Module 5

# Designing for Disassembly

# Sustainable Fashion Design

## Module 5: Designing for Disassembly

**5.1** Designing for Disassembly in Fashion

**5.2** Techniques for Creating Disassembled garments

**5.3** Modular Design in Fashion

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# Module 5 Overview

- This module looks at designing for disassembly, techniques for designing garments for disassembly and the importance of modular design in fashion

- Designing for disassembly will explain why fashion must focuses on creating garments that can be easily taken apart for recycling, repair, or repurposing, hence supporting a more sustainable and circular approach to clothing.

- Will also explain key techniques for disassembly including using modular components like detachable sleeves or panels, which allow specific parts to be replaced or reused without discarding the entire garment.

- The importance of modular design in fashion and how it enables adaptability and versatility, and how it allows customers to modify garments by interchanging elements, extending their usability across different styles and seasons.

- Together, these techniques promote garment longevity, reduce waste, and facilitate a more sustainable life cycle for clothing.

# 5.1 Designing for Disassembly in Fashion

- Designing for disassembly in fashion aligns with the principles of sustainability and the circular economy.

- This involves designing garments that can be easily taken apart at the end of their life cycle, facilitating repair, reuse, and recycling.

- This approach involves intentionally designing products which will allow easy disassembly at the end of their life cycle.

- These decisions must all be made in the designing phase of a product. Garments should be designed keeping in mind not only the needs of the consumer but the post consumer recycling process.

- The aim of disassembly is to expand the lifespan of fashion items and in turn reduce waste.

# Designing a garment for Disassembly

Designers must:

1. Design clothing using mono materials instead of blends making it easier to recycle.
2. Design garments that can be easily pulled apart into pieces so less parts end up in landfills.
3. Avoid the use metal and plastic parts.
4. Avoid using materials with special finishes.
5. Garments need to be designed to allow for components to be replaced or reused.

# Key Principles & Strategies used for Designing for Disassembly

## Modular Design

- The use of modular components like detachable sleeves, collars, or panels, allow specific parts of a garment to be removed, replaced, or recycled separately. This allows customers to mix and match pieces, extending the lifespan and usability of a single garment.

- Replace permanent stitching with fasteners like zippers, snaps, or hooks, making it easy to separate sections for repairs or recycling.

## Mono Materials

• Design garments using one type of fiber. This makes recycling simpler because it avoids the need for separating mixed fibers.

• Avoid using a combination of materials which will require different recycling process or that are difficult to separate, like leather with polyester linings or plastic-based embellishments and metal studs.

•Required viewing of: *Material Design for Disassembly*

Photo by Frank Uyt den Bogaard on Unsplas

## Adhesives & Complex Seams

- Do not use permanent adhesives, use stitching or fasteners that allow parts to be easily separated.

- Use stitches that are strong but can be easily removed or undone This helps in replacing parts without needing heavy-duty or specialized tools.

- Use Resortec threads that are dissolvable in very high temperatures.

•Required reading: *Innovative threads and disassembly for efficient textile waste management*.

## Labeling & Instructions

- Must include labels or instructions that guide customers on how to disassemble the garment, either for repair or recycling.

- Use labels or symbols on the garment to indicate what materials have been used. This will help recycling facilities process the garment correctly.

## Durable & Eco-friendly Fasteners

- Use eco-friendly or biodegradable fasteners like buttons made from natural materials, instead of metal or plastic zippers that are challenging to recycle.

- Innovations like magnetic closures or interlocking fabric fasteners can make disassembly easier and recycling more effective.

Photo by kevin laminto on Unsplash

## End of Life Recycling

• Some designers work with recyclers and closed-loop systems to ensure the materials they select will be easily recycled.

• Brands might incorporate take-back or collection programs that handle the disassembly and recycling processes, encouraging customers to return garments instead of discarding them.

•There are many recycling companies who's main task is to collect used garments diverting them from landfills and producing new products from these old garments.

- The Blue Jeans Go Green™ program collects denim across the US, and partners with Bonded Logic, Inc. to recycle it into UltraTouch™ Denim Insulation.

