STRANDS AND STANDARDS
SPORTS AND OUTDOOR PRODUCT DESIGN 1

Course Description
Students learn basic design and construction skills using technical fabrics to make projects for the outdoor/sports industry. The skills will introduce and prepare students for employment opportunities in the outdoor/sports industry. This course will strengthen comprehension of concepts and standards outlined in Sciences, Technology, Engineering and Math (STEM) education. Student leadership and competitive events (FCCLA) may be integrated into this course.

<table>
<thead>
<tr>
<th>Intended Grade Level</th>
<th>9-12</th>
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<td>Units of Credit</td>
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<td>Core Code</td>
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<td>Concurrent Enrollment Core Code</td>
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<td>Prerequisite</td>
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<td>Skill Certification Test Number</td>
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<td>Test Weight</td>
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<td>License Type</td>
<td>CTE and/or Secondary Education 6-12</td>
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<td>Required Endorsement(s)</td>
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<tr>
<td>Endorsement 1</td>
<td>FACS General Composite</td>
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<tr>
<td>Endorsement 2</td>
<td>CTE License: Fashion/Design/Merchandising</td>
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<td>Endorsement 3</td>
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Performance Skills
Complete FCCLA Step One. (See http://www.uen.org/cte/facs_cabinet/facs_cabinet10.shtml.)

STRAND 1
Students will identify careers and products in the sports and outdoor industry.

Standard 1
Identify soft goods (i.e., products made with fabrics and textiles) in the sports and outdoor industry. (Examples: chalk bag, jackets, coats, bags, sporting goods gear.)

Standard 2
Identify design and careers opportunities in the sports and outdoor industry (designer, textiles designer, fabrication, and pattern drafting).

Resources:
http://www.stio.com
http://www.patagonia.com/us/home
http://concepttocompany.org/outdoor-15
http://concepttocompany.org/outdoor14
http://business.transworld.net/features/industry-leaders-provide-womens-market-insight-mahfia-sessions-portland/
https://www.youtube.com/watch?v=ptxWZl3AgBk
https://www.youtube.com/watch?v=fFS9aURNO_clnser

STRAND 2
Students will be able to recognize basic sewing equipment used in sports and outdoor product development.

Standard 1
Identify sewing machine parts and their function, safety, and maintenance.

- Identify the stitch plate, feed dogs, presser foot, bobbin case, spool pin, upper thread tension, presser foot lever/lifter, thread take-up lever, foot pedal, hand wheel, stitch length control, and stitch width control.
- Demonstrate how to thread the sewing machine, how to replace a needle, and how to turn the hand wheel when sewing.
- Identify basic problems encountered when sewing (e.g., thread jam, dull/broken needle, incorrect stitch formation). For example, if the thread take-up lever is not threaded it will cause loops on the wrong side of the fabric. Recognize that most sewing machine problems result from improper threading and poor-quality thread.
- Identify what a correct stitch looks like and how it is formed (i.e., sewing machine forms a stitch when the upper and bobbin threads interlock).
• Explain causes of and solutions to common sewing machine malfunctions, such as skipped stitches (threaded wrong, bad needle, wrong needle being used), lint removal, noisy sewing machine (bad needle, needs to be oiled, threaded problems), puckered seams (check tension, threading), snagged fabric (tension and needle), tension, and looped thread.
• Identify needle types (e.g., universal, sharp, stretch).
• Follow the machine manual to clean the machine and remove the lint regularly.
• Identify safe sewing procedures (e.g., keep fingers a safe distance from needle, maintain correct foot pedal placement).

Resources:
https://www.youtube.com/watch?v=ML8CMNzW6Tg
http://www.schmetzneedles.com/all-about-needles/#sthash.bKPVwTbo.dpbs

Standard 2
Identify sewing tools, their function, and maintenance and safety procedures associated with each, including seam ripper, straight pins, shears/scissors, rotary cutter and mat, seam gauge, tape measure, iron, pressing cloth, marking tools, and transparent rulers.

Standard 3
Identify the serger and its function.
• Discuss the advantages of the serger (e.g., cuts excess fabric, sews, and finishes edges).
• Practice operating the serger.
• Discuss safety and maintenance of a serger (e.g., always leave the presser foot down; do not serge over pins, zippers, or excessive bulk)

Resources:

Performance Skills
With the completion of a sports and outdoor product design, students will demonstrate competency in sewing machine use, care, and safety.

STRAND 3
Students will identify and analyze the characteristics and care of specific textiles used in sports and outdoor product industry.

