

# Research Strategy of the TU Ilmenau

## Preamble

The TU Ilmenau has a strong position as a research university and is very much committed to fundamental and applied research in specifically identified areas generating outstanding research performance on the highest national and international level and supporting interdisciplinarity and inter-departmental collaboration in the fields of research and teaching. The university upholds Humboldt's ideal of combining teaching and research and is aware of the social framework and its role as innovation driver for the region. In line with its mission statement ⇨ Leitbild a fundamental objective of the TU Ilmenau is determined in the development of an attractive and internationally recognized research location. Not the least due to current social developments, the university is faced with new challenges which primarily require further internationalization in research, bundling scientific competencies in international associations, strengthening support activities for young academics and equality as well as knowledge and innovation transfer into the society. The necessary structures shall be developed and extended by the research strategy and, thus, the sustainability and future viability of the TU Ilmenau are ensured.

## Areas of activity

### Attracting and supporting young academics

Attracting young academics is promoted by, among others, involving students as early as possible in research work in the Groups and by considering current research topics and subjects in the university curricula. Greater international visibility of the research profile and current research topics and subjects shall increase the attractiveness of the TU Ilmenau for international young academics.

The TU Ilmenau opens young academics many paths for realizing their doctoral or post-doctoral projects: e.g. as research fellows in a Group at the TU Ilmenau, as scholarship holders, in Research Training Groups or as external doctoral candidates.

The TU Ilmenau motivates young academics to start their own research projects as early as possible and, at the same time, supports activities of an individual career planning, especially for postdocs, post-doctoral candidates and junior professors in the Departments. In a career concept ⇨ Karrierekonzept the TU Ilmenau defines and specifies possible career paths and various options for development of young academics.

The TU Ilmenau ensures an academically excellent and reliable supervision and support of doctoral and post-doctoral candidates by providing suitable provisions such as the General Doctoral or Habilitation Regulations as well as special provisions at Department level. The Senate Committee for Research and Young Academics regularly reviews and updates these regulations. Rights and obligations of doctoral candidates and supervisors are stipulated in a supervision agreement ⇨ Betreuungsvereinbarung.

The university is committed to grant especially young academics appropriate working conditions with specifications serving for this purpose as in the code ⇨ Kodex "Good working conditions in science at the TU Ilmenau" or gender equality policies as mentioned in the Equality Concept of the TU Ilmenau ⇨ Gleichstellungskonzept.

The TU Ilmenau provides financial support for young academics, e.g. doctoral scholarships, graduation scholarships and postdoc funding. The university informs regularly and in detail about funding opportunities, actively encourages young academics to submit applications and takes care of the proper allocation/awarding of funds.

The Departments and Groups are supported in their offers of interdisciplinary qualification measures for doctoral candidates by the opening of the Graduate Center at the TU Ilmenau, especially focusing on actively involving and supervising international doctoral candidates. The Graduate Center regularly reviews the expectations and requirements of young academics, continuously informs about offers and regularly provides suitable qualified measures and formats for interdisciplinary training for young academics.

## Fields of research and research profile

The cornerstone for gaining scientific knowledge and internationally recognized academic research is the excellent independent research of the scientists in the Groups at the TU Ilmenau. The university ensures the freedoms necessary for research of the Groups and takes special care of the basic equipment referring to personnel as well as spatial and material resources.

Acquiring publicly and privately funded research projects is important for ensuring the scientific performance of the university. Therefore, the university offers its scientists support through the Division for Research Service and Transfer when acquiring funds based on all suitable formats. Furthermore, motivation leading to high-level research performance and quality is recognized and supported.

