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FRAUNHOFER INSTITUTE FOR MANUFACTURING TECHNOLOGY AND ADVANCED MATERIALS IFAM

SHAPING A STRONGER FUTURE

TRAINING CENTER FOR FIBER COMPOSITE TECHNOLOGY

COURSE PROGRAM 2017

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TRAINING CENTER FOR FIBER COMPOSITE TECHNOLOGY
Fraunhofer Institute for Manufacturing Technology
and Advanced Materials IFAM
– Workforce Qualification and Technology Transfer –

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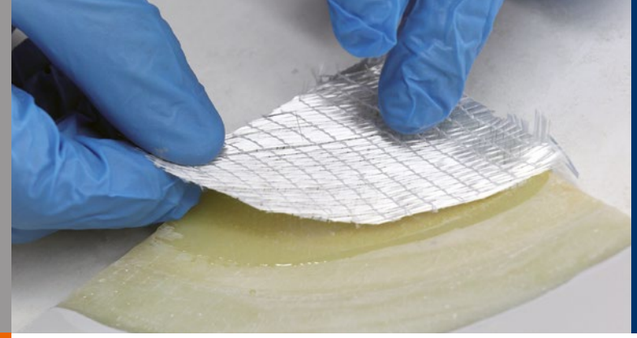

INFORMATION

SHAPING A STRONGER FUTURE

BREMEN BONDING

Please find information about the courses held at the Training Center for Adhesive Bonding Technology in the course program "Bremen Bonding" or online at **www.bremen-bonding.com**

This brochure gives an overview of courses to be held in 2017 at the Training Center for Fiber Composite Technology of the Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM in Bremen.

The **Fiber Reinforced Plastic Manufacturer, Fiber Reinforced Plastic Remanufacturer**, and **Fiber Reinforced Plastic Specialist** courses are offered in both German and English.

If you would like an in-house training course at your company, then this can be given in German, English, or translated into the relevant local language at any desired location in the world. Please contact us to discuss the necessary arrangements for such a course and plan the timing.

We hope our training courses are of interest to you and look forward to welcoming you and your colleagues as course participants in the near future.

The Training Course Team at Fraunhofer IFAM

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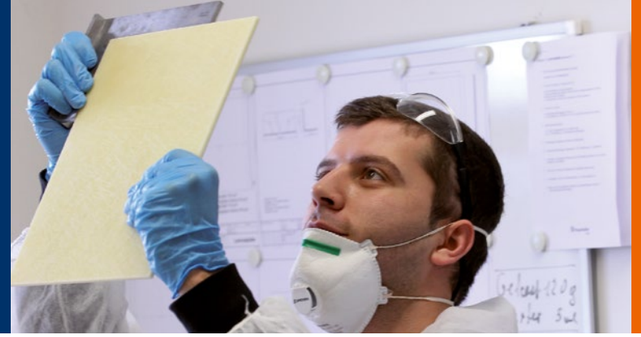
www.bremen-composites.com
www.academy.fraunhofer.de/en.html

Please request an application form by sending an e-mail to register@ifam.fraunhofer.de or alternatively download the form from www.bremen-composites.com



FIBER REINFORCED PLASTIC MANUFACTURER (FRP-M)

(FRP-MANUFACTURER)

CONTENT

Objectives of the training course

The Fiber Reinforced Plastic Manufacturer course teaches participants how to manufacture high-quality FRP components using manual production methods. The course focuses on extending and consolidating practical know-how. The theoretical background knowledge required for working with fiber reinforced plastics is acquired via the so-called digital introductory learning program. This is accessed online or via the special Learn-App.

Duration of the training course and examinations

The total duration of the course, including the examinations, is 40 hours (one week). The theoretical content of the digital introductory learning program is an integral part of the course and is required for the formal training course. The course ends with oral and practical examinations on the last day. A prerequisite for taking these examinations is regular attendance at the course sessions.

