

Module Catalog Master Programme Medical Engineering - Valid for the FPO versions 2018 & 2019

Study Field "Medical Image and Data Processing"

Please note the Module Descriptions in UnivIS!

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

| M 1 Medical Specialisation | | | | L+E+S+P | 10 | 5 | 5 | 0 | 0 | | | | | |
|----------------------------|---|---|------------------------|---------|-----|-----|-----|-----|---|----|-----|-----|---|-------|
| M 1.1 | 1 | Clinical Applications of Optical Technologies and Associated Fundamentals of Anatomy | OMED/CLI | 4+0+0+0 | 5 | | 5 | | | 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 | | 2,5 | | | 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 | | 5 | | | 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 | | 7,5 | | 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 | | 5 | | 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 | | | 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 | | | | 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 | | 2,5 | | | 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 | | | | EN | gCA | MED | Lehrstuhl für Haut- und Geschlechtskrankheiten | WS |
| M 1.10 | | Introduction to simulation, network and data analysis in cancer and oncotherapy | IntCanSys Bio_f_Eng | 2+0+0+0 | 2,5 | | 2,5 | | | EN | gCA | MED | Lehrstuhl für Haut- und Geschlechtskrankheiten | SS |

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|--------|---------------------------------|--|---------|-----|-----|--|--|----|-----|-------|---|----|
| M 1.11 | Ethics of (Medical) Engineering | | 2+0+0+0 | 2,5 | 2,5 | | | EN | gCA | ZiWiS | Zentralinstitut für Wissenschaftsreflexion und Schlüsselqualifikationen (ZiWiS) | WS |
|--------|---------------------------------|--|---------|-----|-----|--|--|----|-----|-------|---|----|

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

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 | | | | WS: EN SS: GER | gCA | EEl | Lehrstuhl für Digitale Übertragung (IDC) | WS: EN SS: GER |
| M 2.8 ³ | Computergraphik / Computer Graphics Exercise | CG | 3+1+0+0 | 5 | 5 | | | | 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 | | | | EN | gCA | EEl | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | WS |
| M 2.10 ¹ | Pattern Recognition Exercise | PR | 3+1+0+0 | 5 | 5 | | | | EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | WS |
| M 2.11 ¹ | Pattern Analysis Exercise | PA | 3+1+0+0 | 5 | 5 | | | | 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 | | | | 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 | | | | GER/EN | gCA | INF | Lehrstuhl für Informatik 12 (Hardware-Software-Co Design) | SS |
| M 2.17 | Reconfigurable Computing Exercise | RC-VU | 2+2+0+0 | 5 | 5 | | | | EN | gCA | INF | Lehrstuhl für Informatik 12 (Hardware-Software-Co Design) | WS |
| M 2.19 | Information Theory and Coding Exercise | ITC ITC-EN | 3+1+0+0 | 5 | 5 | | | | WS: EN SS: GER | gCA | EEl | Lehrstuhl für Digitale Übertragung (IDC) | WS: EN SS: GER |
| M 2.20 | Channel Coding Exercise | KaCo | 3+1+0+0 | 5 | 5 | | | | GER/EN | gCA | EEl | Lehrstuhl für Informationsübertragung (LIT) | SS |
| M 2.22 ³ | Geometrische Modellierung / Geometric Modeling Exercise | GM | 3+1+0+0 | 5 | 5 | | | | EN | gCA | INF | Lehrstuhl für Informatik 9 (Graphische Datenverarbeitung) | WS |
| M 2.23 | Applied Visualization Exercise | AppVis | 2+2+0+0 | 5 | 5 | | | | 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 | | | | EN | gCA | EEl | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | SS |
| M 2.26 | Dependable Embedded Systems Currently not offered! Exercise | DES | 2+2+0+0 | 5 | 5 | | | | 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 | | | | EN | gCA | INF | Lehrstuhl für Informatik 10 (Systemsimulation) | WS |
| M 2.28 ² | Functional Analysis for Engineers Exercise | FuncAnEng | 2+2+0+0 | 5 | 5 | | | | 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 | | | | 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 2.33 | Künstliche Intelligenz 1 | KI I | 4+2+0+0 | 7,5 | 7,5 | | GER/EN | gCA | INF | Professur für Wissensrepräsentation und -verarbeitung | WS |
| M 2.34 | Künstliche Intelligenz 2 | KI II | 4+2+0+0 | 7,5 | 7,5 | | GER/EN | gCA | INF | Professur für Wissensrepräsentation und -verarbeitung | SS |
| M 2.35 | Deep Learning Exercise | DL | 2+2+0+0 | 5 | 5 | | EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | WS/SS |
| M 2.36 | Sprach- und Audiosignalverarbeitung / Speech and Audio Signal Processing Exercise | SAV | 3+1+0+0 | 5 | 5 | | EN | gCA | EEI | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | SS |
| M 2.37 | Maschinelles Lernen für Zeitreihen / Machine Learning for Time Series Exercise | MLTS | 2+2+0+0 | 5 | 5 | | EN | gCA | INF | Lehrstuhl für Informatik 14 (Maschinelles Lernen und Datenanalytik) | WS |

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

² Very profound knowledge of mathematics required.

