

# Course description

|                             |                          |                 |                  |
|-----------------------------|--------------------------|-----------------|------------------|
| <b>Course abbreviation:</b> | KMA/ITG                  | <b>Page:</b>    | 1 / 5            |
| <b>Course name:</b>         | ICT in Teaching Geometry |                 |                  |
| <b>Academic Year:</b>       | 2023/2024                | <b>Printed:</b> | 01.06.2024 12:16 |

|   |  |          |          |                               |                 |
|---|--|----------|----------|-------------------------------|-----------------|
| <b>Department/Unit /</b>                | KMA / ITG                                      |          |          | <b>Academic Year</b>          | 2023/2024       |
| <b>Title</b>                            | ICT in Teaching Geometry                       |          |          | <b>Type of completion</b>     | Pre-Exam Credit |
| <b>Accredited/Credits</b>               | Yes, 3 Cred.                                   |          |          | <b>Type of completion</b>     | Combined        |
| <b>Number of hours</b>                  | Lecture 1 [Hours/Week] Tutorial 2 [Hours/Week] |          |          | <b>Course credit prior to</b> | NO              |
| <b>Occ/max</b>                          | Status A                                       | Status B | Status C | <b>Counted into average</b>   | NO              |
| <b>Summer semester</b>                  | 0 / -  | 0 / -    | 0 / -    | <b>Min. (B+C) students</b>    | 1               |
| <b>Winter semester</b>                  | 5 / -  | 0 / -    | 0 / -    | <b>Repeated registration</b>  | NO              |
| <b>Timetable</b>                        | Yes  |          |          | <b>Semester taught</b>        | Winter semester |
| <b>Language of instruction</b>          | Czech  |          |          | <b>Internship duration</b>    | 0               |
| <b>Optional course</b>                  | Yes  |          |          |                               |                 |
| <b>Evaluation scale</b>                 | S\N  |          |          |                               |                 |
| <b>No. of hours of on-premise</b>       |  |          |          |                               |                 |
| <b>Auto acc. of credit</b>              | No   |          |          |                               |                 |
| <b>Periodicity</b>                      | K  |          |          |                               |                 |
| <b>Substituted course</b>               | None   |          |          |                               |                 |
| <b>Preclusive courses</b>               | N/A  |          |          |                               |                 |
| <b>Prerequisite courses</b>             | N/A  |          |          |                               |                 |
| <b>Informally recommended courses</b>   | N/A  |          |          |                               |                 |
| <b>Courses depending on this Course</b> | N/A  |          |          |                               |                 |

## Course objectives:

The main aim of this course is to give students a thorough introduction to computer-assisted learning and teaching geometry and show them how to explore classical topics in geometry via interactive geometry software. Most of the topics will be learned through the student's own discoveries. Students should gain a deeper perspective about geometry's relationship to the world around them. The course also gives a short introduction to basic theory of modelling curves, surfaces and solids using computers.

## Requirements on student

During semester, students have to prepare several partial homework assignments which will demonstrate knowledge of theory, constructions and practical applications. In addition, students elaborate 1-2 individual assigned projects and present them at the seminar.

## Content

Introduction to computer visualization of curves, surfaces and solids. ICT in teaching geometry, using for training of imagination and experimentation. Creative and inventive application of programs of variational and dynamic geometry or further geometric SW (especially suitable 3D modellers). Solving classical geometric problems using computers.

## Fields of study

## Guarantors and lecturers

- **Guarantors:** Doc. RNDr. Michal Bizzarri, Ph.D. (100%)
- **Lecturer:** Doc. RNDr. Michal Bizzarri, Ph.D. (100%), Mgr. Radek Výrut (100%)
- **Tutorial lecturer:** Doc. RNDr. Michal Bizzarri, Ph.D. (100%), Mgr. Radek Výrut (100%)

## Literature

- **Basic:** Bainville, E. *CABRI II Plus manuál (překlad A. Vrba)*. 2003.
- **Basic:** Geogebra: Příručka - <https://wiki.geogebra.org/cs/P%C5%99%C3%ADru%C4%8Dka> >
- **Basic:** Vaniček, Jiří. *Počítačové kognitivní technologie ve výuce geometrie*. V Praze : Univerzita Karlova, 2009. ISBN 978-80-7290-394-8.
- **Extending:** Piegl, Les; Tiller, Wayne. *The NURBS book*. 2nd ed. Berlin : Springer, 1997. ISBN 3-540-61545-8.
- **Recommended:** Farin, Gerald. *Curves and surfaces for computer-aided geometric design : a practical guide*. 4th ed. San Diego : Academic Press, 1997. ISBN 0-12-249054-1.
- **Recommended:** El Saddik, Abdulmotaleb. *Interactive multimedia learning : shared reusable visualization-based modules : with 60 figures and 16 tables*. Berlin : Springer, 2001. ISBN 3-540-41930-6.

