

Study Regulations for the course of study Master of Science / Visual Computing

Preamble

Pursuant to § 54 of Act No. 1556 on Saarland University (University Act – UG) from August 27th, 2004 (Official Gazette p.982), the University of Saarland Faculty of Natural Sciences and Technology I has issued the following study regulations for the Master course of study in Visual Computing, which are hereby promulgated.

Central idea

Because visual impression is the most important sensory perception of human portrayal, the field of computer-aided information processing has begun replacing more and more text content with visual representations. Computer-aided visual information processing is, among other things, of central importance in communication networks, multimedia-PCs, industrial quality control, medical technology, assistant driving systems, pattern recognition problems in bioinformatics, scientific calculation, the field of augmented-reality, media design, and robotics.

The aim of this Master course of study in Visual Computing is to convey the fundamental ideas, processes and applications of computer-aided visual information processing. The course of study belongs to the field of computer science with interdisciplinary connections especially to mathematics, physics, and electrical engineering, but also to medical engineering, biology, computer linguistics, and cognitive sciences. The entry requirements include a Bachelor's degree in Visual Computing or a relating subject (especially computer science, mathematics, physics, electrical engineering and "Mechatronics"). It is a research-orientated, international course of study for which part of the aim is to gain good command of the specialized English vocabulary. The course of study may be absolved in English.

§1 Aims of the course of study

- (1) These study regulations specify the contents and structure of the Master of Science course of study in Visual Computing, on the basis of the Examination Regulations for this course of study.
- (2) The course of study consists of courses belonging to the categories of lectures with and without tutorials and/or seminars. Every graduate of this course of study must write a final thesis (Master's thesis). Credits ("Credit Points") are assigned to each course, representing the course's scope, whereby one credit equals 30 hours of study (in-course or self-study). At the end of each course

there is a – mostly graded – exam. Each passed exam during the course of study is part of the final Master’s exam (*studienbegleitende Prüfungsleistungen*). Information as to structure, course excerpts and contents as well as form and length of the exams for every course can be taken from the course of study handbook. The complete Master course of study comprises 120 credits. In the case of the recommended four semesters as a student, 30 credits are to be earned each semester.

§2 Courses

(1) The Master course of study contains courses covering 90 credits, as well as a scientific thesis, the Master’s thesis, covering 30 credits. The term “course” corresponds to the term “module” according to the Examination Regulations framework for the Master course of study at Saarland University. The courses offered shall cover at least the following courses (L = lecture, T = tutorial, S = seminar); the number stated after the abbreviations indicates the number of weekly hours per semester (*Semesterwochenstunden*; SWS)):

1. In the central subject area of Visual Computing:

a) In the category of image acquisition methods and basic geometry:

- Introduction to image acquisition methods, 4 credits (L2)
- Medical imaging, 9 credits (L4, T2, mathematics)
- Image acquisition methods: ultrasound, X-ray, 4 credits (L2, medical technology, every year)
- Imaging methods: MRI, 5 credits (L2, T1, medical technology, every year)
- Geometric modeling, 9 credits (L4, T2, at least every two years)
- Effective computational geometry for curves and surfaces, 6 credits (L4)

b) In the category of image analysis:

- Image processing and computer vision, 9 credits (L4, T2, at least every two years)
- Pattern and speech recognition, 6 credits (L2, T2, at least every two years, mechatronics)
- Pattern recognition, 5 credits (L2, T1)
- Differential equations in image processing and computer vision, 9 credits (L4, T2)
- Differential geometric aspects of image processing, 4 credits (L2)
- Probabilistic methods in image processing, 4 credits (L2)

- Mathematical morphology in image analysis, 4 credits (L2)
 - 3D image analysis and synthesis, 6 credits (L2, T2)
- c) In the category of image synthesis:
- Computer graphics, 9 credits (L4, T2, at least every two years)
 - Computer graphics 2, 9 credits (L4, T2)
 - Scientific Visualization, 9 credits (L4, T2, at least every two years)
 - Multimedia, 6 credits (L2, T2)
 - 3D image analysis and synthesis, 6 credits (L2, T2)
- d) Seminars on changing visual computing topics, 8 credits

Seminars are offered every semester.

2. Relating areas from computer science and other subjects:
- Information retrieval and data mining, 9 credits (L4, T2)
 - Artificial intelligence, 9 credits (L4, T2)
 - Telecommunications I / Digital transmission and signal processing, 9 credits (L4, T2)
 - Telecommunications II / audio/visual communication & networks, 9 credits (L4, T2)

These lectures are offered at least once every two years.

