

INDEX

| Chapter | Contents | Page no. |
|---------|---|----------|
| | Abstract | |
| 1. | Introduction | 1 |
| 2. | Theory and Literature survey. | 4-92 |
| | 2.1 Introduction. | 5 |
| | 2.2 Properties influencing comfort characteristic of woven fabrics. | 5 |
| | 2.2.1. Fabric constructional parameters | 7 |
| | 2.2.1.1 Fabric weaves and its appearance | 8 |
| | 2.2.1.2 Fabric sett | 10 |
| | 2.2.1.3 Tightness of weave structure | 11 |
| | 2.2.1.4 Cloth cover | 12 |
| | 2.2.1.5 Yarn crimp | 13 |
| | 2.2.1.6 Fabric thickness | 14 |
| | 2.2.1.7 Fabric weight | 15 |
| | 2.2.2 Fabric mechanical properties. | 15 |
| | 2.2.2.1 Fabric extensibility | 16 |
| | 2.2.2.2 Fabric stiffness | 17 |
| | 2.2.2.3 Fabric Shear deformation | 18 |
| | 2.2.2.4 Compression properties | 20 |
| | 2.2.2.5 Surface smoothness | 21 |
| | 2.2.3 Fabric thermal comfort properties. | 28 |
| | 2.2.3.1. Air Permeability. | 30 |
| | 2.2.3.2. Thermal insulation. | 32 |
| | 2.2.3.3. Moisture Vapour permeability | 39 |
| | 2.2.2.4 Wicking property | 43 |
| | 2.3 Fabric processing and its effect on fabric properties | 51 |
| | 2.4 Fabric Evaluation for Comfort. | 54 |
| | 2.4.1 Peirce approach to "The Handle of Cloth". | 54 |
| | 2.4.2 Fabric evaluation for comfort by KSU's T-PACC. | 58 |
| | 2.4.2.1 Fabric hand lab – | 58 |
| | (Kawabata Evaluation System for fabric- KES-F) | |
| | 2.4.2.2 Micro climate analysis lab | 71 |

| | | |
|---------|--|--------|
| 2.4.2.3 | Absorbency Lab | 73 |
| 2.4.3 | Fabric assurance by simple testing – FAST. | 75 |
| 2.4.4 | Fabric objective measurement (FOM) techniques. | 81 |
| 2.4.4.1 | Over view of some FOM models. | 81 |
| 2.4.4.2 | Principle component analysis technique | 83 |
| 2.4.4.3 | Multiple factor analysis technique | 85 |
| 2.4.4.4 | Weighted Euclidean Distance Concept. | 89 |
| 3. | Methodology | 93-145 |
| 3.1 | Fabric selection and its preparation. | 94 |
| 3.2 | Test methods for yarn properties. | 97 |
| 3.2.1 | Modules for yarn testing. | 97 |
| 3.2.2 | Measurement of yarn twist. | 99 |
| 3.2.3 | Yarn Hairiness | 101 |
| 3.2.4 | Measurement of yarn Flexural rigidity | 102 |
| 3.2.5 | Tensile modulus of yarn | 105 |
| 3.3 | Test methods for fabric properties. | 107 |
| 3.3.1 | Modules for fabric testing. | 107 |
| 3.3.2 | Sample layout and cutting. | 111 |
| 3.3.3 | Yarn crimp. | 112 |
| 3.3.4 | Fabric weight | 114 |
| 3.3.5 | Fabric Thickness | 115 |
| 3.3.6 | Bending length | 116 |
| 3.3.7 | Fabric tensile modulus | 118 |
| 3.3.8 | Critical shear angle | 119 |
| 3.3.9 | Frictional Amplitude | 121 |
| 3.3.10 | Air Permeability | 124 |
| 3.3.11 | Thermal insulation value | 126 |
| 3.3.12 | Moisture Vapour Transfer Rate | 127 |
| 3.3.13 | Wicking test | 129 |
| 3.4 | Objective evaluation of fabric comfort: | 132 |
| 3.4.1 | Mechanical comfort or Handle of cloth. | 132 |
| 3.4.2 | Thermal comfort measurement. | 140 |

| | | |
|----|---|---------|
| 4. | Results and discussions. | 146-175 |
| | 4.1 Yarn Properties contributing to comfort properties of suiting Fabric | 148 |
| | 4.2 Fabric properties contributing to mechanical and thermal comfort. | 150 |
| | 4.2.1 Fabric constructional parameters | 150 |
| | 4.2.2 Fabric mechanical properties | 154 |
| | 4.2.3 Cloth thermal comfort properties | 158 |
| | 4.3 Comfort factor analysis and development of software | 160 |
| | 4.3.1 Mechanical comfort factors | 160 |
| | 4.3.2 Thermal comfort factors. | 163 |
| | 4.3.3 FabCOM - Fabric Comfort by Objective Measurement. | 165 |
| 5. | Conclusion. | 176 |
| 6. | Future scope of this work. | 179 |
| 7. | Bibliography. | 181 |
| | Appendix I. | 188 |
| | Appendix II. | 197 |