³ Yearly change between German and English.

| 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 | | | 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 | | VHB (online) | | | EN | gCA | INF | Virtuelle Hochschule Bayern (VHB) | WS/SS |
| M 3.4 | Biomedizinische Signalanalyse / Biomedical Signal Analysis Exercise | BioSig | 2+2+0+0 | 5 | 5 | | | | EN | gCA | INF | Lehrstuhl für Informatik 14 (Maschinelles Lernen und Datenanalytik) | WS |
| M 3.5 | Computer Architectures for Medical Applications Exercise | CAMA | 2+2+0+0 | 5 | 5 | | | | EN | gCA | INF | Lehrstuhl für Informatik 3 (Rechnerarchitektur), Professur für Höchstleistungsrechnen | SS |
| M 3.6 | Magnetic Resonance Imaging 1 Exercise | MRI1 | 2+2+0+0 | 5 | 5 | | | | GER/EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | WS |
| M 3.7 | Magnetic Resonance Imaging 2 + Übung Exercise | MRI2+Ü | 2+2+0+0 | 5 | 5 | | | | EN | gCA | INF | Lehrstuhl für Informatik 5 (Mustererkennung) | SS |
| M 3.8 | Image and Video Compression Exercise | IVC | 3+1+0+0 | 5 | 5 | | | | EN | gCA | EEI | Lehrstuhl für Multimediakommunikation und Signalverarbeitung (LMS) | SS |
| M 3.9 | Wavelet-Transformationen in der Bildverarbeitung / Wavelet Transformations in Image Processing Exercise (Theoretical or Practical) Currently not offered! | WTBV | 3+1+0+0 | 7,5 | 7,5 | | | | EN | gCA | INF | Lehrstuhl für Informatik 8 (Theoretische Informatik) | WS |
| M 3.11 ¹ | Wearable and Implantable Computing Exercise | WIC | 2+2+0+0 | 5 | 5 | | | | EN | gCA | MED | Lehrstuhl für eHealth/mHealth | WS/SS |

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|--------|---|-------|---------|-----|-----|-----|---|----|----|-----|---|--|----|
| M 3.12 | Auditory Models | AudMo | 2+0+0+0 | 2,5 | 0 | 2,5 | 0 | 0 | EN | PL | EEI | Professur für Audiosignalanalyse (AudioLabs) | SS |
| M 3.13 | A look inside the human body - gait analysis and simulation | GAS | 2+0+0+0 | 2,5 | 2,5 | 0 | 0 | EN | PL | INF | Lehrstuhl für Informatik 14 (Maschinelles Lernen und Datenanalytik) | WS | |

¹ Does **not** take place in the summer semester 2020!

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|---|--|--|----------------|----------|----------|----------|----------|----------|----|----|--|-----------------------|-------|
| M 4 Advanced Seminar Medical Engineering | | | L+E+S+P | 5 | 0 | 0 | 5 | 0 | | | | | |
| Seminar Medical Engineering | | | 0+0+2+0 | 5 | | | 5 | | EN | SA | | see Seminar Catalogue | WS/SS |

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|---|---|------------|----------------|-----------|----------|----------|----------|----------|--------|-----|-----|---|----|
| M 5 Medical Engineering Specialisation Modules | | | L+E+S+P | 10 | 0 | 5 | 5 | 0 | | | | | |
| M 5.1 | Organic Computing Exercise | OC | 2+2+0+0 | 5 | 0 | 5 | 0 | 0 | GER/EN | PL | INF | Lehrstuhl für Informatik 12 (Hardware-Software-Co-Design) | SS |
| M 5.6 | Test and Analysis Techniques for Software Verification and Validation Exercise | TestAn-SWE | 2+2+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 11 (Software Engineering) | WS |
| M 5.9 | Human Computer Interaction Exercise | HCI | 3+1+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 14 (Maschinelles Lernen und Datenanalytik) | SS |
| M 5.10 | Convex Optimization in Communications and Signal Processing Exercise | ConvOpt | 3+1+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | EEI | Lehrstuhl für Digitale Übertragung (IDC) | WS |
| M 5.11 | Image Processing in Optical Nanoscopy Exercise | IPNano | 1+1+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 10 (Systemsimulation) | SS |
| M 5.12 | Security in Embedded Hardware Exercise | SEH | 2+2+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | INF | Lehrstuhl für Informatik 12 (Hardware-Software-Co-Design) | SS |
| 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 | EEI | 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 | EEI | Lehrstuhl für Digitale Übertragung | WS |
| GPP ⁶ 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 |
| MEL ⁶ M 5.8 | Medical Imaging System Technology Exercise | MISysT | 3+1+0+0 | 5 | 0 | 5 | 0 | 0 | EN | gCA | EEI | Lehrstuhl für Hochfrequenztechnik (LHFT) | SS |