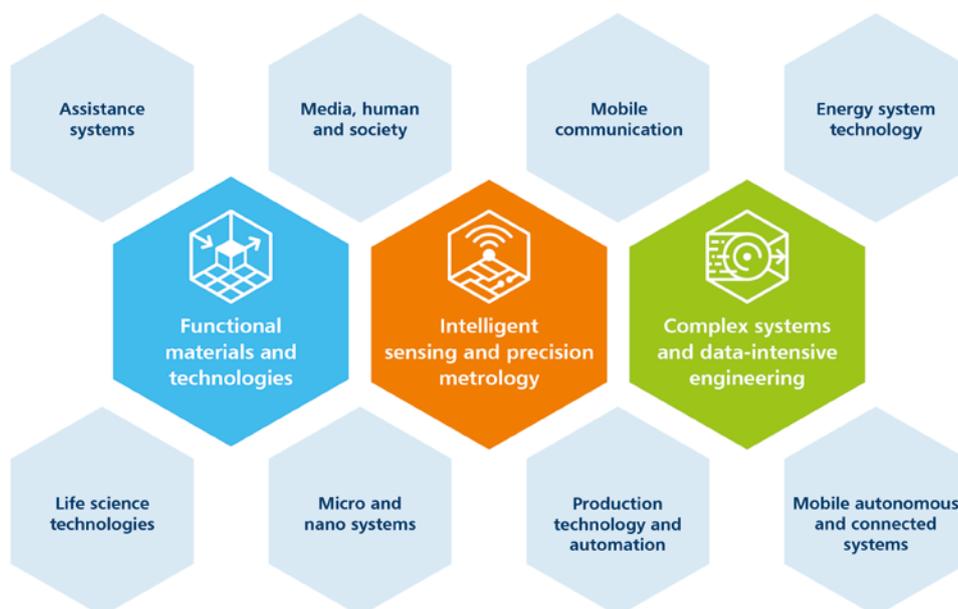
Against the background of an increasing diversification in science, the current social challenges and also the priority setting in research funding can only be met by more distinct research profiles. Strategic research priorities permit not only a bundling of scientific competencies in interdisciplinary work and an efficient use of resources but also enhance the public image and external appearance of the university. The TU Ilmenau also acknowledges the need to significantly strengthen its activities in acquiring major structured research projects of DFG (German Research Foundation), the federal government and the EU (e.g. collaborative research center / Transregios, national and international Research Training Groups and Graduate Research Schools, priority programs and groups of researchers ...). For this purpose and in a transparent process, the university has defined profile lines as interdisciplinary subject areas of basic research where the Groups of the TU Ilmenau particularly prove and demonstrate research performance and strength by a strategic and interdisciplinary collaboration and, thus, supporting the entire university's reputation. A profile line is defined by the following criteria:

- Competence and expertise to meet the requirements of the research subject at the university, ideally proven by acquired funding projects in structured programs of DFG, the federal government or the EU; by relevant publications and patents as well as contacts to leading national and international scientists or research centers in this field,
- Scientific relevance and perspectives in an international competition, e.g. proven by comparison with overall general themes, publication trends and the determination of long-term unique position in this field,
- An interdisciplinary group of at least eight professors of the TU Ilmenau with an Outstanding academic and scientific reputation and the appropriate preliminary ground work, i.e. relevant publications and other scientific results.

Profile lines are determined and published by the university management on the proposal of the Senate. Currently, the following three profile lines have been set up:

- **Functional materials & technologies:** This profile line is based on interdisciplinary research work in the field of development and application of functional materials and micro- and nanomaterials as well as their appropriately targeted structuring. By methods and procedures of nanointegration, their use is guaranteed in the macro world, i.e. for application in sensor technology, electronics, energy technology, communication technology or bio-systems technology. The procedures of micro- and nanointegration cover a wide range of bottom-up and top-down methods for production and structuring as well as comprehensive analysis.
- **Intelligent sensing and precision metrology:** comprise holistic research of nanopositioning technology and nanometrology, nanofabrication, intelligent process measurement technology, image processing and Lorentz force velocimetry. Other areas refer to research and application of intelligent sensors and sensor networks in automotive fields, in mechatronics and bio-mechatronics as well as manufacturing technology and factory automation.
- **Complex systems and data-intensive engineering:** cover methods and techniques for a holistic development, production and use of complex technical systems, the analysis of their spread and impact in economy and society. Precise operational areas at the TU Ilmenau are particularly in microsystems technology, digital media technology, software and automation technology as well as mobile communications. This also includes data-intensive methods of data acquisition and analysis of large datasets such as in metrology, sensor technology, medical technology, fluid mechanics and social media communication.

These profile lines are determined in both basic research and specific fields of application and technology, e.g. assistance systems, energy system technology, life-science-technologies, media, human being & society, mobile communications and networked systems as well as manufacturing engineering and automation.