Standard 1
Identify the basic fibers, characteristics, use and care of textiles. Recognize that fiber content establishes many of the characteristics of a specific fabric.
• Identify natural fibers (e.g., cotton, linen, silk, wool) and their characteristics.
  General characteristics: come from plants and animals, moisture absorbent, more expensive
  Cotton: absorbent, comfortable, durable, wrinkles, shrinks, easy to launder, plant source
Linen: absorbent, natural luster, quick drying, wrinkles, frays, little stretch, plant source (flax)
Silk: animal source (silk worm cocoon), absorbent, natural luster, insulating, strong, resilient, dyes well, expensive, degrades and yellows from age and sunlight.
Wool: animal source (fur), absorbent, strong, elastic, shrinks when laundered improperly, wrinkle resistant, warm

- Identify manmade fibers (e.g., nylon, polyester, acrylic, rayon, spandex, acetate) and their characteristics.
  General characteristics: made from chemical compounds, heat sensitive/will melt, less to not at all absorbent, less expensive
  Nylon: strong, elastic, water repellent, colorfast, frays easily
  Polyester: good shape retention, easy to launder, wrinkle resistant, colorfast, blends well with other fibers, retains oily stains
  Acrylic: resembles wool, soft, warm, nonabsorbent, pills, heat sensitive, can shrink or stretch
  Rayon: soft and comfortable, drapes beautifully, blends well with other fibers, shrinks, poor shape retention, wrinkles, dyes well
  Spandex: very elastic, adds stretch when blended with other fibers, requires stretch stitching techniques, shrinks
  Acetate: high luster, drapes well, loses shape, wrinkles

- Identify iron temperature settings according to fiber content (high heat: cotton, linen; low heat: nylon, spandex

- Identify advantages of blended fibers used in fabrics (i.e., they combine the best characteristics of two or more fibers).

- Identify various stain removal techniques (e.g., grass, blood, chocolate, make-up, ball-point pen, etc.). Recognize that stains set by heat and time.
  Grass: rub detergent into area, let stand, launder
  Blood: soak in cold water for at least 30 min, pre-treat if stain is still there, launder
  Chocolate: scrape off remaining, soak in cold water. Pre-treat any remaining stain, launder.
  Make-up: rub detergent into are or use a pre-wash stain remover, launder
  Ball-point pen: spray with hairspray, let sit, blot stain with paper towel; or rub detergent into spot, then launder.

- Select correct laundering procedures for pre-wash and clothing care based on clothing care labels and end of the bolt.
Standard 2
Discuss how selection of a fabric affects project construction.

- Identify the terminology of woven fabrics (e.g., warp/lengthwise, weft/crosswise, bias, selvage, straight of grain/lengthwise, and cut/raw edge), and understand that grain is determined by the position of the yarns and fibers in the fabric.
- Warp/lengthwise grain: grainline that is parallel for the selvage
- Weft/crosswise grain: grainline that runs form selvage to selvage; perpendicular to the selvage
- Bias: 45-degree angle; has a lot of stretch
- Selvage: tightly woven finished edge of fabric formed by the crosswise yarns
- Straight of grain/lengthwise: commonly referred to as straight of grain on commercial patterns; runs parallel to the selvage
- Cut/raw edge: usually runs across the fabric from selvage to selvage

- Identify the characteristics of woven, knit (looping yarns), and non-woven/felted fabrics. Woven: warp and weft yarns are interlaced at a 90-degree angle, no to limited elasticity Knit: made by looping yarns together, medium to high elasticity Non-woven/felted: fibers are pressed together with heat, moisture, and pressure
- Identify the correct fabric for project.
- Identify specific fabrics (e.g., ripstop nylon, canvas, vinyl, leather, two-way stretch, four-way stretch, polar fleece, sweatshirt, fleece, rib knit, flannel, neoprene).
Ripstop nylon: nylon fabric made with a special reinforcing technique that makes it resistant to tearing and ripping
Canvas: extremely durable plain-woven fabric
Vinyl: non-woven plastic fabric
Leather: the skin of an animal that has been tanned and treated
Two-way stretch: stretches from selvage to selvage
Four-way stretch: stretches both along the lengthwise and crosswise grain
Polar fleece: soft napped insulating fabric made from polyester
Sweatshirt fleece: type of jersey fabric with plain knit stitches on the front and purl knit stitches on the back; stretch factor makes it popular
Rib knit: double knit fabric where the rib wales alternate on the face and back of the fabric
Flannel: woven fabric made of cotton where the surface has been slightly brushed to create a soft napped fabric
Neoprene: soft, flexible, and durable synthetic sponge rubber that is water resistant and stretchable

Resources:

Performance Skills
Create a fabric file. Identify fiber content (e.g., two-way stretch, four-way stretch, canvas, flannel, leather, neoprene, polar fleece, rib knit, rip-stop nylon, sweatshirt fleece, vinyl), care, fabrication (e.g., woven, knit, non-woven), and intended use.

