

<b>Challenge name</b>	Bratelle (sustainable) universal bra closure
<b>Challenge owner</b>	Bratelle
	X Company <input type="checkbox"/> Research <input type="checkbox"/> Student team
	<i>Mariette Jilderda &amp; Anita Schimmel</i>
<b>Brief summary</b>	<p>Bratelle has developed a sustainable prosthetic bra for women with (chronic) lymphedema after breast cancer surgery.</p> <p>Because the size varies due to increase and decrease of edema fluid, there is a need for a flexible and universal closure, allowing for variation in sizes.</p> <p>Besides, Bratelle wants to make the bra (including parts) as circular as possible. The bra must meet the requirements from the medical (insurance) side, for example criteria from MDR.</p> <p>Are you interested in health, sustainability and design? Then this challenge could be perfect for you to make an impact for women with grievances after breast cancer!</p>

### About the challenge owner

*Bratelle is an initiative by and for women with a breast cancer experience. As a result of breast cancer treatment, many women experience symptoms, such as lymphedema, for years to come.*

*Bratelle develops underwear specifically for this target group that affects thousands of woman and in at some point in the future also for men.*

### Challenge description

Bratelle has developed a sustainable prosthetic bra for women with (chronic) lymphedema after breast cancer surgery.

Because the size varies due to increase and decrease of edema fluid, there is a need for a flexible and universal closure, allowing for variation in sizes. The design can be developed further. The different straps make it difficult to put on the bra, the back panel could also have massaging effect. In the semester 2021/2022, 3 students very successfully participated in the Bratelle challenge during an ISBEP. For example: research was conducted by a student of TU/e. She inventoried the needs. This was

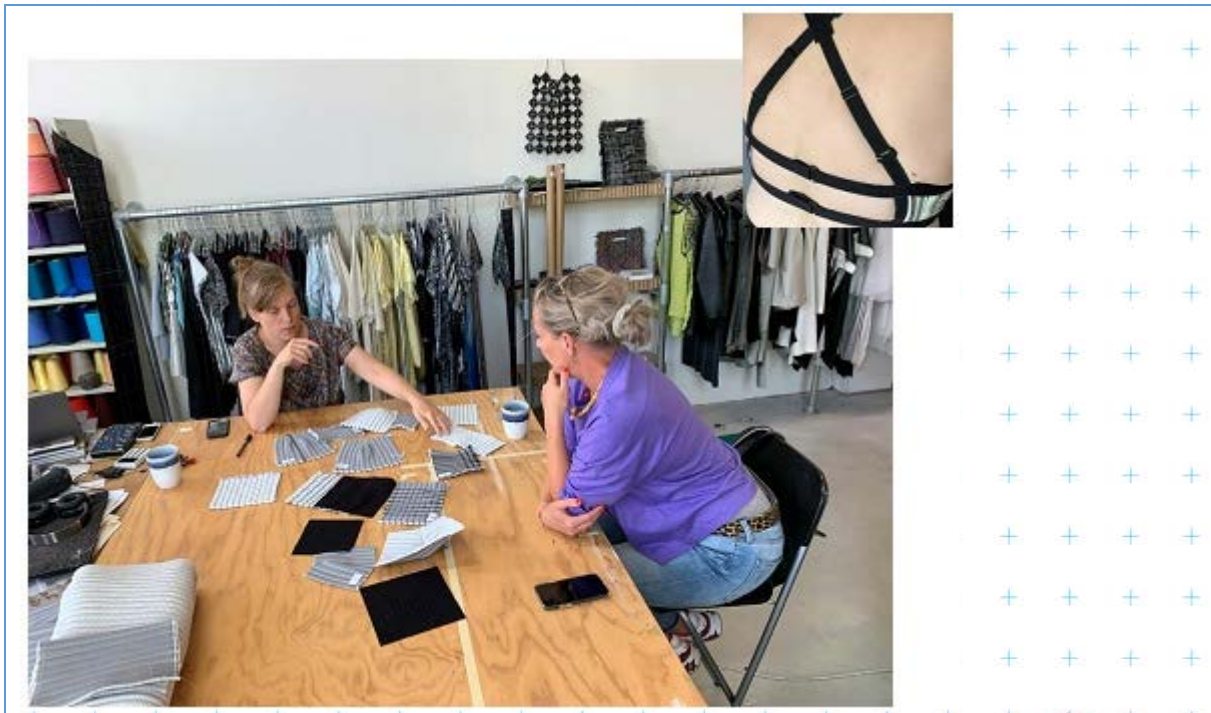
another version of the Bratelle bra: 3D-knitted. Perhaps "the best of both worlds" could be considered: of the 3d-knit bra from the first challenge and this designer's bra. Other recommendations optimizing (the working of) the bra are always welcome. Bratelle stimulates creative thinking.

We are looking for students who can translate wishes into realization and want to think along with the development of a bra closure that is both functional and comfortable. The bra must be easy to use and at the desired points optimal for the function of the bra. A good prototype is available as a starting point. There is also a patient group available for testing and feedback.