Target groups and preconditions for participation

The course is aimed at company employees whose work involves handling or fabricating fiber reinforced plastics and at those who wish to enter this technical field. Participants must have an adequate knowledge of the course language to enable them to understand the course material and take the examinations.

Information about the training course

Information about the course content

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Registration

Michaela Müller
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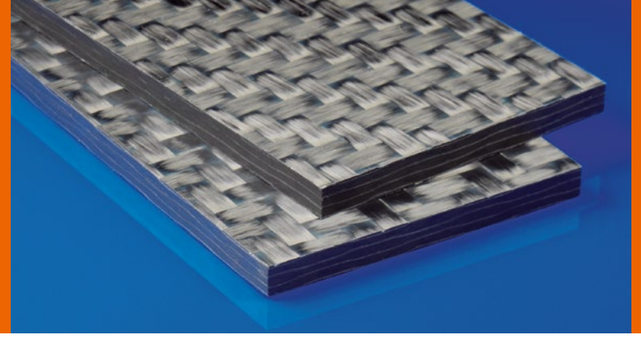
Course fee FRP-Manufacturer – FRP-M
(one week)

The course fee is **1230 €** and covers:

- **Digital introductory learning program**
- **Course documentation**
- **Course certificate**
- **Consumables for the practical assignments**
- **Lunch and drinks during breaks**

There is an additional one-off examination fee of **255 €**.



FIBER REINFORCED PLASTIC REMANUFACTURER (FRP-R)

(FRP-REMANUFACTURER)

Course dates 2017 – FRP-M: Please make an appointment.

The final examination is on the last day of the course.

The number of participants is limited.

Concerning In-house courses please contact us.

COURSE CONTENT

Fundamental principles

The fundamental features of fiber reinforced plastics are largely covered in the digital introductory learning program. This gives participants a basic knowledge of the various components (fibers and matrix materials).

Materials

The course participants learn how the various components of fiber reinforced plastics affect the resulting properties of FRP products. Based on this knowledge, key points for handling FRP materials are highlighted.

Manufacturing methods

The course participants learn theoretical, and **in particular**, practical aspects of manual manufacturing methods. This covers various components and geometries and also the effective machining of FRP components. The identification and prevention of flaws and defects are discussed. The proper use of work equipment and personal protection equipment is also covered.

Health and safety at work and environmental protection

Safety measures to be taken when working with fibers and plastics, and regarding the auxiliary materials which are used in repair and manufacturing processes, are discussed. The proper use of work equipment and protective equipment is also covered.

Objectives of the training course

The course participants will be trained to repair fiber composites and to work in industrial production. The training course teaches employees how to understand and effectively follow work instructions for their particular work tasks. After successful completion of the course they are able to process and repair high-quality fiber composite structures. The course focuses on extending and consolidating practical know-how. The theoretical background knowledge required for working with fiber reinforced plastics is acquired via the so-called digital introductory learning program. This is accessed online or via the special Learn-App.

Duration of the training course and examinations

The total duration of the course, including the examinations, is 40 hours (one week). The theoretical content of the digital introductory learning program is an integral part of the course and is required for the formal training course. The course ends with oral and practical examinations. A prerequisite for taking these examinations is regular attendance at the course sessions.

Target groups and preconditions for participation

The course is aimed at employees in companies whose work involves independently maintaining, repairing, and processing fiber reinforced plastics following work instructions. Participants must have an adequate knowledge of the course language to enable them to understand the course material and take the examinations.

Information about the training course

Information about the course content

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Registration

Michaela Müller
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Course fees FRP-Remanufacturer – FRP-R (one week)

The course fee is **1230 €** and covers:

- **Digital introductory learning program**
- **Course documentation**
- **Course certificate**
- **Consumables for the practical assignments**
- **Lunch and drinks during breaks**

There is an additional one-off examination fee of **255 €**.

Course dates 2017 – FRP-R: Please make an appointment.

The final examination is on the last day of the course The number of participants is limited. Concerning In-house courses please contact us.

