Czech Technical University in Prague
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Mathematics II – Schedule of Lectures in the Academic Year 2025/26

1. **Week (February 16 – 20):** Point in $\mathbb{E}_n$ and its neighborhood. Sequence of points in $\mathbb{E}_n$ and its limit. Interior and boundary point of a set in $\mathbb{E}_n$. Open and closed sets in $\mathbb{E}_n$, boundary and closure of a set in $\mathbb{E}_n$. Real function of n variables, its limit and continuity. Partial derivatives, geometric meaning. Gradient of a function of n variables, its physical and geometric interpretation.

2. **Week (February 23 – 27):** Total differential. Differentiable function. Relation to the existence of the tangent plane. Partial derivatives of a composite function. Directional derivative and its calculation, geometric meaning. Equation of the tangent plane and the normal equation to the graph of the function $z = f(x, y)$ and to the surface implicitly defined by the equation $F(x, y, z) = 0$.

3. **Week (February 2 – March 6):** Partial derivatives of higher orders.
   Local extrema of functions of multiple variables. Necessary condition, sufficient conditions. Examples for functions of two variables. Global (absolute) extrema of functions of two variables. Constrained extrema (resolved by substitution, mentioning the use of Lagrange multipliers).

4. **Week (March 9 – March 13):** Function $y = f(x)$ implicitly given by the equation $F(x, y) = 0$. Existence, continuity and first and second derivatives. Tangent to the graph and Taylor polynomial of the 2nd degree. Approximate calculation of the value of the implicitly defined function $y = f(x)$. Function $z = f(x, y)$ implicitly given by the equation $F(x, y, z) = 0$. Existence, continuity and partial derivatives. Tangent plane. Approximate calculation of the value of the implicitly defined function of two variables.

5. **Week (March 16 – 20):** Double integral, physical and geometric significance. Jordan measure and measurable sets in $\mathbb{E}_2$. Basic properties of double integrals. Fubini's theorem for double integrals. Area of a planar figure. Calculation of mechanical characteristics of a planar plate.

6. **Week (March 23 – 27):** Transformation of a double integral into polar or generalized polar coordinates.
   Triple integral, physical and geometric significance. Jordan measure and measurable sets in $\mathbb{E}_3$. Fubini's theorem for triple integrals.

7. **Week (March 30 – April 2; Good Friday, April 3):** Basic properties of the triple integral. Transformation of integrals into cylindrical and spherical coordinates. Use of generalized versions of these coordinates.
   Volume of a body. Calculation of mechanical characteristics of bodies.

   Definition of a vector function. Differential operators. Divergence of a vector field. Rotation of a vector field.

8. **Week (April 7 – 10 ; Easter Monday, April 6 canceled):** Simple (piecewise) smooth curve in $\mathbb{E}_2$ and in $\mathbb{E}_3$. Closed curve. Parametrization of a curve: segment, circle, ellipse, helix. Graph of a function of one variable $y = f(x)$, or $x = g(y)$. Curve with a given parametrization. Curve in $\mathbb{E}_3$ defined by the intersection of two surfaces. Curvilinear integral of a scalar function, basic properties and physical significance. Length of a curve. Calculation of mechanical characteristics of curves.

9. **Week (April 13 – 17):** Curvilinear integral of a vector function, basic properties and physical significance.
   Connection between the curvilinear integral of a vector function and the curvilinear integral of a scalar function.
   Circulation of a vector field over a closed curve. Green's theorem.

10. **Week (April 20 – 24; classes canceled on Tuesday, April 21 – Dean's Day):** Definition of a potential field (in $\mathbb{E}_2$ and in $\mathbb{E}_3$). Independence of the curvilinear integral of a vector function on the path, relation to the circulation of this vector function over closed curves.
    Necessary condition and sufficient conditions for a planar vector field to be potential in a region in $\mathbb{E}_2$. Calculation of the potential in $\mathbb{E}_2$.

11. **Week (April 27 – 30; Labor Day, May 1 canceled without replacement):** Simple smooth surface and simple piecewise smooth surface in $\mathbb{E}_3$. Closed (piecewise smooth) surface.
    Surface integral of a scalar function, basic properties and physical significance. Area of a surface in $\mathbb{E}_3$
    Calculation of mechanical characteristics of surfaces.

12. **Week (May 4 – 7; Victory Day, Friday, May 8 canceled without replacement):** Surface integral of a vector function, basic properties and physical significance. Connection between the surface integral of a vector function and the surface integral of a scalar function.
    Flux of a vector field through a surface. Gauss's theorem. Significance of the divergence of a vector field.

13. **Week (May 11 – 15; Rector's Day, Wednesday, May 13 canceled without replacement):** Necessary condition and sufficient conditions for a vector field to be potential in a region in $\mathbb{E}_3$. Calculation of the potential. Solenoidal field. Necessary condition for a differentiable vector field to be solenoidal in a given region (in $\mathbb{E}_2$ and in $\mathbb{E}_3$). Stokes' theorem. Connection with Green's theorem in $\mathbb{E}_2$. Significance of the rotation of a vector field.

14. **Week (May 18 – 22):** Replacement classes for missed lessons:

    May 18: Replacement for Easter Monday, April 3

    May 19: Replacement for Dean's Day on Tuesday, April 21

    May 20: Replacement for Rector's Day on Wednesday, May 13

    May 21: Replacement for Victory Day on Friday, May 8

    May 22: Replacement for Good Friday, April 6