DEPARTMENT OF LEATHER TECHNOLOGY
ANNA UNIVERSITY, CHENNAI

Vision:

To become a premier centre of learning and research in Leather and Allied Technologies.

Mission:

1. To provide quality education in the area of Leather Technology to transform students into graduates with high professional values.

2. To share and disseminate expertise for use in the solution of problems faced by the Leather industry.

3. To conduct need based research projects giving priority to the needs of the industry.

4. To build an expertise based capsule of delivering technology to leather and allied sectors.

5. To provide a learning ambience for innovators, researchers and professional a. technology authors.

6. To foster development of advanced human capacity for translational research for solution science.
1. **PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):**
   1. To build an expertise base capsule of delivering technology based solution to global footwear sectors.
   2. To foster development of advanced human capacity to provide solution in footwear science and engineering.
   3. To equip learners with relevant knowledge and expertise system for professional consultation.
   4. To enable learners in the areas of pedagogy and advanced research.
   5. To provide a learning ambience for innovators researchers and professional technology authors.

2. **PROGRAMME OUTCOMES (POs):**
   On successful completion of the programme,

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<td>1</td>
<td>Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
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<tr>
<td>2</td>
<td>Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
</tr>
<tr>
<td>3</td>
<td>Design/development of solutions</td>
<td>Design a system or process to improve its performance, satisfying its constraints.</td>
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<tr>
<td>4</td>
<td>Conduct investigations of complex problems</td>
<td>Conduct experiments &amp; collect, analyze and interpret the data.</td>
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<td>5</td>
<td>Modern tool usage</td>
<td>Apply various tools and techniques to improve the efficiency of the system.</td>
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<td>6</td>
<td>The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
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<td>7</td>
<td>Environment and sustainability</td>
<td>Design the system with environment consciousness and sustainable development.</td>
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<td>8</td>
<td>Ethics</td>
<td>Interact in industry, usiness and society in a professional and ethical manner.</td>
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<td>9</td>
<td>Individual and team work</td>
<td>Function in a multi disciplinary team.</td>
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<td>Communication</td>
<td>Proficiency in oral and written Communication.</td>
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<td>Project management and finance</td>
<td>Implement cost effective and improved system.</td>
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<td>12</td>
<td>Life-long learning</td>
<td>Continue professional development and learning as a life-long activity.</td>
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3. PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of Footwear Science and Engineering Program the student will have following Program specific outcomes.

1. **Foundation**: Knowledge for manning and managing footwear industries.

2. **Communication**: People and social skills required for leadership, consultation and self-employment.

3. **Responsibility**: Professionally ethical behavior and social responsibility of footwear sector.

4. **Design**: Ability to comprehend, analyze, synthesize for design, develop and delivery of converging solutions for industrial problems.

4. PEO / PO MAPPING

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**Semester 4**

**Semester 3**

**Semester 2**

**Semester 1**

**YEAR 2**

**YEAR 1**
ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
M.TECH. FOOTWEAR ENGINEERING AND MANAGEMENT
REGULATION – 2019
CHOICE BASED CREDIT SYSTEM
CURRICULUM AND SYLLABI FOR I TO IV SEMESTER

SEMESTER I

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* Compulsory for Non-Leather UG graduates
** Audit Course is Optional

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PROFESSIONAL ELECTIVE STREAMS

In order to build an expertise base for technology management for footwear sector with scope of super specialization four different streams namely Industrial Project Planning and Development, Total Quality and Productivity Management, Research and Development and Pedagogy and Precision and Product Design and Engineering, it is proposed to create four elective streams.

a) Industrial Project Planning and Development
b) Total Quality and Productivity Management
c) Research & Development and Pedagogy
d) Precision and Product Design and Engineering

Students are expected to choose any one the streams depending on their interest and capabilities. From the list of Professional Elective Courses, about 7 courses are proposed for each stream and students are expected to choose any 4 courses.

a) Industrial Project Planning and Development

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AUDIT COURSES (AC)

Registration for any of these courses is optional to students.

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EMPLOYABILITY ENHANCEMENT COURSES (EEC)

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SUMMARY

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SYLLABI
SEMESTER I
FW5101 ANATOMY AND SOLID MODELLING OF FOOT L T P C 2 1 0 3

OBJECTIVE
The objective of this course is to provide the fundamental knowledge about foot and its modelling

UNIT I ANATOMY OF HUMAN FOOT 9
Lower limb - bones, muscles, nerves and fascia, their functions in structural stability (static & dynamic) muscles in helping in walking, muscle relate to limb functions like flexion, extension, etc. Science in Shoe Design.

