

Module Catalog Master Program Medical Engineering

Study Field "Medical Image and Data Processing"

Please note the Module Descriptions in UnivIS!

| Modul Group | Modul Number | Modules | | SWS L+E+S+P | Total Sum ECTS | 1st Year | | 2nd Year | | Language | Credit Modalities | Department | Responsible Chair(s) | WS/SS |
|-------------|--------------|---------------------------------|-------|----------------|-------------------|----------|------|----------|------|----------|-------------------|------------|----------------------|-------|
| | | Modul Name (Name of Lecture) | Abbr. | | | WS | SS | WS | SS | | | | | |
| | | | | | | ECTS | ECTS | ECTS | ECTS | | | | | |

| M 1 | Medical Specialisation | | L+E+S+P | 10 | 5 | 5 | 0 | 0 | | | | | | |
|--------|---|---------------------|---------|-----|-----|-----|---|---|----|-----|-----|---|-------|--|
| M 1.1 | Clinical Applications of Optical Technologies and Associated Fundamentals of Anatomy ¹ | OMED/CA | 4+0+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | MED | Lehrstuhl für Anatomie II (Prof. Dr. Paulsen) | SS | |
| M 1.2 | Applications of nanotechnology in cardiovascular diseases | HNO 24 | 0+0+2+0 | 2,5 | 0 | 2,5 | 0 | 0 | EN | gCA | MED | Professur für Nanomedizin (Stiftungsprofessur der Else Kröner-Fresenius-Stiftung) | WS/SS | |
| M 1.3 | Medizinische Biotechnology / Medical Biotechnology | MBT | 3+1+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | CBI | Lehrstuhl für Medizinische Biotechnologie (MBT) | SS | |
| M 1.4 | Medical Physics in Radiation Therapy Praktikum | MSP | 4+0+0+2 | 10 | 2,5 | 0 | 0 | 0 | EN | PfE | MED | Lehrstuhl für Strahlentherapie | WS+SS | |
| M 1.5 | Medical Physics in Radiation Therapy - lab only Praktikum | MSPL | 2+0+0+2 | 7,5 | 2,5 | 0 | 0 | 0 | EN | PfE | MED | Lehrstuhl für Strahlentherapie | WS+SS | |
| M 1.6 | Medical Physics in Radiation Therapy - special topic only | MSPS | 4+0+0+0 | 5 | 2,5 | 2,5 | 0 | 0 | EN | PfE | MED | Lehrstuhl für Strahlentherapie | WS+SS | |
| M 1.7 | Medical Physics in Nuclear Medicine | MPNM | 2+0+0+0 | 2,5 | 2,5 | 0 | 0 | 0 | EN | gCA | MED | Lehrstuhl für Klinische Nuklearmedizin | WS | |
| M 1.8 | Jüngste Entwicklungen der medizinischen Systembiologie / Advances in Medical Systems Biology | AdvMedSys | 0+0+3+0 | 2,5 | 0 | 2,5 | 0 | 0 | EN | PfE | MED | Lehrstuhl für Haut- und Geschlechtskrankheiten | SS | |
| M 1.9 | Introduction to simulation, network and data analysis in Medical Systems Biology | IntSysMed_ f_Eng | 2+0+0+0 | 2,5 | 2,5 | 0 | 0 | 0 | EN | gCA | MED | Lehrstuhl für Haut- und Geschlechtskrankheiten | WS | |
| M 1.10 | Medical Communications | MedCom | 2+0+0+0 | 2,5 | 2,5 | 0 | 0 | 0 | EN | gCA | MED | Lehrstuhl für Innere Medizin II | WS/SS | |

¹ Obligatory, if appropriate skills not acquired in the Bachelor.

Additional medical modules can be used with the agreement of the program director. Please consult with your study advisor beforehand.