FIBER REINFORCED PLASTIC SPECIALIST (FRP-S)

(FRP-SPECIALIST)

COURSE CONTENT

Fundamental principles
The fundamental features of fiber reinforced plastics are largely covered in the digital introductory learning program.

Materials
This section of the course provides participants with knowledge about the various components (fibers, matrix materials, core materials, fillers) used for manufacturing and repairing fiber reinforced plastics and their effects on the subsequent component properties. Points which must be specially heeded when repairing and maintaining fiber reinforced plastics are also covered.

Repair methods
Effective repair is a prerequisite for subsequently using the repaired components. The participants are introduced to the principles of repair techniques. Besides the necessary preliminary work, various strategies for repairing fiber composite components are introduced and are consolidated in practical assignments. In addition, the identification and prevention of flaws and defects are discussed.

Quality assurance
This section of the training course covers relevant quality assurance measures when repairing fiber reinforced plastics. This includes correct storage and processing of starting materials and also effective surface pretreatment to realize high-quality repairs.

Health and safety at work and environmental protection
Safety measures to be taken when working with fibers and plastics, and regarding the auxiliary materials which are used in repair and manufacturing processes, are discussed. The proper use of work equipment and protective equipment is also covered.

Objectives of the training course
This course provides training for employees involved in designing fiber reinforced plastics and planning their industrial manufacture. The direct linking of the theoretical and practical sessions means that the participants acquire a fundamental understanding of the effects of the individual components (e.g. fibers, matrix materials, core materials, additives) on the properties of the final FRP components. This practical knowledge is vital for effectively monitoring production processes. The course hence teaches the participants how to select suitable starting materials and manufacturing methods in order to meet the requirements of the resulting FRP products. After successful completion of the course, the participants will be able to select suitable matrix materials to manufacture high-quality FRP components, identify any defects/flaws, and repair these. They also acquire a comprehensive overview of current manufacturing methods and learn the differences between processing thermosets and thermoplastics.

Duration of the training course and examinations
The total duration of the course, including the examinations, is 120 hours and is split into 3 one-week modules focusing on different topics. To aid the learning, the theoretical part is backed up by a large number of practical assignments. The first and second one-week modules finish with written examinations. The final oral and practical examinations take place on the last day of the course. A prerequisite for taking the final examinations is regular attendance at the course sessions and having passed the written examinations at the end of the first and second one-week modules.

Target groups and preconditions for participation
The course is aimed at employees in industry whose work involves planning the manufacture of FRPs and implementation in the process chain, and at employees in companies that want to start manufacturing FRPs. Participants must have an adequate knowledge of the course language to enable them to understand the course material and take the examinations. A professional qualification in fiber composites or plastics or several years' work experience in these areas would be advantageous.

FRP-S

Information about the training course

Information about the course content

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Registration

Michaela Müller
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Course fees FRP-Specialist – FRP-S
(three one-week modules)

The course fee is **1380 € per course week** and covers:

- **Course documentation**
- **Course certificate**
- **Consumables for the practical assignments**
- **Lunch and drinks during breaks**

There is an additional one-off examination fee of **455 €**.

Course dates 2017 – FRP-S

The courses are held in the Training Center for Fiber Composite Technology.

Week 1

Principles of fiber reinforced plastics – properties of fibers and matrix materials, health and safety at work and environmental protection, textile semifinished products

Week 2

Influence of material selection – fiber and semifinished product selection, sandwich structures, manufacturing methods

Effect of the laminate structure – layer structure, component geometry

Week 3

Damage mechanisms, causes of damage, test and repair methods

Seminar code	
FRP-S-1-17	
Week 1	**11.12.–15.12.2017**
Week 2	**15.01.–19.01.2018**
Week 3	**05.02.–09.02.2018**

The final examination is on the last day of the course.

The number of participants is limited.

Concerning In-house courses please contact us.

COURSE CONTENT

Fundamental principles

The course starts by covering the fundamentals of fiber reinforced plastics (FRPs). In theoretical and practical sessions the participants learn about the special features of FRPs and their constituent components. The differences between thermoplastics and thermosets are explained as are the typical features and properties of different fiber materials and textile semifinished products.