- **Circ** is a technology system that returns clothes to their raw ingredients. It can recycle polyester or poly-cotton blends into virgin-grade polyester and make pulp that can be made into viscose and lyocell type fabrics.

- **Circulose** is a recycling company that has created a process that creates circular cellulose using a mechanical recycling process that transforms old garments into sheets of circulose that can be made into natural textile fibers. (Hertantyos, S.)

Required reading: *Renewing Denim with Purpose*

# 5.3 Modular Design in Fashion

Modular design refers to creating garments that consist of interchangeable or detachable components. This emphasizes flexibility and adaptability allowing the consumer to modify a garment as they please. This allows the consumer to create different looks without having to buy extra garments.

Design and photo by Angela Michail

# Benefits of Modular Design in Fashion

- The benefits of modular design for consumers, is that it offers versatility and personalization, as a single garment can be adapted for different looks, occasions, or weather conditions, reducing the need to buy multiple items.

- The benefits of modular design for the environment, is that modular fashion supports sustainability by encouraging fewer purchases, promoting longer garment life, and facilitating repair or replacement of specific parts rather than the entire piece.

# How Modular Design Works

- Garments are made with interchangeable parts that can be easily removed, swapped or rearranged.
- The wearer is able to personalize their outfits by switching pieces and creating a new look from the same base garment.
- Garments are designed with longevity and durability in mind. Parts of garments can be replaced without discarding the whole garment.
- Garments are more sustainable as consumers buy less garments as they can upgrade various pieces.
- Modular garments are more versatile as one garment can have multiple looks and/ or functions.

# Modular Design and the 12 Principles of Green Engineering

- In many cases the end of a garments life occurs due to ‘stylistic obsolescence rather than a fundamental performance or failure of quality’ as discussed by Anastas and Zimmerman in the 12 Principles of Green Engineering.

- Designing modular collections which allow the wearer to mix and match pieces of one garment to create a variety of looks can aid in the stylistic obsolescence.

- The 12 Principles of Green Engineering by Anastas and Zimmerman, promote the idea of modular design by addressing the issues of separation, disassembly and the reuse of products.

Required Reading: *Design of Through the 12 Principles of Green Engineering.*
www.pubs.acs.org/doi/pdf/10.1021/es032373g

## Principal 3: Design for Separation

The concept of "design for separation" in green engineering focuses on creating products that can be easily disassembled into separate, recyclable, or reusable components.

This principle is especially relevant to modular design in fashion, as modular fashion emphasizes creating clothing that can be adapted, repaired, and recycled more easily than traditional garments.

## How "design for separation" connects to modular fashion:

- In modular fashion, clothes are designed with separable components. When an item can be taken apart easily, damaged parts can be replaced or repaired individually rather than discarding the entire garment. This extends the product’s life cycle and reduces waste.

- Modular designs that use separable components allow for efficient recycling by ensuring different materials can be separated.

- With modular garments, consumers can adapt pieces by swapping or upgrading parts instead of buying entirely new items. This approach aligns with sustainable consumption.

- A garment designed for separation at the modular level can be easily deconstructed at the end of its life.

# Principal 9: Minimize Material Diversity

- The principle of "minimizing material diversity" in green engineering is about using fewer types of materials in a product to make it simpler to recycle, reuse, and maintain.
- In modular fashion, this principle is highly relevant because it enhances both the durability and sustainability of garments.
- Modular designs with limited material types make it easier to separate and recycle components, simplifying end-of-life processing and promoting a circular lifecycle.
- Using fewer material types allows for better compatibility between modular components. This also supports the ability to adapt a garment for different seasons, trends, or personal preferences without discarding parts that can't be reintegrated.
- Choosing fewer, high-quality materials can increase the durability of modular fashion pieces, reducing the need for frequent replacements.
- When fewer materials are used, manufacturing processes become simpler, which can reduce energy, water, and chemical use.