## Time requirements

### All forms of study

| Activities                                       | Time requirements for activity [h] |
|--|------------------------------------|
| Contact hours                                    | 36                                 |
| Individual project (40)                          | 20                                 |
| Undergraduate study programme term essay (20-40) | 30                                 |
| <b>Total:</b>                                    | <b>86</b>                          |

## assessment methods

### Knowledge - knowledge achieved by taking this course are verified by the following means:

Test  
Seminar work  
Project

### Skills - skills achieved by taking this course are verified by the following means:

Test  
Seminar work  
Project

### Competences - competence achieved by taking this course are verified by the following means:

Test  
Seminar work  
Project

## prerequisite

### Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:

rozumět základním poučkám z elementární geometrie, trigonometrie a analytické geometrie v rovině a v prostoru  
orientovat se v principechh vybrané promítací metody  
rozumět reprezentaci geometrických objektů a ovládat manipulace s nimi

### Skills - students are expected to possess the following skills before the course commences to finish it successfully:

aplikovat osvojené postupy na elementární geometrické úlohy  
analyzovat a vhodně využívat vybrané geometrické vlastnosti  
pracovat ve vhodném geometrickém SW

### Competences - students are expected to possess the following competences before the course commences to finish it successfully:

N/A  
N/A

N/A

N/A

N/A

**teaching methods****Knowledge - the following training methods are used to achieve the required knowledge:**

Lecture

Lecture with visual aids

Practicum

Multimedia supported teaching

Task-based study method

Individual study

**Skills - the following training methods are used to achieve the required skills:**

Lecture

Lecture with visual aids

Practicum

Multimedia supported teaching

Task-based study method

Individual study

**Competences - the following training methods are used to achieve the required competences:**

Lecture

Lecture with visual aids

Practicum

Multimedia supported teaching

Task-based study method

Self-study of literature

**learning outcomes****Knowledge - knowledge resulting from the course:**

rozumět počítačovému zobrazování křivek, ploch a těles

rozumět významu zapojení vhodného software dynamické geometrie pro modelování konstrukcí a geometrických objektů

chápat se všemi důsledky vlastnosti a vztahy uvnitř dobře známých základních geometrických objektů

orientovat se v možnostech zařazení ICT do výuky geometrie

**Skills - skills resulting from the course:**

používat vhodný software dynamické geometrie pro provádění konstrukcí a vizualizací geometrických objektů (křivek, ploch, těles), provádět s nimi vhodná měření a následné výpočty

objevovat vlastnosti a vztahy základních geometrických objektů

dle vlastní volby začít vlastní zkoumání geometricky orientovaných témat s využitím počítače

rozpoznávat a analyzovat využití geometrie a jejích metod v nejrůznějších oborech

aplikovat vhodné geometrické modely na řešení jednoduchých reálných problémů

využít účelně vhodný geometrický SW pro trénování představivosti a k experimentování

**Competences - competences resulting from the course:**

N/A

N/A

N/A

## Course is included in study programmes:

| Study Programme                                      | Type of             | Form of   | Branch   | Stage | St. plan v. | Year | Block                            | Status | R.year | R. |
|--|---------------------|-----------|--|-------|-------------|------|----------------------------------|--------|--------|----|
| Učitelství matematiky pro střední školy              | Postgraduate Master | Full-time | Secondary School Education Mathematics - Major             | 1     | 2020        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Učitelství matematiky pro střední školy              | Postgraduate Master | Full-time | Secondary School Education Mathematics - Minor             | 1     | 2020        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Biology   | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Biology         | 1     | 2021        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Biology   | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Biology         | 1     | 2023        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Biology   | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Biology         | 1     | 2020        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Biology   | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Biology         | 1     | 2022        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Geography | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Geography       | 1     | 2023        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Geography | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Geography       | 1     | 2020        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Geography | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Geography       | 1     | 2021        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Geography | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Geography       | 1     | 2022        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Chemistry | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Chemistry       | 1     | 2022        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Chemistry | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Chemistry       | 1     | 2023        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Chemistry | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Chemistry       | 1     | 2021        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Upper Secondary School Teacher Training in Chemistry | Postgraduate Master | Full-time | Upper Secondary School Teacher Training in Chemistry       | 1     | 2020        | 2023 | Matematika - didaktické předměty | A      | 2      | ZS |
| Design   | Bachelor            | Full-time | Design, specialization Industrial Design                   | 1     | 4           | 2023 | Blok geometrie                   | B      | 2      | ZS |
| Lower Secondary School Teacher Training              | Postgraduate Master | Full-time | Lower Secondary School Teacher Training in the Mathematics | 1     | 2020        | 2023 | Povinně volitelné - blok 2       | B      | 2      | ZS |
| Lower Secondary School Teacher Training              | Postgraduate Master | Full-time | Lower Secondary School Teacher Training in the Mathematics | 1     | 2021        | 2023 | Povinně volitelné - blok 2       | B      | 2      | ZS |
| Lower Secondary School Teacher Training              | Postgraduate Master | Full-time | Lower Secondary School Teacher Training in the Mathematics | 1     | 2023        | 2023 | Povinně volitelné - blok 2       | B      | 2      | ZS |

| Study Programme                         | Type of             | Form of   | Branch   | Stage | St. plan v. | Year | Block                      | Status | R.year | R. |
|---|---------------------|-----------|--|-------|-------------|------|----------------------------|--------|--------|----|
| Lower Secondary School Teacher Training | Postgraduate Master | Full-time | Lower Secondary School Teacher Training in the Mathematics | 1     | 2022        | 2023 | Povinně volitelné - blok 2 | B      | 2      | ZS |
| Teacher Training for Basic Schools      | Postgraduate Master | Full-time | BS Teacher Training in Mathematics                         | 2     | 17          | 2023 | Povinně volitelné - blok 2 | B      | 2      | ZS |
| Teacher Training for Basic Schools      | Postgraduate Master | Full-time | BS Teacher Training in Mathematics                         | 2     | 19          | 2023 | Povinně volitelné - blok 2 | B      | 2      | ZS |
| Teacher Training for Basic Schools      | Postgraduate Master | Full-time | BS Teacher Training in Mathematics                         | 2     | 18          | 2023 | Povinně volitelné - blok 2 | B      | 2      | ZS |