UNIT II GROWTH AND DEFORMITIES 7
Growth of foot from infancy to maturity, arches of foot, relationship between foot shape and last. Different types of foot deformities like PesCavus, Valgus, Blisters, Gangrene, injuries in sports, methods of prevention etc., Footcare and protection

UNIT III PRINCIPLES OF BIO MECHANICS 7
Reference planes of motion; Kinematics; Limb Movements; Motion of Joints; Kinetics; Force; Momentum; Inertia; Pressure; Torque; Work, Power and Energy. Free body diagram, analysis - biomechanics of walking, running.

UNIT IV FUNDAMENTALS OF GAIT 7
Terminology used in Gait; Gait Parameters Definition; Phases of Gait Cycle; Fundamentals in Gait Analysis; Balance and Posture; Ground Reaction Force. Introduction to gait analysis techniques.

UNIT V SOLID MODELLING 15
Basic principles of solid modelling and surface modelling using contours and geometry. Use of solid modelling in designing and developing modern footwear. Introduction to Foot Anthropometry; Design of anthropometric foot surveys; Data collection and Statistical Analysis of foot data; Establishment of Sizing systems.
Lasts: Different measurement of feet and lasts - methods, units, sizing systems such as English, French, American, German, Japan Mondo-point their conversion and comparison. Materials for last making, manufacturing technique. Model development. Principles of grading - Manual, machine and computer grading.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of this course the students will be able

CO1. To understand anatomy of human lower limb
CO2. To have knowledge on principles of biomechanics of foot
CO3. Aware of solid modelling of foot.
REFERENCES:
Course Articulation Matrix:

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<td>To have knowledge on principles of biomechanics of foot</td>
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<td>Aware of solid modelling of foot.</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
The objective of this course is to present the students on various unit operations in footwear manufacture.

UNIT I DESIGN AND PATTERN DEVELOPMENT 7

UNIT II CUTTING 7

UNIT III PRE-CLOSING AND CLOSING 11
Checking incoming work, stitch making, skiving, punching and gimping, heat embossing, flowmoulding, toe puff attachment, attaching linings and scrims, trimming linings, finishing off closed seams. Top line and other edge treatments, local reinforcements, attaching fasteners and trims. Threads, needles, Seam and stitch types, preparing for stitching, Dealing with thread breakages, automatic stitching, working environment faults and remedies, Types of stitching machines, Design of assembly section and Stitching machine management.

UNIT IV LASTING 9

UNIT V POST LASTING AND FINISHING 11
Principles and methods of various post lasting and finishing operation; Sole attaching –preparation of lasted margin, upper preparation, sole preparation, sole cementing, uppercementing, halogenations; bottom fillers and shanks adhesive drying, heat activation, spotting,pressing, last slipping, health and safety, quality control and fault finding problems- solving, recommended bonding systems. Shoe room techniques.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course, the students are expected to

CO1. Understand the construction of a shoe and its components.
CO2. Understand the design and pattern development.
CO3. Have knowledge on prelisting and lasting.
REFERENCES:

Course Articulation Matrix:

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
The purpose of this subject is to identify; formulate; foresee or predict problems as possible; and to plan, organize, control activities of the project to complete it successfully in spite of all risks.

UNIT I  PROJECT IDENTIFICATION AND FORMULATION  10

UNIT II  PROJECT BUDGETING AND FINANCING  9


UNIT III  PROJECT APPRAISAL AND RISK ANALYSIS  8
Project Appraisal: Time Value of Money; Project Appraisal Techniques – Payback Period, Accounting Rate of Return, Net Present Value, Internal Rate of Return, Benefit Cost Ratio; Social Cost Benefit Analysis; Effective Rate of Return.
Risk Analysis: Measures of Risk; Sensitivity Analysis; Stimulation Analysis; Decision Tree Analysis.

UNIT IV  PROJECT DESIGN AND EVALUATION  7

UNIT V  PROJECT SCHEDULING TOOLS AND TECHNIQUES  11
Critical Path Method (CPM); Critical Chain Method; Schedule Compression Techniques – Crashing – Fast Tracking; Resource Optimization Techniques – Leveling – Balancing; Modelling Techniques – What-if Analysis – Simulation; Leads and Lags; Scheduling tools; Schedule network Analysis.