STRAND 4
Students will use pattern envelope and guide sheet/ instructions for pre-construction skills at the introductory level.

Standard 1
Identify the information found on a commercial pattern envelope and pattern guide sheet.

• Identify important information on the pattern envelope (e.g., body measurements help you make sure you have selected the right pattern size for your body), suggested fabrics (fabric weight, design and hand affect the way a garment looks and fits). The pattern envelope tells what fabrics are appropriate for the garment being made), notions (refers to all the supplies that will be needed to complete a project (e.g., elastic, thread, buttons, bias tape, zippers, trims), yardage requirements (a chart on the pattern envelope tells you how much fabric is needed to make the garment), and finished garment measurements (certain finished garment measurements will be listed). You may be able to find out the length of a skirt or width of a pant leg to help you visualize how the finished garment will look and decide whether you need to alter a pattern for a better fit.

• Identify important information found on the guide sheet, such as pattern pieces (i.e., line sketches of each pattern piece used in the garment are arranged and numbered for
• Determine pattern size based on body measurements and finished garment measurements. Note that correct pattern size is almost never the same as ready-to-wear sizing and choose a pattern size closest to your body measurements. (You must also take into account any ease—added room beyond the body measurements—included in the garment’s design.) When choosing a blouse, dress or jacket pattern, look at the bust/chest measurement; when choosing pants and skirt patterns, compare the waist and hip measurements. Select a pattern to fit the hips and plan to adjust the waist to fit.

**Standard 2**
Prepare pattern for layout and cutting.

- Identify pattern tissue terminology/symbols (e.g., straight of grain arrows, notches, pattern markings, buttons and buttonholes, place on fold line, sizing lines, adjustment lines).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Purpose</th>
<th>Where Located</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straight of grain arrow</td>
<td>Solid line with an arrow point at one or both ends</td>
<td>To orient the pattern on the fabric for cutting; usually indicates the lengthwise grainline, parallel to the selvage</td>
<td>On all pattern pieces</td>
</tr>
<tr>
<td>Place on fold line</td>
<td>Rectangular bracket with arrow tips pointing toward the folded edge</td>
<td>For cutting efficiency, pattern pieces are often produced as ‘half pieces’ and laid cut on doubled fabric. This on-the-fold edge is never cut. The pattern piece must be placed along a folded edge to create a full piece.</td>
<td>At center front and/or center back</td>
</tr>
<tr>
<td>Pattern markings</td>
<td>Solid circles, squares, or triangles of varying sizes; sometimes appear as unitized shapes with different outline styles</td>
<td>To match patterns at seams (and for details within the garment)</td>
<td>Most often on collar, neck, and shoulder points</td>
</tr>
<tr>
<td>Buttons and buttonholes</td>
<td>Buttons/holes are marked as a horizontal or vertical bar; buttons/holes are marked with an X</td>
<td>Placements and spacing of buttons and buttonholes</td>
<td>Either illustrated on the pattern piece or provided as a separate overlay pattern piece</td>
</tr>
<tr>
<td>Notches</td>
<td>One diamond, a pair of diamonds, or a triple set of diamonds, usually half inside/half outside the cutting line; some patterns use a half diamond (triangle pointed into the seam allowance)</td>
<td>Matching seams (and during constructions: one diamond usually indicates the garment front; a pair of diamonds usually denotes the back, and a triple set of diamonds indicates a seam reference other than the front or back)</td>
<td>In a variety of spots on most pattern pieces, including center back, sleeves, armhole, side, waist, and shoulder seams</td>
</tr>
<tr>
<td>Sizing lines</td>
<td>Line style is different for each size included in multi-size patterns</td>
<td>Indicates where you cut both the pattern pieces and the garment fabric</td>
<td>On all pattern pieces</td>
</tr>
<tr>
<td>Adjustment lines</td>
<td>A double solid line running across pattern piece, a single dashed line, or a single line with a dotted rectangle above it and mini-values at either end, depending on the pattern brand</td>
<td>Recommended area in which to lengthen or shorten the pattern piece</td>
<td>Below the knee on pants, below the elbow on sleeves, between the waist/hip on skirts; may change depending on figure variations</td>
</tr>
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</table>
Complete necessary pattern alterations (length or width).

