The second aim requires presence at all talks.

(3) The book presents the material in a way, which is almost ready for seminar talks. The seminar shall cover (almost) all material in the book.

Talk 1:
Expansion of Rational Fractions. Chapter 1.

Talk 2:
Diophantine Equations. Chapter 2.

Talk 3:
Infinite Continued Fractions. Subsections 3.1, 3.2, 3.3, 3.4, 3.5, and 3.6.

Talk 4:
Approximation Theorems and Fibonacci Numbers. Subsections 3.7, 3.8, 3.9, 3.10, and 3.11.

Talk 5:
Periodic Continued Fractions. Subsections 4.1, 4.2, 4.3, 4.4, and 4.5.

Talk 6:
Lagrange's Theorem and Pell's Equation. Subsections 4.6, 4.7, 4.8, and 4.9 and Appendix I.

Talk 7:
Hurwitz' Theorem and Some Miscellaneous Expansions. Chapter 5 and Appendix II.