OUTCOMES:
At the end of the course the students can
CO1. Successfully develop and implement all project’s procedures.
CO2. Achieve project’s main goal within the given constraints.
CO3. Develop techniques to manage and coordinate project managers, subcontractors, customers, team members and vendors.
CO4. Identify various implementation techniques.
CO5. Describe ways to manage scope in a rapidly changing business environment.
REFERENCES:
### Course Articulation Matrix:

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<tr>
<td>CO1</td>
<td>Successfully develop and implement all project’s procedures.</td>
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<tr>
<td>CO2</td>
<td>Achieve project’s main goal within the given constraints.</td>
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<tr>
<td>CO3</td>
<td>Develop techniques to manage and coordinate project managers, sub contractors, customers, team members and vendors.</td>
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<td>CO4</td>
<td>Identify various implementation techniques.</td>
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<td>CO5</td>
<td>Describe ways to manage scope in a rapidly changing business environment.</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
LE5152  ORIENTATION TO LEATHER MANUFACTURE  L  T  P  C
[Bridge Elective Course for Non-Leather UG Graduates]  3  0  0  0
“Syllabus is Common with M.Tech (Leather Technology) Programme”

OBJECTIVE
This course objective is to orient the non-leather students on the fundamental science and technology of leather manufacture.

UNIT I  HIDES, SKINS and PRESERVATION  7
Origin and characteristics of hides and skins; Categories of livestock; Grading systems; Defects in hides and skins; Various preservation techniques and their principles.

UNIT II  PRETTANNING PROCESSES AND OPERATIONS  8
Principles and objectives of beam house processes viz., soaking, liming, reliming, deliming, bating, pickling, depickling and degreasing; Various unit operations in pretanning.

UNIT III  TANNING  10
Definition and objectives of tanning; Types and basic chemistry of vegetable tannins; Basic chemistry of basic chromium sulfate; Principles involved in vegetable and chrome tanning and their mechanism in brief; Combination tannages.

UNIT IV  POST TANNING PROCESSES AND OPERATIONS  10
Principles and objectives of post tanning processes viz., neutralisation, retanning, dyeing and fatliquoring; Various unit operations involved.

UNIT V  FINISHING TECHNIQUES  10
Types of binders; Basic chemistry of protein, resin and PU binders; Types of pigments; Basic characteristics of pigments; Basic theory of coating; Principles and objectives of finishing; Classification of finishing; Types of auxiliaries and finishes.

TOTAL : 45 PERIODS

OUTCOME
At the end of the course, students are expected to
CO1. Understand the application and alternatives to leather in current global scenario.
CO2. Have knowledge on pretanning, tanning and post tanning processes.
CO3. Comprehend the process rational for making specific leather.

REFERENCES:
## Course Articulation Matrix:

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</table>

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RESEARCH METHODOLOGY AND IPR

COURSE OBJECTIVES:
To impart knowledge and skills required for research and IPR:
- Problem formulation, analysis and solutions.
- Technical paper writing / presentation without violating professional ethics
- Patent drafting and filing patents.

UNIT I    RESEARCH PROBLEM FORMULATION 6
Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations

UNIT II    LITERATURE REVIEW 6
Effective literature studies approaches, analysis, plagiarism, and research ethics.

UNIT III    TECHNICALWRITING /PRESENTATION 6
Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

UNIT IV    INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR) 6

UNIT V    INTELLECTUAL PROPERTY RIGHTS (IPR) 6
Traditional knowledge Case Studies, IPR and IITs.

TOTAL HOURS: 30

COURSE OUTCOMES:
1. Ability to formulate research problem
2. Ability to carry out research analysis
3. Ability to follow research ethics
4. Ability to understand that today’s world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
5. Ability to understand about IPR and filing patents in R & D.

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REFERENCES:
FW5111 TESTING OF FOOTWEAR MATERIALS AND PRODUCTS LAB  L  T  P  C
0  0  6  3

OBJECTIVE
The objective of this course is provide practical exposure on the testing of footwear materials

- Methods of sampling and conditioning of footwear materials and end products.
- Physical analysis of leather upper, lining, toe-puff / stiffener, insole and sole.
- Demonstration of Chemical Testing of Leather for Footwear Manufacturing
- Physico-mechanical properties of non-leather upper and lining materials and coated fabrics-pH and chloride content
- Physico - mechanical properties of rigid Cellulose, Woven and Non-Woven
- Testing of Insole
- Visual and physico mechanical tests like seam strength, strap strength, Toe load, Heel pull-off (ladies), top-line strength, water resistance etc.
- Testing of footwear grinderies and accessories.
- Testing of safety shoe.