# Principal 11: Design for Commercial Afterlife

Designing for commercial afterlife, as outlined in the principles of green engineering, emphasizes creating products that can be easily repurposed, recycled, or reused at the end of their life cycle. This principle connects closely to modular fashion in several ways:

- Modular fashion supports a commercial afterlife by allowing individual components to be replaced or repurposed. This approach extends the item's usefulness, reducing the need for disposal therefore supporting a sustainable fashion ecosystem.

- Commercial afterlife encourages the development of secondary markets for products. Modular fashion can facilitate this by making it easier to sell or trade individual components, creating a sustainable economy around fashion.

- Modular designs invite consumers to participate in the lifecycle of their clothing, fostering a sense of ownership and responsibility. This can lead to greater awareness about sustainability in fashion.

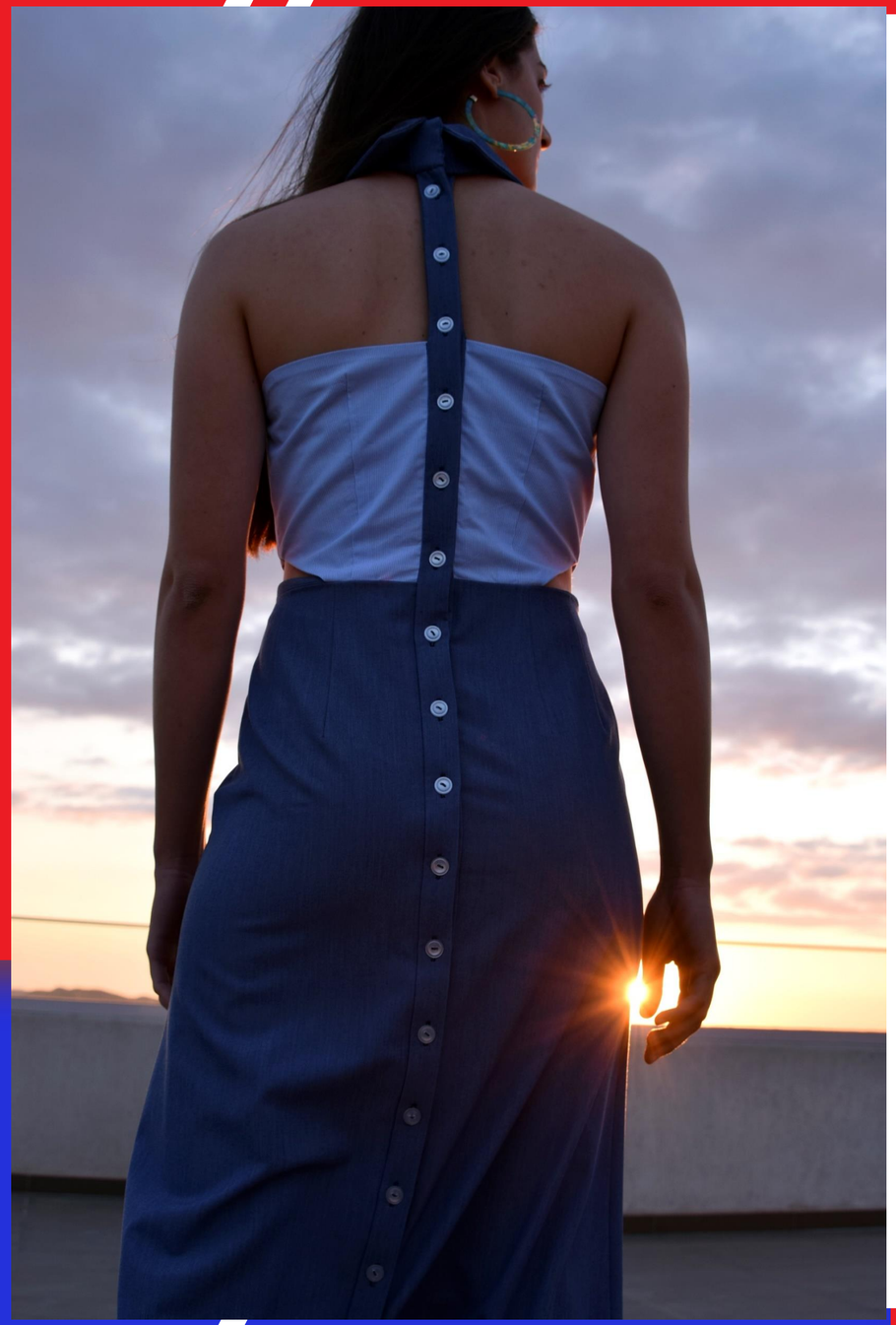
This approach aligns with the goals of green engineering by keeping products in circulation longer, reducing waste and promoting sustainable consumer behaviors.