Pattern alteration basics:

- Use the pattern adjustment lines on the pattern pieces which indicate the correct area to make an adjustment.
- You must make the same length adjustments to adjacent pattern pieces (such as front and back).
- If you are adding length or width to the pattern, cut along the length adjustment line and place tissue paper or pattern paper under the pattern. Tape the pattern to the paper to fill in the gap caused by the addition.
- Remember that each front or back pattern piece represents a quarter of your body.
- After you make an alteration, “true” the cutting line (redraw the line to smooth any uneven jogs created by your alteration). Use a ruler or curve to guide the new line.
- If you are making multiple alterations, adjust the length first.

Length:

- Use printed length adjustment lines on the pattern to lengthen or shorten. If there are two adjustment lines within the body area, divide the total adjustment between the two lines. If you are making a dress, determine whether you need to make your adjustment in the back-waist length or in the waist-to-hem length and use the appropriate adjustment line.
- To shorten, make a pleat in the pattern tissue at the adjustment line half the desired amount. True the cutting lines and the dart markings. For straight styles, cut away the excess pattern tissue at the hem, following the shape of the pattern; however, leave enough for a hem or last-minute length change. To lengthen, cut along the adjustment line and spread the pattern tissue the desired amount. Be sure to spread evenly and tape a piece of tissue paper in the opening. True the cutting lines. For straight styles, add length at the hem by taping tissue paper to the lower edge and drawing a new cutting line. Keep the original hem shape and extend the cutting lines on the side to the new bottom edge.
• **Width:**
  - Simple adjustments of girth, at the waist, hip or around the torso can be made at the side seams or in the middle of a pattern piece. If the adjustment is larger than 2 inches you may need to make a more involved alteration. For tops with sleeves, adjustments at the side seams require that the sleeves be altered too.
  - **Pants:** To adjust pants at the hip, simply add or subtract near the side seam, as shown. Use a curved ruler as a guide when you redraw the cutting line. Adjustments at the waistline are made similarly, with the side seam gradually straightening as it nears the waist.
  - **Bodices:** Blouses, tops, and jackets can be made wider or narrower by tucking or adding vertically from the shoulder seamline to the hem. This alteration can accommodate an increase or decrease up to 2 inches. On the pattern front and back, draw a line parallel to the grainline from the mid-point.

Resources:

[http://thesewingloftblog.com/understanding-pattern-markings](http://thesewingloftblog.com/understanding-pattern-markings)
[https://www.namedclothing.com/pattern-alterations](https://www.namedclothing.com/pattern-alterations)
Standard 3
Demonstrate correct placement of pattern pieces on the fabric.

- Press and straighten grain, if necessary. A fabric does not hang properly if the fabric is off grain. (One way to straighten grain is by holding the fabric at its opposite corners and stretching it away from the center.) Preshrink the fabric first, then try straightening the grain, and finally press the fabric. Avoid using off-grain fabrics for garments; they may be suitable for patchwork or smaller projects.

- Check for directional print (i.e., fabric pattern that goes in one direction and has a definite top and bottom) and nap layout. A fabric with a nap, pile, or directional print needs a one-way layout (i.e., when all the pattern pieces must be placed with their upper edges in the same direction).

- Choose correct layout from the pattern guide sheet. The fabric is usually folded lengthwise for cutting. The pattern instructions provide suggested layouts for different fabric width and are intended to make the most economical use of fabric. Sometimes fabrics with asymmetrical prints or weaves need to be cut out in a single layer. When cutting singly, flip over some pattern pieces for their second cutting to create both a left and right half. A crosswise layout is often needed for wide pieces and sometimes a layout shows a double fold, in which both selvages are brought to the center. Fold fabrics with right sides out to view the designs on the fabric.
Standard 4
Correctly position, pin and cut out the fabric pieces.

- Check straight of grain arrows and place on fold pattern symbols. The grainline on each pattern piece should be aligned with the lengthwise grain of the fabric, unless indicated otherwise.
- Use correct spacing and positioning of pins (pin perpendicular to pattern edge, inside cutting line). Make sure pin points do not cross the cutting line. Place pins closer together on curves to secure the fabric.
- Select and use appropriate cutting tools. Use shears to cut out fabric. Right-handed sewers hold down pattern with left hand, and left-handed sewers, the opposite. Hold scissors perpendicular to the cutting surface. Keep scissor blade in contact with table surface slide it along as you cut.
- Cut notches. Snip about 1/4” long, into the seam allowance at the notch position. This method works best of garments with 5/8” seam allowance and fabric that doesn’t ravel easily. You can also mirror image the notch outside of the cutting line.
- Keep pattern pieces flat as flat as possible, cutting around the pattern piece rather than moving it.

