



# SCIENCE AND TECHNOLOGY OF WEFT AND WARP KNITTING

## PROF. BIPIN KUMAR

Department of Textile Engineering  
IIT Delhi

**INTENDED AUDIENCE :** Students, Lecturer, Researchers, Designer, Industry Experts

**INDUSTRIES APPLICABLE TO :** Voltas Pvt. Ltd.(Textile Machinery Division),Laxmi Industries

High Performance Textiles Private Limited, Texzium International Private Limited, Vertex Machinery Works, Elex India

## COURSE OUTLINE :

This is a definitive course for everyone from beginners to experienced knitters to know the fundamental principles of knitting. This course covers all aspects of weft and warp knitting including their science, engineering, technology and design. The contents of the lectures have been systematically arranged to start from the basic of simple knit design and related theories, and then progressing towards research and engineering of advanced knitted structures and their technologies. Internationally accepted methods of fabric notation are presented to clarify explanations of weft/warp structures, and their knitting actions on the machine. Both theory and practical components have been included to help participants gaining hand on experience in knit designs, and machines. Many weft and warp knit construction are carefully selected, designed and demonstrated during lectures for more clarity on the structure and their influence on the fabric properties. Several lab videos/animations/photographs are included to familiarize with the working principle of weft and warp knitting technologies. A number of worked calculations have been included in certain topics to further clarify explanations and assist participants. Many application areas of knitting have been researched that could encourage participants to further explore the potential of knitting in other technical fields.

## ABOUT INSTRUCTOR :

Prof. Bipin Kumar is currently working as an Assistant Professor in The Department of Textile Technology at IIT Delhi. Prior to joining IIT Delhi, he worked as Research Assistant Professor (2016-2017) at The Hong Kong Polytechnic University, Hong Kong. He graduated from IIT Delhi, with a PhD in Textile Engineering in 2013. After PhD., he served as Postdoctoral Scholar at The Hong Kong Polytechnic University (2013-2014) and The University of California Davis (2014-2016). He is the first recipient from India to be selected for the Fulbright Postdoctoral Program (2013-14) in the field of textiles. His main research focuses on Textile Fabric Structures and Mechanics. He has over 30 publications in leading refereed SCI journals of materials, textiles and medical fields, 4 Patents, 2 Authored book, 10 book chapters, and over 30 conference proceedings. He holds editorial membership of several international referred journals including AATCC Journal of Research, JEFF, FTEE and CTFTTE. For his outstanding contribution in research and teaching, he received several prestigious awards including IIT Delhi Teaching Excellence Award (2018), IEI Young Engineer Award (2018-19), ACP outstanding Material Scientist Award (2014), DST INSPIRE Faculty Award (2016), and Award for Excellence in Postdoctoral Research (2016). Currently, he is involved in several start-up ventures in commercializing smart e-textile products for healthcare applications.

## COURSE PLAN :

**Week 1:** Introduction to Knitting

**Week 2:** Single Bed Weft Knitting Technology (Flat & Circular)

**Week 3:** Double Bed Weft Knitting Technology (Flat & Circular)

**Week 4:** Weft Knit Constructions and their Notation

**Week 5:** Weft Knit - Fabric Design and Structure-property Analysis

**Week 6:** Knitting Calculation

**Week 7:** Advanced Weft Knit Designs and Technology

**Week 8:** Introduction to Warp Knitting

**Week 9:** Warp Knit Constructions - Lapping Diagram and Plan

**Week 10:** Swinging and Shogging Motion Control in Warp Knitting

**Week 11:** Warp Knit Fabrics - Design and Structure-property Analysis

**Week 12:** Technical Applications of Weft and Warp Knit Structures