Further courses, for example:

- in-depth and special courses on the above lectures
- applicable courses on machine-learning from the field of robotics
- courses from the field of language recognition and computer linguistics
- courses from the field of medical technology
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3. Supplementary basic courses:

These should help fill in possible gaps from a student's previous studies and can cover courses in the following areas:

- Mathematics (practical mathematics, theory and numeric of ordinary differential equations, stochastic, numeric partial differential equations, integral equations, calculus of variations, differential geometry of curves and surfaces, partial differential equations,

- inverse problems, and integral transformations, among others)
- Computer science (programming I and II, software practical training, software technology, algorithms, and data structures, and optimization, among others)
 - Mechatronics (basic signal processing and digital signal processing, among others)
 - Physics (introduction to physics I and II or physics for engineers I and II, among others)

These courses are offered at least every two years.

4. Further credits can be acquired by passing additional courses (in addition to the above-mentioned courses, also for example, languages, image sciences of the arts, media design, cognitive sciences, psychology etc.) or by supervising a tutorial as a tutor.
- (2) The range of course offered in the different course categories may be extended by additional courses for one or more semesters, which requires the approval of the examination board. These courses, as well as their weight in credits and their allocation to one or more of the course categories shall be announced before the start of each semester.
 - (3) Courses which are central to the Visual computing subject area and the relating fields of computer science are generally held in English. Courses in the remaining categories are also held in English, so that the ability to study in English is guaranteed.

§3 Plan of Study

- (1) Based on these conditions of studies, the Dean of the Faculty of Natural Science and Technology I issues a plan of study containing further information about form and extent of the courses, as well as recommendations concerning the advisable organization of the studies. This plan shall be published in appropriate form. The current range of courses available at a time in the different course categories shall be announced in the timetable of courses of each semester.
- (2) Attachment B contains examples of study plans for the Master course of study.

§4 Becoming effective

These study regulations for the Master of Science / Visual Computing course of study will become effective on the day after their publication in the official gazette of Saarland University.

Saarbrücken, _____, 200__

The President of Saarland University
Univ. –Prof. Dr. Margret Wintermantel

Attachment B

The following are three sample plans of study for different future specialized fields of work.

Master's – classic broad plan

(for students wanting to move on to a career in industry)

| | | | | | |
|---|-------------------|----------------------|-----------------|-----------|-----|
| 1 | Com Gr I (9) | Im Pr Com Vis (9) | Image Acq (4) | Erg V (9) | 31 |
| 2 | Geo Mod (9) | Diff Equ in IPCV (9) | Pattern Rec (6) | Erg V (9) | 33 |
| 3 | Sci Vis (9) | Bildverw Geb. (9) | Seminar (8) | | 26 |
| 4 | Final thesis (30) | | | | 30 |
| | Credits total | | | | 120 |

Master's with emphasis on image synthesis

(for students wanting to obtain a PhD in the area of image synthesis)

| | | | | | |
|---|-------------------|-------------------|----------------|-----------|-----|
| 1 | Com Gr I (9) | Im Pr Com Vis (9) | Multimedia (6) | Erg V (9) | 33 |
| 2 | Com Gr II (9) | Geo Mod (9) | MT (4) | Erg V (9) | 31 |
| 3 | Sci Vis (9) | Bildverw Geb (9) | Seminar (8) | | 26 |
| 4 | Final thesis (30) | | | | 30 |
| | Credits total | | | | 120 |

Master's with emphasis on image analysis

(for students wanting to obtain a PhD in the area of image analysis)

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|---|----------------------|----------------------|-----------------|-------------|-----|
| 1 | Com Gr I (9) | Im Pr Com Vis (9) | Image Acq (4) | Erg V (9) | 31 |
| 2 | 3D Image A and S (6) | Diff Equ in IPCV (9) | Pattern Rec (6) | Seminar (8) | 29 |
| 3 | DiffgeoIP (4) | Bildver Geb (9) | Seminar (8) | Erg V (9) | 30 |
| 4 | Final thesis (30) | | | | 30 |
| | Credits total | | | | 120 |

Abbreviation key

| | |
|------------------|--|
| Com Gr | = Computer Graphics |
| Im Pr Com Vis | = Image Processing and Computer Vision |
| Image Acq | = Introduction to Image Acquisition Methods |
| Sci Vis | = Scientific Visualization |
| DiffgeoIP | = Differential Geometric Aspects of Image Processing |
| Geo Mod | = Geometric Modeling |
| Pattern Rec | = Pattern Recognition |
| 3D Image A and S | = 3D Image Analysis and Synthesis |
| Diff Equ in IPCV | = Differential Equations in Image Processing and Computer Vision |
| MT | = Medical Technology |
| Bildverw Geb | = Bildverwandte Gebiete (relating areas) |
| Erg V | = Ergänzungsveranstaltung (supplementary course) |