The bra must meet the requirements of the MDR (Medical Device Regulation). The MDR is a European legislation in which new rules about medical devices are established. Bratelle wants to have insight into how this can be done and what steps need to be taken to achieve this.

The bra is partly made of a circular fabric, it is preferred to develop a bra including the parts such as hooks and connecting parts, that can be recycled (reused)/is circular. Bratelle would like to have a bra that can be taken apart completely, so that all the parts can be reused in a new bra or elsewhere. How can this be achieved technically? What steps need to be taken? How to collect the sold bras? Who will take it apart? What will all this cost?

### Challenge Picture



### Input and involvement of challenge owner

*Please indicate briefly what your involvement will be for the project group.*

*The initiators are experts by experience and involved in oncology and lymphedema networks.*

*The organization does a lot of research on the effects of breast cancer from a socially responsible point of view.*

*How would solving this challenge help your organization?*

*Chronic lymphedema fluctuates by doing many or few activities. The target population indicates that they need to be able to vary sizes. Bratelle wants to contribute to this solution.*

*Bratelle wants to comply immediately with sustainability requirements that will apply in a number of years and with medical requirements.*

## Resources

*What resources are necessary for the students to work on the challenge?*

*Good research was done by three TU students about the 3D-knitted bra during the last semester, these reports are a source of knowledge and a nice starting point.*

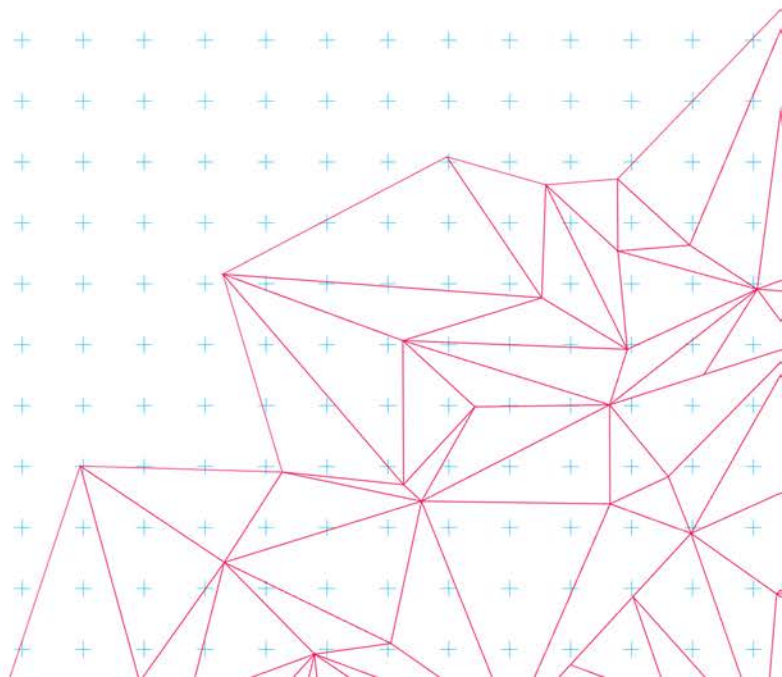
*What resources do you offer to students?*

*Expertise; ...*

*Materials; ...*

*Workplace; ...*

*Other; ...*



## Roles of different disciplines (only for ISBEP)

Please describe possible contributions you expect to see from as many disciplines as you see fit for this project.

(On the next pages you find descriptions of the different departments).

<b>Automotive Technology</b>	
<b>Biomedical Engineering</b>	<i>Apply modern medical technology to the bra, which materials for the closure and straps fit human bodies best? Optimize massaging effects through studying fluid dynamics</i>
<b>Architecture, Urbanism and Building Sciences</b>	
<b>Computer Science and Engineering</b>	
<b>Data Science</b>	
<b>Electrical Engineering</b>	
<b>Industrial Design</b>	<i>- develop universal closure ? implement back panel ? optimize, e.g- straps«</i>
<b>Medical Sciences and Technology</b>	<i>The bra working as effectively as possible- Can you individualize the bra in a simple way to surface the needs of different patients- How can the requirements of MDR be met for all cases-</i>
<b>Psychology and Technology</b>	<i>what is the bra-s addition to quality of life- Can you translate this into cost reduction for health insurer- How can the bra be improved through customer review-</i>
<b>Chemical Engineering and Chemistry</b>	
<b>Sustainable Innovation</b>	<i>Circular bra and parts development- What is the role of bra longevity in this, how long does the material retain its massaging effect [is this proportional to the longevity of the individual parts-«  What are the costs- What investments are needed- What will this yield in the longer term-</i>
<b>Industrial Engineering</b>	<i>What are the costs for developing the bra- What investments are needed- What will this yield in the longer term- Understand and even set up business processes- More efficient processes possible- Outsource production or buy a machine-</i>

Applied Physics	
Applied Mathematics	
Mechanical Engineering	<i>Apply the best circular material, the best properties«-See also Industrial Design-Optimize massaging effects through studying fluid dynamics</i>