Materials

In order to adapt the component properties to meet specific requirements, it is vital to have knowledge about all influencing factors and their effects on the final products. The participants learn to estimate the effects of the individual starting materials (matrix, fiber type, textile semifinished product) on the resulting properties of an FRP component and learn to use this findings for production process planning. They also learn that not only the nature of the starting materials has a key effect but also their relative quantities and, for example, the fiber orientation. Optimal laminate structure and component geometry to maximize fiber/matrix interactions are also dealt with.

Manufacturing methods

The participants are introduced to the principles of manual and machine-based production technologies. In addition to hand lay-up, the special features of modern production methods such as vacuum infusion technology, resin transfer molding (RTM), press methods, autoclave technology, and pultrusion are discussed. The effect of the choice of matrix on the FRP production process is covered as are the necessary boundary conditions for production processes. Also discussed is how the production process, as well as the choice of starting materials and laminate structure, can affect the resulting properties of FRP components. In addition, the identification and prevention of flaws and defects are discussed.

Repair methods

In order to carry out effective repairs it is vital to know the extent of the damage. The course participants learn how to identify typical types of damage to FRP materials and potential sources of the damage. They acquire a basic knowledge of non-destructive and destructive test methods. The course outlines what preliminary work is required for effective repair (e.g. removal of damaged sections, surface preparation). Strategies for repairing fiber reinforced plastic components are explained and these are then consolidated in practical assignments.

Health and safety at work and environmental protection

Safety measures to be taken when working with fibers, plastics, and auxiliary materials are discussed. The proper use of work equipment and protective equipment is also covered.

IN-HOUSE COURSES

FRP-MANUFACTURER
FRP-REMANUFACTURER
FRP-SPECIALIST

For companies who wish to train a larger number of their employees at the same time, there is the option of holding courses at your company. A minimum of 10 participants is required for an in-house training course. The prerequisites for participation, length of the courses, objectives, and course materials are identical to the courses held at the Training Center for Fiber Composite Technology in Bremen. For specially customized courses for which a qualification cannot be awarded, participants receive a Certificate of Participation.

General requirements for training courses held outside the Training Center for Fiber Composite Technology are as follows:

- If possible, the availability of two separate rooms for theory and practical sessions.
- Theory room with table, flip-chart or whiteboard, including pens, etc.
- Practical room with work benches, adequate ventilation and air extraction, plus facilities for waste disposal. If agreements are made, production areas can also be used for the practical sessions.

All equipment and consumables (such as resins, hardeners, fibers, etc.) required for the practical sessions must be made available by the host company/organization in consultation with the Training Center for Fiber Composite Technology. In consultation with the company/organization, certain aspects of the course can be tailored so that they have relevance to specific production-related issues.

To arrange a date for a course please contact the relevant course organizer.

→ In-house courses in Germany and other countries

If you would like an in-house training course at your company, then this can be given in

- German,
- English, or
- translated into the relevant local language at any desired location in the world. Please contact us to discuss the necessary arrangements for such a course and plan the timing.

INFORMATION ABOUT THE COURSES

Training establishment

The Training Center for Fiber Composite Technology is accredited by Cert-IT and also meets the quality requirements of DIN EN ISO/IEC 17024.

Course venue in Bremen

Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM
– Adhesive Bonding Technology and Surfaces –

Training Center for Fiber Composite Technology
Parkallee 301 | 28213 Bremen | Germany
Phone +49 421 2246-402 | Fax -605
www.bremen-composites.com

If you any questions about registering for the course, then please contact

Michaela Müller
Training Center for Fiber Composite Technology
Phone +49 421 2246-431 | Fax -605
register@ifam.fraunhofer.de

Reservation of accommodation for courses in Bremen

Accommodation can be booked at a special rate at the following hotels:

Atlantic Hotel Universum | Wiener Strasse 4 | 28359 Bremen | Germany
Phone +49 421 2467-0 | reservierung.ahu@atlantic-hotels.de
www.atlantic-hotels.de
Please ring the hotel directly to make a reservation, quoting booking code **"IFAM 2017"**.