Photo by James Lee on Unsplash

# Designers with Modular Collections

- Designers have begun to use the concept of modular design in their collections. Although this has been is seen as a challenge designers who have embedded the concept of sustainability in the mission statement  have begun designing garments which can be disassembled and reassembled to create a different look for different occasions.

Design and Photo by Angela Michail



- In modular design components of a garment must be standardized, enabling them to fit accurately with other pieces. This must be considered in the design and pattern cutting phase so seams and fastenings must be placed in a way to allow components to be attached accurately.

- Modular design allows for pieces of a garment to be repaired or replaced without discarding the whole garment. It provides an infinite variety of styles and combinations, and crucially, the ability for considered disassembly and re-use.

# Marfa Stance and the Modular Coat

- Marfa Stance is a British luxury outerwear brand known for its modular clothing.
- Georgia Dant is the founder of the brand Marfa Stance which was established in 2019.
- Marfa Stance is know for its modular coats and jackets which feature detachable collars, hoods, and linings—that can be added, removed, or swapped to create various looks from a single piece.
- The brand focuses on sustainability and quality, using premium materials and working with skilled European artisans.
- The brand emphasizes timelessness over fast-fashion trends, aiming for pieces that will last and remain in style for years.
- Recommended reading: *Make It Modular: Reversible. Buildable.* www.marfastance.com/pages/make-it-modular

# Flavia La Rocca

- Flavia La Rocca is an Italian fashion designer known for her sustainable and modular fashion collections. The brand, focuses on eco-friendly practices, creating collections with an innovative approach to versatility.

- All pieces are designed to be modular. This allows the wearer to mix and match individual parts to create different outfits.

- This concept supports sustainable fashion by encouraging a "fewer, better items" philosophy, reducing waste and encouraging mindful consumption.

- Flavia La Rocca uses eco-friendly materials, such as organic, recycled, and natural fibers, as well as ethical production practices within Italy.

- La Rocca’s has received awards and recognition worldwide for her contributions to the sustainable fashion industry.

- Recommended Reading: *Introducing the Modular Concept* www.flavialarocca.com

# Fu Zhih-Chi’s Code Prototype Modular Jacket

- Fu Zhih-Chi is a Taiwanese fashion designer known for his modular and sustainable designs that allow users to easily adapt their clothing for functionality and style.

- He is known for projects like the "Code Prototype" modular jacket. The jacket can be reconfigured by replacing specific parts, such as collars or sleeves, to extend wearability and reduce waste.

- "CODE: Chromosome X/Y,“ is another modular project inspired by human chromosomes, blending unisex and adaptive design elements to seamlessly integrate male and female patterns into one garment.

- Fu Zhih-Chi’s commitment to both environmental consciousness and design innovation, earned him awards from the A' Design Award and the International Design Awards (IDA).

Recommended Reading: *Design Award Winne. Awarded for Good: Fu Zhih-Chi.*
www.designers.org/design.php?ID=61414

## The Ultimate Modular Work Trouser

The Ultimate Modular Work Trouser by Portwest, has been designed to be converted into three different functional garments.

1. The basic work trouser.
2. The zip off legs allows the lower part to be reversed, transforming the trouser into a class one high-visibility trouser for increased visibility.
3. The zip off legs can be completely removed converting the rouser into shorts.

Apart from all the multifunctional design features the trouser has been eco-consciously developed to contain GRS certified recycled nylon and carry the OEKO-TEX ® STANDARD 100 label meaning that there are no harmful substances used in the production of this garment.

Recommended viewing: *Red Dot Award Winner 2022 Design Concept – Ultimate Modular Work Trouser*.

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