TOTAL: 90 PERIODS

COURSE OUTCOMES:
At the end of this course the students will

CO1. Understand the importance of testing footwear materials and products
CO2. Have gained hands on experience of testing footwear materials and products
CO3. Aware of various quality standards of various leather, non-leather and shoes

REFERENCES:

1. BIS Standards.
2. “Quality manuals of footwear materials”, CLRI publications, 2000
Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Statement</th>
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<tr>
<td>CO2</td>
<td>Have gained hands on experience of testing footwear materials and products</td>
<td>–</td>
<td>3</td>
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<tr>
<td>CO3</td>
<td>Aware of various quality standards of various leather, non-leather and shoes</td>
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</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To impart practical exposure in Pattern developments and cutting operation

UNIT I  LAST  45

UNIT II  CUTTING AND CLICKING  45

TOTAL: 90 PERIODS

COURSE OUTCOMES:
At the end of this course, the students are expected to
CO1. Be in a position to develop patterns of different style of footwear.
CO2. Gain experience in leather assortment and grading
CO3. Have practical knowledge on cutting and clicking process.
### Course Articulation Matrix:

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<tr>
<th>Course Outcomes</th>
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<tbody>
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<td></td>
<td></td>
<td>PO1</td>
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<tr>
<td>CO1</td>
<td>Be in a position to develop patterns of different style of footwear</td>
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</tr>
<tr>
<td>CO2</td>
<td>Gain experience in leather assortment and grading</td>
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<tr>
<td>CO3</td>
<td>Have practical knowledge on cutting and clicking process.</td>
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<tr>
<td>Footwear Fabrication Laboratory - I</td>
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</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
The objective of this course is provide the students with the knowledge on various components and accessories used for footwear manufacture.

UNIT I COMPONENTS

UNIT II GRINDERIES

UNIT III FASTENERS

UNIT IV ACCESSORIES
Ornaments, embellishments, studs, methods of manufacture, moulding, electroplating and polishing.

UNIT V REINFORCEMENTS
Toe-puff and Stiffeners: Types of Toe-puff and stiffeners, manufacture techniques - Paint on liquids, impregnated fabrics, print on hot-melt resin, filmic. Recommended use. Non-metallic grinderies: Reinforcement tape - tape preparation - Vulcanization of adhesive. Fibre fastening, Velcro, etc.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students will be able:

CO1. To understand about various footwear components
CO2. Have practical knowledge on characteristics of various footwear components and accessories
CO3. Have knowledge on different manufacturing techniques of accessories

REFERENCES:
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<td>PO1</td>
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<td>CO1</td>
<td>To understand about various footwear components</td>
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<tr>
<td>CO2</td>
<td>Have practical knowledge on characteristics of various footwear components and accessories</td>
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<tr>
<td>CO3</td>
<td>Have knowledge on different manufacturing techniques of accessories</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Footwear Components and Accessories</td>
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</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
The objective of this course is project the use of computer assisted designing techniques for making footwear.

UNIT I COMPUTER APPLICATIONS IN FOOTWEAR SECTOR
Definition, historical development, scope of applications and advantage.

UNIT II HARDWARE IN CAD
Introduction, Principles, Capabilities and operation of graphical workstations, central processing units, graphic terminals, input/output devices, interface and storage devices, net-working concepts of LAN and WAN.
Digitization : 2D & 3D Coordinate extracting, principles of digital and analog conversion, digital input/output processing systems. CNC devices for computer aided cutting including laser and water jet, computer aided manufacturing.

UNIT III PATTERN ENGINEERING
Computerized techniques for pattern generation, grading and assessment of footwear patterns, consumption calculations, pattern nesting and costing, stitching etc. through computerized techniques.
Data Conversion techniques, DXF.

UNIT IV LAST MODELLING
Digitization with 3D Scanner; manipulation and optimization of digitized last; use of macros; last comparison; grading wizard; flattening; 3D visualization of last and styles; concept of e-last; introduction to sole and sole mould design.

UNIT V ADVANCED COMPUTATIONAL TECHNIQUES IN CAD, RAPID PROTOTYPING
Principles and practice of foot scanner; conversion of foot dimensions to last model; creation of still files for last manufacture; simulation – concepts and applications; robotics: concepts and applications in footwear manufacture; 3D Printing : concepts and applications in footwear manufacture.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course students are expected to
CO1. Understand the concepts of computer applications in footwear sector.
CO2. Have knowledge on CAD for pattern engineering, last and sole modelling for footwear.
CO3. Have knowledge in advanced computational techniques in CAD, rapid prototyping, simulation, 3D printing and robotics.
REFERENCES:

5. Desai and Abel, “Introduction to FEM”.
6. “Step by Step guide to CAD for footwear”: CAD Centre, SDDC, CLRI.
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<td>CO1</td>
<td>Understand the concepts of computer applications in footwear sector.</td>
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</tr>
<tr>
<td>CO2</td>
<td>Have knowledge on CAD for pattern engineering, last and sole modelling for footwear.</td>
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</tr>
<tr>
<td>CO3</td>
<td>Have knowledge in advanced computational techniques in CAD, rapid prototyping, simulation, 3D printing and robotics</td>
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<td></td>
<td>Computer Aided Design and Manufacturing for Footwear</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To impart theory and practical knowledge on the working principles, use and maintenance of machineries used in Footwear manufacture.