7THINGS my basic hotel | Universitätsallee 4 | 28359 Bremen | Germany
Phone +49 421 2202-603 | info@7things-hotel.de | www.7things-hotel.de
Please ring the hotel directly to make a reservation, quoting booking code **"Fraunhofer-IFAM"**.

Ringhotel Munte am Stadtwald | Parkallee 299 | 28213 Bremen | Germany
Phone +49 421 2202-0 | info@hotel-munte.de | www.hotel-munte.de
Please ring the hotel directly to make a reservation, quoting booking code **"Fraunhofer"**.

The hotels are about 5 minutes on foot from the course venue in Bremen.

Cancellation

If a place on a course is canceled more than 4 weeks before the start of the whole course, 15% of the course fee is still payable. If a place on a course is canceled more than 7 days but less than 4 weeks before the start of the whole course, 50% of the course fee is still payable. Cancellation at shorter notice will mean the whole course fee still being payable. Naturally it is possible for another person to take a place on a course. If there are too few participants, we reserve the right to cancel a course at the latest seven days before the start of the course. The number of participants on each course is limited. The invoice for the full course fee is issued after the start of the course. The prices are valid until 31.12.2017.

It is not possible to reimburse any part of the paid course fee, for example in the event a participant does not complete the course or does not pass the examinations or wishes to take a different course at another time.

Events with a duration of less than one week:
If a place on an event is canceled more than 7 days before the start of the event, 50% of the fee is still payable. For cancellation less than 7 days before the start of the event, the whole fee is payable. Naturally it is possible for another person from your company/organization to attend the event instead.