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|----------------------------|--|-----|---------|-----|---|---|-----|---|----|-----|-----|---|----|
| MEL ⁶ M 5.17 | Body Area Communications | BAC | 2+0+0+0 | 2,5 | 0 | 0 | 2,5 | 0 | EN | gCA | EEl | Lehrstuhl für Technische Elektronik (LTE) | WS |
| MEL ⁶ M 5.26 | Architekturen der digitalen Signalverarbeitung / Architectures for Digital Signal Processing Exercise | ADS | 2+2+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | EEl | Lehrstuhl für Technische Elektronik (LTE) | WS |

⁶ Only a maximum of 5 ECTS credits of these modules can be used.

| M 6 Medical Engineering Practical Modules | | | 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 Pattern Recognition Project Computer Vision Innovationslabor für Wearable und Ubiquitous Computing MedTech Entrepreneurship Lab | ProjME ProjCV InnoLabPro E-Lab | 0+0+0+8 0+0+0+8 0+0+0+8 0+0+0+8 | 10 10 10 10 | | | 10 10 10 10 | | EN EN EN EN | uCA uCA uCA uCA | | Lehrstuhl für Informatik 5 (Mustererkennung) Lehrstuhl für Informatik 5 (Mustererkennung) Lehrstuhl für Informatik 14 (Maschinelles Lernen und Datenanalytik) Zentralinstitut für Medizintechnik (ZiMT) | WS/SS WS/SS WS/SS WS/SS |

| M 7 Flexible Budget Faculty of Engineering | | | | 10 | 0 | 0 | 10 | 0 | | | | | |
|--|---|---------|---------|----|---|---|----|---|----|-----|------|--|-------|
| | Flexible Budget Faculty of Engineering any graded lecture / course at the Faculty of Engineering | | | 10 | | | 10 | | | gCA | | only <u>graded</u> modules of the Faculty of Engineering on Master's level (no conditional subjects) | |
| | Beyond all graded lectures / courses at the Faculty of Engineering, the following modules can be used for M7: | | | | | | | | | | | | |
| | Innovation and Leadership | InnLead | 4+0+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | WiSo | Lehrstuhl für Wirtschaftsinformatik, insbesondere Innovation und Wertschöpfung | WS |
| | Service Innovation first offered in SS 2020! | | 4+0+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | WiSo | Lehrstuhl für Wirtschaftsinformatik, insbesondere Innovation und Wertschöpfung | SS |
| | MedTech Entrepreneurship Lab | E-Lab | 4+0+0+4 | 10 | 0 | 0 | 10 | 0 | EN | gCA | ZiMT | Zentralinstitut für Medizintechnik | WS/SS |
| | Designing Technology Exercise | InnTec | 2+2+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | WiSo | Lehrstuhl für Wirtschaftsinformatik, insbesondere Innovation und Wertschöpfung | SS |
| | Technology and Innovation Management | TIM | 2+2+0+0 | 5 | 0 | 0 | 5 | 0 | EN | gCA | WiSo | Lehrstuhl für Betriebswirtschaftslehre, insbesondere Industrielles Management | SS |

| M 8 Free Choice Uni | | | 5 | 5 | 0 | 0 | 0 | | | |
|---|--|--|---|---|---|---|---|--|-----|---------------------------------|
| Free Choice Uni any graded lecture / course at the university | | | 5 | 5 | 0 | 0 | 0 | | gCA | graded modules of all Faculties |

| M 9 Master's Thesis | | | 30 | 0 | 0 | 0 | 30 | | | |
|--|--|--|------|---|---|---|------|--|-----|--|
| M 9.1 Master's Thesis | | | 27,5 | 0 | 0 | 0 | 27,5 | | PfE | |
| M 9.2 Advanced Seminar Master's Thesis | | | 2,5 | 0 | 0 | 0 | 2,5 | | | |

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

For M5 you can use max. 5 ECTS credits from the module groups M2 and M3 of your own branch of study or from M2, M3 and 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 taught in English and are imported from the branches of study "Medical Electronics" and "Medical Device Engineering, Production Technology and Prosthetics ". Hence, you can only take a maximum of 5 ECTS credits.

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 description.

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
SA Seminar Achievement (usually a presentation and written report)
w written
o oral
online online (Virtual University Bavaria, VHB, www.vhb.org)

BESCHLUSS Stuko – 24.01.2020