| M 2 Engineering Core Modules | | | L+E+S+P | 20 | 10 | 10 | 0 | 0 | | | | | |
|------------------------------|---|---------------|---------|-----|-----|----|---|---|-------------------|-----|-----|--|-------------------|
| M 2.6 | Digitale Übertragung / Digital Communications Exercise | DÜ / DiCo | 3+1+0+0 | 5 | 5 | 0 | 0 | 0 | WS: EN SS: GER | gCA | EEL | Lehrstuhl für Digitale Übertragung (IDC) | WS: EN SS: GER |
| M 2.8 | Computergraphik / Computer Graphics ³ Exercise | CG | 3+1+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 9 (Graphische Datenverarbeitung) | WS |
| M 2.9 | Digitale Signalverarbeitung / Digital Signal Processing Exercise | DSV | 3+1+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | EEL | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | WS |
| M 2.10 | Pattern Recognition ¹ Exercise | PR | 3+1+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | WS |
| M 2.11 | Pattern Analysis ¹ Exercise | PA | 3+1+0+0 | 5 | 5 | 5 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | SS |
| M 2.12 | Statistische Signalverarbeitung / Statistical Signal Processing Exercise | STASIP | 3+1+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | EEL | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | WS |
| M 2.14 | Parallele Systeme / Parallel Systems Exercise | PSYS-VU | 2+2+0+0 | 5 | 5 | 5 | 0 | 0 | DE/EN | gCA | INF | Lehrstuhl für Informatik 12 (Hardware-Software-Co-Design) | SS |
| M 2.17 | Reconfigurable Computing Exercise | RC | 2+2+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 12 (Hardware-Software-Co-Design) | WS |
| M 2.19 | Informationstheorie und Codierung / Information Theory and Coding Exercise | ITC ITC-EN | 3+1+0+0 | 5 | 5 | 5 | 0 | 0 | WS: EN SS: GER | gCA | EEL | Lehrstuhl für Digitale Übertragung (IDC) | WS: EN SS: GER |
| M 2.20 | Channel Coding Exercise | ChCo | 3+1+0+0 | 5 | 5 | 5 | 0 | 0 | EN | gCA | EEL | Lehrstuhl für Informationsübertragung (LIT) | SS |
| M 2.22 | Geometrische Modellierung / Geometric Modeling ³ Exercise | GM | 3+1+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 9 (Graphische Datenverarbeitung) | WS |
| M 2.23 | Applied Visualization Exercise | AppVis | 2+2+0+0 | 5 | 5 | 5 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 9 (Graphische Datenverarbeitung) | SS |
| M 2.24 | Transformationen in der Signalverarbeitung / Transformations in Signal Processing | TSV | 2+0+0+0 | 2,5 | 2,5 | 0 | 0 | 0 | EN | gCA | EEL | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | SS |
| M 2.26 | Dependable Embedded Systems currently offered in SS! Exercise | DES | 2+2+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 12 (Hardware-Software-Co-Design) | WS |
| M 2.27 | Algorithms of Numerical Linear Algebra Exercise | ANLA | 4+2+0+0 | 7,5 | 7,5 | 0 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 10 (Systemsimulation) | WS |
| M 2.28 | Functional Analysis for Engineers ² Exercise | FuncAnEng | 2+2+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 10 (Systemsimulation) | WS |
| M 2.29 | Optimierung für Ingenieure / Optimization for Engineers Exercise | OptIngV | 3+1+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | NAT | Lehrstuhl für Angewandte Mathematik 2 (Prof. Dr. Leugering) | SS |

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|--------|--|--------|---------|---|--------------|---|---|----|-----|-----|-----------------------------------|--|-------|
| M 2.32 | Heterogene Rechnerarchitekturen Online | HETRON | 4+0+0+0 | 5 | VHB (online) | | | EN | gCA | VHB | Virtuelle Hochschule Bayern (VHB) | WS/SS | |
| M 2.35 | Deep Learning ⁴ Exercise | DL | 2+2+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | WS/SS |

¹ Obligatory, if appropriate skills not acquired in the Bachelor.

² Very profound knowledge of mathematics required.

³ Yearly change between German and English.

⁴ In 2018 this Module is also offered in SS, usually it is just offered in WS.

| M 3 Medical Engineering Core Modules | | | L+E+S+P | 20 | 10 | 10 | 0 | 0 | | | | | |
|--------------------------------------|--|----------|---------|-----|--------------|-----|-----|----|--------|-----|-----------------------------------|--|-------|
| M 3.1 | Visual Computing in Medicine | VCMed | 4+0+0+0 | 5 | 2,5 | 2,5 | 0 | 0 | GER/EN | gCA | INF | Lehrstuhl für Informatik 9 (Graphische Datenverarbeitung) | WS+SS |
| M 3.2 | Diagnostic Medical Image Processing (VHB-Kurs) | DMIP-VHB | 4+0+0+0 | 5 | VHB (online) | | | EN | gCA | VHB | Virtuelle Hochschule Bayern (VHB) | WS/SS | |
| M 3.3 | Interventional Medical Image Processing | IMIP | 4+0+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | SS |
| M 3.4 | Biomedizinische Signalanalyse / Biomedical Signal Analysis Exercise | BioSig | 2+2+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | WS |
| M 3.5 | Computer Architectures for Medical Applications Exercise | CAMA | 2+2+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 3 (Rechnerarchitektur), Professur für Höchstleistungsrechnen | SS |
| M 3.7 | Magnetic Resonance Imaging 2 | MRI2 | 2+0+0+0 | 2,5 | 0 | 2,5 | 0 | 0 | DE/EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | SS |
| M 3.8 | Image and Video Compression Exercise | IVC | 3+1+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | EEl | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | SS |
| M 3.9 | Wavelet-Transformationen in der Bildverarbeitung / Wavelet Transformations in Image Processing Exercise (Theoretical or Practical) | WTBV | 3+1+0+0 | 7,5 | 0 | 0 | 7,5 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 8 (Theoretische Informatik) | WS |
| M 3.11 | Multidimensional Signals and Systems | MDSS | 4+0+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | EEl | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | WS |