UNIT I  MACHINERIES USED IN PRECLOSING AND CLOSING DEPARTMENT

UNIT II  MACHINERIES USED IN LASTING AND BOTTOMING DEPARTMENT
Counter Moulding, Insole attaching, Toe puff activator, Mulling chamber, thermo-cementing, preforming, Toe lasting, side lasting, seat lasting , Heel crowing , heat setter, Hot air blower, Roughing machine, Heat Reactivator, Sole Pressing machine, Delasting machine, Polishing machine

UNIT III  ADVANCED FOOTWEAR MACHINES AND TRANSPORT SYSTEM

UNIT IV  MODULAR MANUFACTURING AND FOOTWEAR UNIT LAYOUT
Productivity improvements: scheduling, simulation, Toyota and lean manufacturing system. Factor affecting plant location and construction of factory building for balancing the production line in footwear industry.

UNIT V  PREVENTIVE MAINTENANCE AND SAFETY
Preventive maintenance and safety in the use of footwear machinery

TOTAL : 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will be able to understand the working principles of machineries used in footwear manufacture and their use and maintenance. The students also understand the following:
CO1. General principles involved in various machineries used in footwear manufacture.
CO2. Salient features and purpose of the various machinery used.
CO3. Preventive maintenance and safety in the use of footwear machinery.
CO4. Adjustment of machinery parts for proper functioning of different machines used in footwear processing.
CO5. Design of optimal machinery layout in footwear unit.

REFERENCES:
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<th>Course Outcomes</th>
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<tbody>
<tr>
<td>CO1</td>
<td>General principles involved in various machineries used in footwear</td>
<td>PO1</td>
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<tr>
<td></td>
<td>manufacture</td>
<td>2</td>
</tr>
<tr>
<td>CO2</td>
<td>Salient features and purpose of the various machinery used.</td>
<td>2</td>
</tr>
<tr>
<td>CO3</td>
<td>Preventive maintenance and safety in the use of footwear machinery.</td>
<td>2</td>
</tr>
<tr>
<td>CO4</td>
<td>Adjustment of machinery parts for proper functioning of different machines</td>
<td>2</td>
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<tr>
<td></td>
<td>used in footwear processing.</td>
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<tr>
<td>CO5</td>
<td>Design of optimal machinery layout in footwear unit.</td>
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<td>Footwear Machinery</td>
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</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To impart practical exposure in unit operations of full shoe manufacture

UNIT I  UPPER FABRICATION  40
Assessment on cut components, practice in sewing machine – pedal control without thread –
Thread –synthetic – leather, practice on pre-closing operation – skiving - splitting- folding, practice
on fabrication of – derby - oxford - slip on, practical exposure on upper inspection and
assessment practice

UNIT II  BOTTOM STOCK PREPARATION  10
Insole cutting - Sole cutting and cutting other sections/components. Leather/Rubber Sole
preparation - Heel attaching - Heel treatment - Edge Treatment - Finishing.

UNIT III  LASTING AND FINISHING  40
Insole attachment - base strap lasting – vamp lasting – full strap lasting(Manual practice), hand
drafting – practice on lasting machine – practice on fabrication of different styles of footwear -
shoe dressing and finishing

TOTAL: 90 PERIODS

COURSE OUTCOMES:
At the end of the course, the students will

CO1. Have knowledge on bottom stock preparation and upper fabrication.
CO2. Have practical knowledge on lasting and finishing process.
CO3. Gain skill set to handle full shoe manufacture.

REFERENCES:
**Course Articulation Matrix:**

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<tr>
<td>CO1</td>
<td>Have knowledge on bottom stock preparation and upper fabrication.</td>
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<tr>
<td>CO2</td>
<td>Have practical knowledge on lasting and finishing process.</td>
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<tr>
<td>CO3</td>
<td>Gain skill set to handle full shoe manufacture.</td>
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<td>Footwear Fabrication Laboratory - II</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
To provide students a practical knowledge on the use of computer assisted designing techniques for making footwear

LIST OF EXPERIMENTS
- 2D and 3D digitization
- Line modifications
- Pattern creation using CAD
- Pattern Engineering
- Grading in CAD/CAM
- Concept of e-last
- Sole mould design

