# Syllabus for Calculus 1 (BMETE90AX21)

**Complex numbers**

1. Algebraic form of complex numbers, conjugate and absolute value, operations with complex numbers in algebraic form, properties of operations.
2. Trigonometric form of complex numbers, operations in trigonometric form. Multiplication of complex numbers in trigonometric form. The nth power and nth root.

**Number sequences**

1. Convergence and divergence of number sequences, definition of $\lim_{n\to\infty} a_n = A$, finding $N(\varepsilon)$
2. Uniqueness of the limit **(proof)**
3. Convergent sequences are bounded **(proof)**
4. Operations with convergent sequences (limits of the sum, product, reciprocal and quotient of sequences). Sum rule **(proof)**
5. Limit of the product of a bounded sequence and a sequence tending to zero is zero **(proof)**
6. The limit of the reciprocals of sequences tending to infinity or to zero
7. Comparison of orders of magnitudes
8. Subsequences, limit of subsequences of a convergent sequence
9. The sandwich theorem for number sequences **(proof)**
10. Limits of the sequences $\sqrt[n]{p}$, $\sqrt[n]{n}$, $\left(1+\frac{x}{n}\right)^n$
11. Monotonic and bounded sequences are convergent
12. Mathematical induction and its application to determining the convergence of recursive sequences
13. Bolzano-Weierstrass theorem for number sequences
14. Cauchy-sequences.
15. Limit points of number sequences, limes superior, limes inferior

**Limit and continuity of real functions**

1. Definition of limits of functions, one-sided limits
2. The sequential criterion for the limit of a function
3. Operations with limits of functions (sum, difference, product and quotient of limits)
4. Sandwich theorem for limits of functions
5. The limit $\lim_{x\to 0} \frac{\sin x}{x} = 1$
6. Definition of continuity of a function
7. The sequential criterion for continuity
8. Algebraic properties of continuous functions (sum, difference, product and quotient of continuous functions is continuous)
9. Sandwich theorem for continuity
10. Types of discontinuities
11. Theorems for continuous functions on a finite and closed interval and applications of these theorems (Bolzano's theorem and Weierstrass extreme value theorem)