| M 4 Medical Engineering Core Skills | | | L+E+S+P | 10 | 5 | 0 | 5 | 0 | | | | | |
|-------------------------------------|--|----------|---------|-----|---|--------------|-----|---|-------------------|-----|------|--|-------------------|
| M 4.1 | Medical Law, Economics and Innovation | | | 5 | 5 | | | | | | | | |
| | Innovation Technology | | 2+2+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | WISO | Lehrstuhl für Wirtschaftsinformatik I | WS |
| | Leadership and communication in a global world | | 2+0+0+0 | 2,5 | | VHB (online) | | | EN | gCA | VHB | Virtuelle Hochschule Bayern (VHB) | WS/SS |
| | Management of Change Processes in a Global World | | 2+0+0+0 | 2,5 | | VHB (online) | | | EN | gCA | VHB | Virtuelle Hochschule Bayern (VHB) | WS/SS |
| | Product Management | OSS-PROD | 4+0+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | INF | Professur für Open Source Software | WS |
| | Innovation & Leadership | | 2+2+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | WISO | Lehrstuhl für Wirtschaftsinformatik I | WS |
| | Internationales Projektmanagement / International Projekt Management | IntPM | 4+0+0+0 | 5 | 5 | 0 | 0 | 0 | EN | gCA | WISO | Lehrstuhl für International Business and Society Relations mit Schwerpunkt Lateinamerika | WS |
| | Product Innovation Management in Emerging Markets | | 4+0+0+0 | 5 | | VHB (online) | | | EN | gCA | VHB | Virtuelle Hochschule Bayern (VHB) | SS |
| M 4.2 ⁵ | Seminar Medical Engineering and Ethics , consisting of: | | | 5 | | | 5 | | | | | | |
| M 4.2 a | Seminar Medizinethik / Seminar Medical Ethics | MEDET | 0+0+2+0 | 2,5 | 0 | | 2,5 | 0 | WS: EN SS: GER | gCA | ZiMT | Lehrstuhl für Systematische Theologie II (Ethik) | WS: EN SS: GER |
| M 4.2 b ⁴ | Seminar Medical Engineering | | 0+0+2+0 | 2,5 | 0 | 0 | 2,5 | 0 | EN | gCA | ZiMT | see Seminar Catalogue | |

⁴ Selection of 1 out of Catalogue

⁵ Obligatory

| M 5 Medical Engineering Specialisation Modules | | | L+E+S+P | 10 | 0 | 5 | 5 | 0 | | | | | |
|--|---|------------|---------|-----|---|---|-----|---|----|-----|-----|---|----|
| M 5.6 | Test and Analysis Techniques for Software Verification and Validation | TestAn-SWE | 2+2+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 11 (Software Engineering) | WS |
| | Exercise | | | | | | | | | | | | |
| M 5.8 | Medical Imaging System Technology | MISysT | 3+1+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | EEL | Lehrstuhl für Hochfrequenztechnik (LHFT) | SS |
| MEL ⁶ | Exercise | | | | | | | | | | | | |
| M 5.9 | Human Computer Interaction | HCI | 3+1+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | SS |
| | Exercise | | | | | | | | | | | | |
| M 5.10 | Convex Optimization in Communications and Signal Processing | ConvOpt | 3+1+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | EEL | Lehrstuhl für Digitale Übertragung (IDC) | WS |
| | Exercise | | | | | | | | | | | | |
| M 5.11 | Image Processing in Optical Nanoscopy currently not offered! | IPNano | 1+1+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 10 (Systemsimulation) | SS |
| | Exercise | | | | | | | | | | | | |
| M 5.12 | Security in Embedded Hardware currently not offered! | SEH | 2+2+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 12 (Hardware-Software-Co-Design) | SS |
| | Exercise | | | | | | | | | | | | |
| M 5.1 | Optical Technologies in Life Science | OIC/OTLS | 4+0+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | CBI | Lehrstuhl für Medizinische Biotechnologie (MBT) | WS |
| GPP ⁶ | | | | | | | | | | | | | |
| M 5.2 | Lasers in Healthcare Engineering | LASHE | 2+0+0+0 | 2,5 | 0 | 0 | 2,5 | 0 | EN | gCA | WW | Lehrstuhl für Photonische Technologien (LPT) | WS |
| GPP ⁶ | | | | | | | | | | | | | |