TOTAL: 90 PERIODS

COURSE OUTCOMES
At the end of this course, student should
CO1. Understand the basic concepts and technique of CAD in footwear industry
CO2. Learn about the concept of e-last
CO3. Have practical knowledge on grading and sole mould design
Course Articulation Matrix:

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<th>Course Outcomes</th>
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<th>PSO 4</th>
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<td>CO1</td>
<td>Understand the basic concepts and technique of CAD in footwear industry</td>
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<tr>
<td>CO2</td>
<td>Learn about the concept of e-last</td>
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<tr>
<td>CO3</td>
<td>Have practical knowledge on grading and sole mould design</td>
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<tr>
<td>CAD/CAM for Footwear Designing</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
The objective of this course is to provide theoretical knowledge on various chemicals and polymers associated with footwear.

UNIT I  PRINCIPLES FOR PREPARATION OF POLYMERIC MATERIALS
Definition and classification of polymers - Chemistry and mechanism involved in different polymerisation processes such as Stepwise, Addition, Ring opening, Free Radical polymerisations (Bulk, solution, suspension and emulsion polymerisations) – Copolymerisation - Anionic and Cationic polymerisations.

UNIT II  MODIFICATIONS OF POLYMERIC MATERIALS FOR DIFFERENT FOOTWEAR COMPONENTS
i. Polymer Blending : High polymer blends - Plasticization – Other additives, fillers, Antioxidants, flame retardants, stabilizers, colorants and pigments - Post reactions of polymers ii. Moulding techniques and equipment used in fabrication of polymer products such as : Injection moulding, calendering, Reaction Injection moulding (RIM), Blow moulding etc.

UNIT III  PROPERTIES, SPECIFIC USES AND TESTING OF DIFFERENT POLYMER MATERIALS
Properties and test procedures for polymer materials such as rheological, mechanical, electrical, thermal, chemical and comfort - suitability of polymer materials for different components of footwear such as upper, lining, shank, insole, outer sole, heel, thread etc.

UNIT IV  CHEMISTRY AND TECHNOLOGY IN MANUFACTURING POLYMER MATERIALS

UNIT V  ADHESIVES
Adhesive formulations involving starch, glue, latex, rubber solutions, chloroprene, PU etc. Properties of adhesives & their choice for different purposes and in construction as in DIP, DVP, cemented etc. Mechanism of adhesion.

UNIT VI  FOOTWEAR DRESSING CHEMICALS
Formulation of polymeric materials such as shoe polishes, upper dressings, glazing materials, lacquers, binders, resins - Properties and their application in footwear industry. Manufacture of shoe finishes.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course the students will be able
CO1. To understand various chemicals materials used in footwear components
CO2. To understand various polymers materials used in footwear components
CO3. Aware of manufacturing and testing of various polymer materials of footwear industry
REFERENCES:

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<tr>
<td>CO1</td>
<td>To understand various chemicals materials used in footwear components</td>
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<td>CO2</td>
<td>To understand various polymers materials used in footwear components</td>
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<tr>
<td>CO3</td>
<td>Aware of manufacturing and testing of various polymer materials of footwear industry</td>
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<tr>
<td>Polymers and Auxiliaries for Footwear</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
The industrial internship is expected to enhance the technical employability skills of the students.

Students are expected to undertake industrial internship programme during the summer vacation. Minimum duration of this should be 1 month. During their internship programme, the students are expected to at least resolve one of the problems faced by the industry. Students pursuing R&D elective stream will be allowed to take up their internship at a research lab. As a part of this course students are expected to make presentations and report on the work they have carried out during their internship.

COURSE OUTCOME:
CO1. At the end of this course the students will have confidence in handling practical aspects in footwear and allied sector and also to improve the presentation skills of the students
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<tr>
<td>CO1</td>
<td>Have confidence in handling practical aspects in footwear and allied sector and also to improve the presentation skills of the students</td>
<td>PO1  PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 1 PO 2 PSO 1 PSO 2 PSO 3 PSO 4</td>
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<td>Substantial (High)</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
The objective of this course is to facilitate the students to identify innovative projects that promotes creativity.

Under Project Phase I the students are expected to pursue preliminary work on a project undertaken by and assigned to him/her by the Department. A report should be submitted based on the information available in the literature or data determined in the laboratory/industry. The objective of the project work is to make use of the knowledge gained by the student at various stages of the degree programme. Project Phase I is intended to facilitate the better completion of project extended through Project Phase II in Semester IV.

VIVA VOCE
The object of the viva-voce examination is to determine whether the objectives of the Project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the Project Work.