New research priorities can be developed via perspective topics. A perspective topic can be set up upon the request of a group of professors by the Senate Committee for Research and Young Academics for a period of initially two to three years, whereas profile lines are subject to comparable criteria. Perspective topics are similarly supported as profile lines by central funds.

To guarantee the future sustainability of the university, the given profile lines are regularly evaluated, and if necessary updated, max every. Five years based on an activity report. Perspective topics are similarly evaluated at the end of the agreed period, and based on the results of the evaluation, the decision is made concerning the topic's continuation, discontinuation or transfer into a profile line.

The TU Ilmenau supports the expansion of research in the profile lines and the networking of scientists by long-term, central and need-based measures as the funding of infrastructure, comprehensive technical equipment or additional personnel. The necessary financial support is provided by central strategy funds.

## Relationship between fundamental and applied research

The TU Ilmenau sees itself as a research intense university and is aware of the synergies of basic and applied research. Focused support and strengthening of basic research underline the self-conception of the TU Ilmenau as a university fulfilling its role as innovation driver for the region through application-oriented research in specific areas. The university maintains cooperation with partner institutions and ensures the transfer of scientific knowledge and evidence into new fields of application by its transfer strategy  
⇨ Transferstrategie.

## Scientific environment and non-university institutions

The TU Ilmenau, as Thuringia's technical university, has committed itself to strengthening and upgrading the profile of the region as a research and technology location and, thus, securing high-quality workplaces. Alignment with the Free State of Thuringia's innovation strategy, currently within the framework of RIS3, and the cooperation with industry-related and non-university research institutions are therefore essential components of the university's research activities.

Associated institutes of the TU Ilmenau are legally independent institutions mainly solving application-oriented research projects closely interacting with the university. They also provide additional offers in the field of academic education and, thus, complement and extend the range of research and teaching of the university. Currently, the following institutes are awarded the status of an associated institution:

- CiS Forschungsinstitut für Mikrosensorik GmbH Erfurt: in the field of micro-sensors/mirco-systems technology;
- iba Heiligenstadt e.V.: in the field of bio-process measurement technology/analytical measuring technology and biomaterials;
- TiTK e.V. Rudolstadt: in the field of functional and structural polymers/composite materials;
- IMMS GmbH Ilmenau: in microelectronics/mechatronics and systems engineering

The TU Ilmenau and its associated institutes coordinate their strategic objectives in the field of research and promote a closer exchange and alignment for using synergy effects.

In addition to associated institutes, the TU Ilmenau maintains intensive cooperation relationships with non-university institutions, e.g. Fraunhofer Gesellschaft and Helmholtz Association, partially also characterized by joint appointments or joint research groups.

Strategic research cooperations regulated in framework agreements exist with German and international universities as well as universities of applied sciences in the Free State of Thuringia.

## Internationalization

In the past, research and science were and will still further be important stimuli for the European integration. The TU Ilmenau, as a cosmopolitan research university, is committed to a united Europe and is a viable part of the international research area. Based on the internationalization strategy ⇨ Internationalisierungsstrategie, international research plays a key role for the TU Ilmenau: Scientists of the TU Ilmenau are open and address the national, European and international competition, create networks with international research partners and welcome scientists from all over the world.

The activities in international research programs, in particular EU Research Framework Programs, shall be enhanced by motivating and supporting scientists of the TU Ilmenau to establish or extend sustainable research networks. Another priority is given by the participation in international programs initiated by DFG, the federal government and DAAD (German Academic Exchange Service) in order to generally enhance the international visibility of the TU Ilmenau.

The university offers research-relevant topics and contents in English on its website. The university intensifies its international public relations by using relevant print media, online media, blogs and links to players on the European and international level. A research editorial meeting regularly sounds out topics in the field of science communication and research marketing, which are of interest to the international public. The press office of the TU Ilmenau regularly gathers, collects and checks suitably qualified channels of communication, including portals for scientific journalists, and makes recommendations for the distribution of such contents.