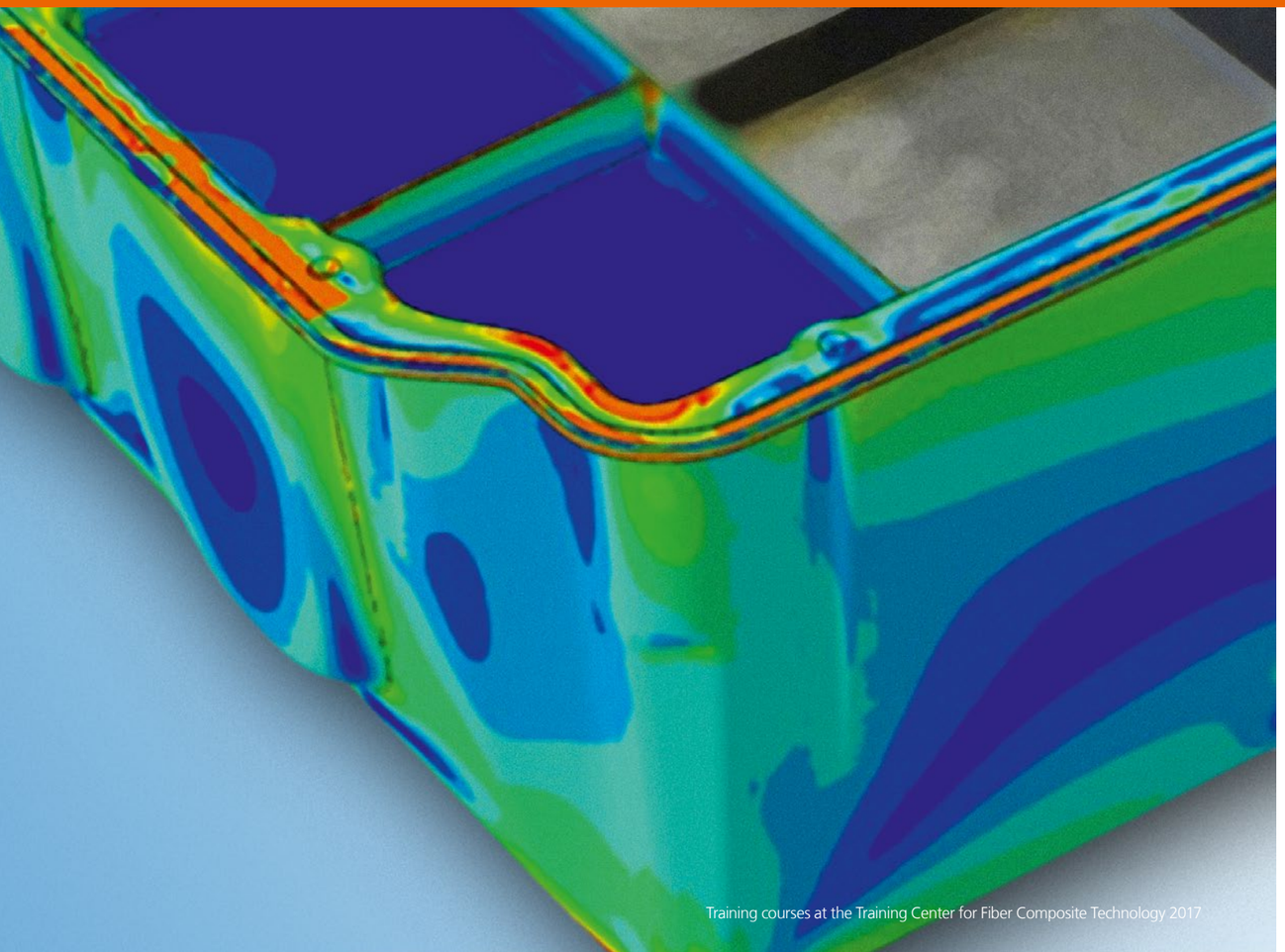
Training courses abroad

Please contact us so that we can discuss the necessary arrangements for the relevant course and plan the timing.

INFORMATION ABOUT THE COURSES

Training courses at the Training Center for Fiber Composite Technology 2017

TRAINING COURSE VENUE



Training courses at the Training Center for Fiber Composite Technology 2017

Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM
– Adhesive Bonding Technology and Surfaces –

Wiener Strasse 12 | 28359 Bremen | Germany
Phone +49 421 2246-402

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Institute Director

Prof. Dr. Bernd Mayer

Workforce Qualification and Technology Transfer

Head: Prof. Dr. Andreas Groß
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Course venues

– Training Center for Fiber Composite Technology –
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www.bremen-composites.com

– Training Center for Adhesive Bonding Technology –
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Wiener Strasse 12 | 28359 Bremen | Germany
www.bremen-bonding.com

FRAUNHOFER ACADEMY

Fraunhofer IFAM is a founding member of the Fraunhofer Academy

Handling new technology and new methods and processes wants to be learned. If current research knowledge is to unfold its innovative potential in companies, smart minds with the relevant know-how are needed. The Fraunhofer Academy, the consortium of all Fraunhofer Institutes with a focus on advanced training, provides the necessary qualification for specialists and managers. It is the expert supplier for advanced training on the job. Specialists and managers profit from a unique knowledge transfer flowing from Fraunhofer Research to the companies. The "knowledge generators" simultaneously act as "knowledge transmitters".

What started out as a project, has developed into a well established and renowned institution of the German education and training landscape.

Since the founding the Fraunhofer Academy has continually grown. In the beginning phase the academy comprised the activities of four Fraunhofer Institutes offering one program each, today 17 facilities are responsible for 25 programs in five thematic areas:

- Technology and Innovation
- Energy and Sustainability
- Logistics and Production
- Production and Testing Technology
- Information and Communication

Due to the close co-operation with industry and businesses, Fraunhofer knows the current technical as well as social challenges and turns research results into usable innovations in an efficient and targeted way. This up-to-date knowledge from experience is reflected in the course offers of the Fraunhofer Academy.

For further information about the Academy's program **www.academy.fraunhofer.de/en.html**

NOTES


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