TOTAL: 180 PERIODS

COURSE OUTCOME:
CO1. At the end of the Project Phase I period, students should be familiar with current thinking in their field, and able to apply the concepts to relevant research problems or practical applications.
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<td>CO1</td>
<td>Familiar with current thinking in the field, and able to apply the concepts to relevant research problems or practical applications.</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
The objective of the project is to make use of the knowledge gained by the student at various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme.

The students should continue their work proposed in Project Phase I and are expected to complete the proposed work. A report should be submitted based on the data determined in the laboratory/industry. The objective of the project work is to make use of the knowledge gained by the student at various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the programme.

VIVA VOCE
The object of the viva-voce examination is to determine whether the objectives of the Project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the Project Work.

TOTAL: 360 PERIODS

COURSE OUTCOME:
CO1. The project work is expected to shape the student to think originally, plan/execute work properly, analytical abilities and reporting/communication skills
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<td>CO1</td>
<td>Expected to shape the student to think originally, plan/execute work properly, analytical abilities and reporting/communication skills</td>
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ELECTIVES

FW5001 COMPUTATIONAL METHODS AND COMPUTER GRAPHICS L T P C
3 0 0 3

OBJECTIVE
The objective of this course is provide various theories on computation methods and graphics.

UNIT I SOLUTION OF LINEAR EQUATION AND INTERPOLATION

UNIT II INITIAL AND B.VP FOR ODE
Taylor series, Euler, Modified Euler, RungeKutta method of Fourth order for First and Second order differential equations – Finite difference solution for the second order ordinary differential equation.

UNIT III FINITE ELEMENT METHOD
Integral Formulation and variational methods – Mathematical concepts, weak formulation of BVP, variational methods of approximation, Two dimensional BVP – Model equation, Finite element discretization, Interpolation – function, Assembly of element equation, Axisymmetric problems- Mesh generation and interposition of Boundary condition.

UNIT IV TWO DIMENSIONAL GRAPHICS
Line, circle, ellipse drawing algorithm, line attributes, curve attributes, character generation, line clipping algorithm, two dimensional geometric transformations.

UNIT V THREE DIMENSIONAL GRAPHICS
Bezier curves, Bezier surfaces, generation of quadric surfaces, Three dimensional geometric transformations, viewing transformations – projections.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students are expected to

CO1. Have knowledge on information technology,
CO2. Comprehend the application aspects of finite element method
CO3. To understand different theories on computation methods and computer graphics.

REFERENCES:
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<td>PO1</td>
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<tr>
<td>CO1</td>
<td>Have knowledge on information technology</td>
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</tr>
<tr>
<td>CO2</td>
<td>Comprehend the application aspects of finite element method</td>
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<tr>
<td>CO3</td>
<td>To understand different theories on computation methods and computer graphics</td>
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<td></td>
<td>Computational Methods and Computer Graphics</td>
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</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES

- To equip individuals with knowledge and skills undertaking Corporate Social Responsibility.
- To develop competencies for effective field interventions, research and management of CSR interventions.
- To develop an insight into present CSR strategies of model business organization.
- To enable students with conceptual clarity on need, purpose and relevance of research applicability in CSR practice.

UNIT I INTRODUCTION

Introduction to CSR - Meaning & Definition of CSR, History & evolution of CSR. Concept of Charity, Corporate philanthropy, Corporate Citizenship, CSR-an overlapping concept. Concept of sustainability & Stakeholder Management.

CSR through triple bottom line and Sustainable Business; relation between CSR and Corporate governance; environmental aspect of CSR; Chronological evolution of CSR in India; models of CSR in India, Carroll’s model; drivers of CSR; major codes on CSR; Initiatives in India.

UNIT II PRINCIPLES OF CSR

International framework for corporate social Responsibility, Millennium Development goals, Sustainable development goals, Relationship between CSR and MDGs. United Nations (UN) Global Compact 2011. UN guiding principles on business and human rights. OECD CSR policy tool, ILO tri-partite declaration of principles on multinational enterprises and social policy.

UNIT III LEGISLATION AND ACTS


UNIT IV REGULATORY REFORMS

The Drivers of CSR in India, Market based pressure and incentives civil society pressure, the regulatory environment in India Counter trends. Performance in major business and programs. Voluntarism Judicial activism.

UNIT V GUIDELINES OF CSR

Identifying key stakeholders of CSR & their roles. Role of Public Sector in Corporate, government programs that encourage voluntary responsible action of corporations. Role of Nonprofit &Local Self-Governance in implementing CSR; Contemporary issues in CSR & MDGs. Global Compact Self-Assessment Tool, National Voluntary Guidelines by Govt. of India. Understanding roles and responsibilities of corporate foundations.