## Good scientific practice and quality management

The TU Ilmenau has committed itself to the recommendations of the Deutsche Forschungsgemeinschaft (German Research Foundation) on ensuring good scientific practice and has adopted appropriate rules and regulations ⇨ „Regeln guter wissenschaftlicher Praxis“ (“Rules of good scientific practice”) and ⇨ „Richtlinie zum Umgang mit wissenschaftlichem Fehlverhalten“ (“Guidelines on handling scientific misconduct”). An ombudsman as contact and trustworthy person and the commission for the investigation of allegations of scientific misconduct are available for dealing with individual cases.

Putting scientific quality standards into practice plays an important role in supervising young academics during their doctoral work. These standards are bindingly defined in the General Doctorate Regulations of the TU Ilmenau and the supervision agreements for the doctoral and post-doctoral candidates.

The TU Ilmenau respects the diversity and multiplicity of subject cultures and their different assessment standards and criteria for research achievements. For comparative purposes not only in the internal context but primarily in a national and international research area, the assessment of research quality is based significantly on published research results and their scientific quality. Criteria of the goals and performance agreements with the Free State of Thuringia, third-party funding, doctorates and habilitations are taken into account appropriately.

The TU Ilmenau expressly recognizes outstanding scientific achievements of its scientists using individual incentives (performance bonus, recognition in form of e.g. the publication award) and approaches on departmental level (e.g. goal and performance agreements). The university regularly gathers research achievements of its members and informs its students and staff members about excellent results. Among other things, the top-10-list of third party funded research work is regularly published in the university journal. Outstanding research results are introduced in the research blog of the TU Ilmenau.

The TU Ilmenau promotes a responsible approach to research data for ensuring good scientific practice. The DFG recommendations for good scientific practice and the principles for the handling of research data of the alliance of German scientific societies have been summarized and expressed in the guidelines for the management of research data at the TU Ilmenau ⇨ Leitlinien zum Umgang mit Forschungsdaten. The university management supports these guidelines by key measures as legal and organizational consultancy on all aspects of research data management.

## Central facilities and institutions

Additionally to Departments, technological centers and cross-departmental institutes significantly contribute to the interdisciplinary research profile of the TU Ilmenau. Technological centers provide their technical equipment for Groups and teams of researchers and provide services in cooperation with these involved Groups for all institutions of the university and third parties. They are supplied with financial resources, personnel and rooms for fulfilling their tasks and must work economically according to budget and in-house guidelines. Currently, there are the following technological centers:

- ZMN Center for micro- and nanotechnologies
- ZMF Center for mobility research (ThIMo)
- ZET Center for Energy Technology

Inter-departmental institutes are optional, virtual and in general temporary associations of Groups for interdisciplinary work on research projects, for bundling resources, for branding and marketing without additionally provided university resources. They serve as priority setting within the framework of the research strategy of the TU Ilmenau.

## Research-accompanying services

Winning and successful implementation of large-scale research funding require professional support in the long run by research-accompanying services. At the TU Ilmenau these services are provided by several Divisions and offices: in addition to the Research Support Office and Transfer (FuT), there are PATON with Copyright and Patent Management, the Office of Marketing and the Division of Media and Public Relations.

The primary responsibility of the research service provided by FuT is the needs-based support for scientists when applying for and carrying out research projects referring to specific individual applications, also long-term planning processes and strategic consulting and funding advisory service. The key focus is on the collaboration with scientists in the course of the profile lines and main research areas. Furthermore, FuT advises and supports the President's staff on research related matters.

The TU Ilmenau sees itself as an innovation driver for the region. Based on the results of application-oriented research and cooperation with partners, knowledge, innovation and technology transfer contribute to the development of the region. The TU Ilmenau provides appropriate framework conditions. Precise objectives and measures are determined in the transfer strategies of the TU Ilmenau.

Visibility and acceptance of research work and also transfer of research results require communication with the general public beyond the academic community. Research marketing is considered a key service for scientists and academic institutions of the TU Ilmenau, addressing the relevant target groups by strategic orientation and coordinated measures. Scientists receive support and advice by the responsible Divisions and strategic activities are coordinated by the editorial working party.

The open and unlimited access to research results is an essential precondition for keeping and intensifying the international academic exchange. Referring to scientific publications, the Technische Universität Ilmenau has committed itself to the guidelines of "Open Access" and has expressed this commitment in an appropriate declaration.