Standard 5
Transfer pattern markings before removing pattern pieces from fabric. Transfer fit-related and construction markings (i.e., fold lines, buttonhole and pattern markings)

- Select and use appropriate marking tool for fabric mark on the wrong side of the fabric (marking pen/pencil).
  - Air soluble pens disappear with exposure to air within a few days.
  - Water soluble pen markings disappear by applying a damp cloth to the fabric.
  - Chalk makes a nice straight line and is easily removed.
  - For tracing wheel and paper, choose the lightest color paper that is visible on the fabric. Position colored side of paper on wrong side of fabric or between two fabric layers. Roll tracing wheel over pattern marking, use a ruler for long straight lines.
  - Insert straight pins vertically through the pattern tissue and fabric at the markings and the mark the fabric on the wrong side at the pin location.

Performance Skills
Construct a sports and outdoor apparel item (e.g., lounge pants, lounge/“joggers”’ pants, elastic or drawstring shorts, basic T-shirt, gators, hoodie, etc.) using the correct pattern size based on body measurements and finished garment measurements.;

STRAND 5
Students will utilize basic construction skills

Standard 1
Explain and be able to demonstrate the following construction terms: basting stitch, back stitch, pivot, trimming, reinforce stitch, top stitch, right sides together.
Basting stitch: long, temporary stitch
Backstitch: overlapping stitches to form a knot, done at the beginning and end of sewing
Pivot: leaving the needle in the fabric, lift presser foot, turn fabric, and continue stitching
Trimming: reducing the bulk of a seam allowance
Reinforce stitch: short stitches done to make a seam stronger, especially done in crotches and corners
Top stitch: stitching seen on the outside of an item, usually 1/4” from a seam
Right sides together: placing and pinning the design sides or intended front sides of fabric
together when preparing to sew, thus creating a seam on the inside of an item.

Standard 2
Examine and select correct thread for sports and outdoor projects.
- Standard thread is “all purpose.”
- Quality thread prevents stitching problems.

Standard 3
Identify and construct standard seam allowances and seam finishes.
- Seam allowance is the area between the cut edge of the fabric to the stitching line.
- Standard seam allowance for commercial pattern is 5/8 inch.
- Identify 1/4 (approx. the edge of the presser foot), 3/8, 1/2, 5/8, and 3/4-inch seam allowance guidelines on the needle stitch plate.
- A seam finish is applied to the raw fabric edges, used to prevent raveling/fraying,
improves product quality and durability.
- Identify terms: clean finished, zigzagged, and serged.
  - Clean Finish: turn under 1/4” toward the wrong side of fabric
  - Zigzagged: zigzag stitch on the outer edge of fabric
  - Serged: use an overcast/serger to finish the outer edge of fabric

Standard 4
Press garment correctly.
- Press as you sew (never sew over a seam that hasn’t been pressed).
- Pressing is an up-and-down motion; ironing is a sliding motion.
- Use correct temperature for fabric/fiber content.
- Use steam/moisture if appropriate.
- Use pressing cloth to prevent scorching and/or shine marks.

Performance Skills
Press as you go to complete a professional quality project.
Complete all the following skills as part of the course. A minimum of 8 skills need to be included as part of an apparel or personal item project.
- Zigzag seam finish
- Clean finish seam finish
- Construct seam allowance as indicated on the guide sheet
- Casing (1/4” wider than elastic or draw cord)
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- Patch pocket with mitered corners and reinforced top corners (triangle, horizontal, bar-tack, double row of top stitching)
- Buttonhole
- Attach a button with hand needle and thread
- Construct a machine stitched hem
- Hand stitching (examples: blind stitch, hemstitch, slipstitch, whipstitch, or ladder stitch)

Resources:
Betzina, Sandra. Fast Fit, Easy Pattern Alterations for Every Figure. ISBN-10 1561586498.
The Threads YouTube channel has some great video tutorials. DVDs can also be purchased from the Threads website that offer short informative tutorials on several techniques for beginner sewers.

Skill Certificate Test Points by Strand

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<th>Test Name</th>
<th>Test #</th>
<th>Number of Test Points by Strand</th>
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<th>Total Questions</th>
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