Technical University of Braunschweig | iBMB | Division of Building Materials
Beethovenstraße 52 | 38106 Braunschweig | Germany

Students of the module
Additive Manufacturing in Construction
Additive Fertigung im Bauwesen

Technical University of Braunschweig
Institute of Building Materials, Concrete Construction and Fire Safety (iBMB)
Division of Building Materials

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Date: 20. Februar 2026

Module information „Additive Manufacturing in Construction"
„Additive Fertigung im Bauwesen"

Dear students,

Interest in additive manufacturing (AM) in construction has increased significantly in recent years, reflected in an exponential rise in research initiatives and industrial applications worldwide. In response to the ongoing digital transformation of the construction sector, the module **Additive Manufacturing in Construction** equips students with both the theoretical foundation and practical competencies required to actively shape the future of digital building production.

The course brings together engineering and architecture students in an interdisciplinary learning and research environment. By integrating computational design, material science, and robotic fabrication, participants gain a holistic understanding of digital construction processes and their impact on the built environment.

The lecture **Materials and Processes in Additive Manufacturing – Module I** (Materialien und Prozesse in der Additiven Fertigung) provides a structured introduction to additive manufacturing technologies in construction. It conveys fundamental knowledge of process principles across different material systems, with a particular focus on large-scale 3D concrete printing. Students are introduced to relevant 3D-printing processes such as Selective Cement Activation, Selective Paste Intrusion, Large Particle 3D Concrete Printing, Extrusion-based and Shotcrete-based 3D printing, Injection techniques, and additive manufacturing with earth materials. In addition, the module addresses material development and mix design, rheological behavior, mechanical performance, testing methods, and quality control. By linking material properties with process parameters and structural performance, the course establishes a comprehensive understanding of additive fabrication in contemporary construction.

The course **Methods of Digital Fabrication – Module II** (Methoden der digitalen Baufabrikation) develops the computational and programming skills required for digital construction workflows. Students are introduced to parametric modeling and scripting using Rhino Grasshopper, enabling them to translate design concepts into fabrication-ready data. Through practical exercises, participants create geometries tailored to additive manufacturing, prepare models for 3D printing, generate robotic toolpaths, and simulate robotic processes to assess manufacturability. The module highlights the relationships among geometry, algorithmic logic, and robotic production in digitally driven construction environments.

In the joint exercise **Advanced Applications in Additive Manufacturing – Module III** (Angewandte Additive Fertigung), interdisciplinary groups work through the entire workflow of a digital manufacturing process based on the knowledge acquired. This includes hands-on material characterisation, creating a design based on given constraints, and robot-based manufacturing of the designed object.

Information on the content and objectives of the module can be found in the Modulhandbuch. An overview of the three courses offered in the module can be found in the table below:

Additive Manufacturing in Construction (Elective Module, 6 Points)				
Materials and Processes in Additive Manufacturing (Module I)	Lecture	2	Written exam (60 min)	4398702
Methods of Digital Fabrication (Module II)	Lecture/ Exercise	2	Laboratory work + Presentation	4398701
Advanced Applications in Additive Manufacturing (Module III)	Exercise	2		

The assessment for Materials and Processes in Additive Manufacturing (Module I) [Course coordinator: Freund, iBMB] consists of a written exam (60 minutes) for engineering students. Architecture students will complete a design project followed by an oral presentation. For Methods of Digital Fabrication (Module II) [Course coordinator: Khader, ITE] and Advanced Applications in Additive Manufacturing (Module III) [Freund, iBMB / Khader, ITE], assessment is based on a joint final graded oral presentation. Further details will be provided during the introduction lecture.

The courses “Methods of Digital Construction Manufacturing (Module II)” and “Advanced Applications in Additive Manufacturing (Module III)” are limited to a **maximum of 15 participants from the engineering sciences**. Engineers can register via the Stud.IP course **“Übung: Angewandte Additive Fertigung” on 25 March 2026 between 7 a.m. and 10 p.m**. Places will be allocated by lottery. The remaining participants will be placed on a waiting list. It is therefore very important that you attend the introduction lecture (both: participation list and waiting list) or deregister so that we know you cannot attend. After the introduction lecture, students on the waiting list will be notified whether they can attend the lecture. Otherwise, your place will be given to a student on the waiting list.

In addition, 15 architecture students can participate in the course. Details can be obtained from Ms Noor Khader, ITE (n.khader@tu-braunschweig.de).

Schedule (more information and detailed planning, see separate attachments)

i) **Module I – Materials and Processes in Additive Manufacturing**
- Lectures weekly on Wednesdays (09:45-11:15 and/or 11:30-13:00) at iBMB
- Teaching language: English
- Final exam will take place on 8 July 2026 (09:45-10:45) at iBMB
  Language of the final exam: English or German

ii) **Module II – Methods of Digital Fabrication**
- Rhino Grasshopper on 15, 22, 29 April 2026 (09:45-11:15) at iBMB
- Lab-work group project (Printing session) on 8 May 2026 for 3 hours time slot between 8 am – 6 pm at ITE
- Teaching language: English
- Assessment: short presentation in English on 20 May 2026 (09:45-13:00) at ITE
- Attendance is mandatory

iii) **Module III – Advanced Applications in Additive Manufacturing**
- Lab-work group project (Material study) on half a day time slot (4 hours) on 27 or 28 April 2026 at iBMB
- Calculation assessment for material study on 3, 10 or 17 June 2026 (11:30-13:00) at iBMB

- Lab-work group project (Printing session) on one day (8 hours) on 8, 9, 11, 12, 18 or 19 June 2026, including mechanical testing 7 days after the printing day (2 hours) at iBMB
- Teaching language: English
- Assessment: group presentation in English on 15 July 2026, 09:45–13:00
- Attendance is mandatory

We are delighted by the keen interest in this module and are available to answer any questions you may have. If you have any questions, please contact Ms Jennifer Rudolph (0531 391-8224 – j.rudolph@ibmb.tu-bs.de).