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|--------|---|--------|---------|-----|---|-----|-----|---|----|-----|-----|---|----|
| M 5.17 | Body Area Communications MEL ⁶ | BAC | 2+0+0+0 | 2,5 | 0 | 0 | 2,5 | 0 | EN | gCA | EEL | Lehrstuhl für Technische Elektronik (LTE) | WS |
| M 5.18 | Knowledge Discovery in Databases | KDD | 2+0+0+0 | 2,5 | 0 | 2,5 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 6 (Datenmanagement) | SS |
| M 5.22 | Image, Video and Multidimensional Signal Processing Exercise | VMSP | 3+1+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | EEL | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | WS |
| M 5.23 | Molecular Communications Exercise | MolCom | 3+1+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | EEL | Lehrstuhl für Digitale Übertragung | WS |
| M 5.25 | Wearable and Implantable Computing | WIC | 2+2+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | MED | Lehrstuhl für eHealth/mHealth | SS |

⁶ Modules from the branches of study "Medical Devices, Manufacturing Engineering and Prosthetics" (GPP) and "Medical Electronics" (MEL): only a maximum of 5 ECTS of these modules can be used.

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|---|---|--|---|----------------------------|----------|----------|----------------------------|----------|----------------------------|---------------------------------|--|--|---|
| M 6 Medical Engineering Practical Skills | | | L+E+S+P | 10 | 0 | 0 | 10 | 0 | | | | | |
| M 6.1 | Academic Laboratory See list on the homepage | | 0+0+0+4 | 5 | 0 | 0 | 5 | 0 | EN | uCA | | Zentralinstitut für Medizintechnik (ZiMT) | WS/SS |
| M 6.2 | Research Laboratory | | 0+0+0+4 | 5 | 0 | 0 | 5 | 0 | EN | uCA | | Lehrstuhl für Informatik 5 (Mustererkennung) | WS/SS |
| M 6.1 + M 6.2 | Alternatives for M 6.1 and M 6.2: Project Flat-Panel CT Reconstruction Project Pattern Recognition Project Computer Vision Project Magnetic Resonance Imaging Innovationslabor für Wearable und Ubiquitous Computing | ProjFCR ProjME ProjCV ProjMRI InnoLabPro | 0+0+0+8 0+0+0+8 0+0+0+8 0+0+0+8 0+0+0+8 | 10 10 10 10 10 | | | 10 10 10 10 10 | | EN EN EN EN EN | uCA uCA uCA uCA uCA | | Lehrstuhl für Informatik 5 (Mustererkennung) Lehrstuhl für Informatik 5 (Mustererkennung) Lehrstuhl für Informatik 5 (Mustererkennung) Lehrstuhl für Informatik 5 (Mustererkennung) Lehrstuhl für Informatik 5 (Mustererkennung) | WS/SS WS/SS WS/SS WS/SS WS/SS |

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|----------------------------|---|--|--|-----------|----------|----------|-----------|----------|--|-----|--|--|--|
| M 7 Flexible Budget | | | | 10 | 0 | 0 | 10 | 0 | | | | | |
| M 7.1 | Flexible Budget any graded lecture / course at the university | | | 10 | 0 | 0 | 10 | 0 | | gCA | | | |

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|----------------------------|----------------------------------|--|--|-----------|----------|----------|----------|-----------|--|-----|--|--|--|
| M 8 Master's Thesis | | | | 30 | 0 | 0 | 0 | 30 | | | | | |
| M 8 | Master's Thesis Thesis + Talk | | | 30 | 0 | 0 | 0 | 30 | | PfE | | | |

For M3 you can use max. 5 ECTS points from the module groups M2 or M5 of your own branch of study or from M2, M3 or M5 of the other branches of study (mostly taught in German!)

For M5 you can use max. 5 ECTS points from the module groups M2 or M3 of your own branch of study or from M2, M3 or M5 of the other branches of study (mostly taught in German!)

Please note that the modules in your module group M5 marked with "MEL" or "GPP" are English-taught modules, which belong to the branches of study "Medical Electronics" and "Medical Production"

All lectures can be complemented by additional exercises and practical courses.

It is possible that in rare cases the exam type is changed. This information must be communicated to the students no later than two weeks after the semester start and must be documented in the module

L Lecture
E Exercise

S Seminar

P Practical Exercise

WS Winter Term

SS Summer Term

PfE Portfolio Examination
gCA graded Course Achievement

uCA ungraded Course Achievement

w written

o oral

online online (Virtual University Bavaria, www.vhb.org)