UNIT VI CSR REVIEW AND INITIATIVES

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students would have

CO1. Gained comprehensive knowledge to relate the multidisciplinary, strategic, and evolving nature of corporate social responsibility.
CO2. Able to apply ethical decision making principles in a professional or business context.
CO3. Aware of regulatory reforms, guidelines and initiatives of CSR.

REFERENCES:
3. Innovative CSR by Lelouche, Idowu and Filho
5. Handbook on Corporate Social Responsibility in India, CII.
10. Blowfield, Michael, and Alan Murray, Corporate Responsibility, Oxford University Press, 2014
Course Articulation Matrix:

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<th>Course Outcomes</th>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
The objective of this course is to present students on project feasibility analysis, management, organization and budgeting that will enable the students to perform as efficient managers.

UNIT I  PROJECT IDENTIFICATION AND PREPARATION  10
General considerations - choice of project between alternative propositions - engineering aspects- cost estimates and demand forecasting for footwear industry.

UNIT II  PRINCIPLES OF PROJECT APPRAISAL  10
Investment appraisal and financial analysis through the measurement of project return – by discounted cash flow method - net present value of a project - internal rate of return - project payback period - cash flows accounting profit - intangible returns - Inflation and project appraisal.

UNIT III  IMPLEMENTATION AND MANAGEMENT  9
Methodological and organisational aspects of implementation - pert and other methods - risk and uncertainty - probability theory.

UNIT IV  SOURCES OF FINANCE AND BUDGETING  9
Different sources of finance - ownership finance - ordinary share, short, medium and long term loan - budget preparation - annual cost, variable costs - allocation of costs.

UNIT V  METHODS OF BUDGETING  7
Marketability method - benefit method - use of facilities method - special cost method, alternative single purpose expenditure method.

TOTA : 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students are expected to

CO1. Understand the financial management and economics in the footwear industry
CO2. Understand the profit value analysis
CO3. Have knowledge in organisational aspects of implementation

REFERENCES:
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<td>Understand the profit value analysis</td>
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<td>CO3</td>
<td>Have knowledge in organizational aspects of implementation</td>
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<td>Engineering Economics In Production</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
The objective of this course is to present the students on the footwear performance and customer services.

UNIT I FOOTWEAR PERFORMANCE 9
Definition of Footwear Performance; Customer Expectations; Comparative measurement of Performance for Footwear.

UNIT II CUSTOMER COMPLAINTS 9
Customer Complaints and its classification; Justified and unjustified complaints; Customer attitude and international obligations.

UNIT III CUSTOMER SERVICES 9
Product Liability; Different types of customer services; Settlement of complaints; Declaration of Services; Guarantee & Warranty.

UNIT IV IMPORTANCE OF TESTING 9
Significance of Testing for assessment of Footwear Performance; List of testing and their methodology.

UNIT V AVOIDANCE OF COMPLAINTS 9
Fashion Vs. Suitability; Taking care of Footwear; Shoe care products; Defects check list & maintaining quality in production.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, one can

CO1. Enhance external and internal customer relationships by delivering a consistent superior customer experience

CO2. To efficiently & successfully resolve queries

CO3. To supply relevant information & conclude every interaction on a positive note.

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<td>CO3</td>
<td>To supply relevant information &amp; conclude every interaction on a positive note.</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
The objective of this course is to provide knowledge and demonstration on GAIT analysis.

UNIT I  UPPER AND LOWER LIMB ANATOMY  9
Basic anatomical terms; Neuromuscular anatomy; Bones of Trunk and Hands; Bones of pelvis and legs; Joints, Ligaments, Muscles, Tendons and Fascia.

UNIT II BIOMECHANICS CONCEPT  9
Motion - Types, Location, Direction, Magnitude. Definition of Forces, Force of Gravity, Reaction Force, Moment Arm of Force.

UNIT III GAIT  9

UNIT IV INFLUENCE OF FOOTWEAR ON GAIT  9
Influence of footwear on hip, knee, ankle and foot movement; Abnormal walking base; Common pathologies affecting gait and corrective measures using footwear.

UNIT V GAIT ANALYSIS TECHNIQUE  9
Visual/observational gait analysis; 2D video analysis; 3D video analysis; Inertial sensors; Electrogoniometers; Force platforms; Wearable sensors; Pressure platforms; Electromyography; Energy consumption.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students will be able
CO1. To understand principle and techniques of GAIT analysis.
CO2. Have knowledge on influence of footwear on human being.
CO3. To appreciate the use of GAIT in footwear design.

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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
• Studying the work procedure and understanding the relationships between the workers and working environments.
• To study the applications of ergonomic principles and physiology of workers.
• To know the concepts of personal protective equipment and its usages.
• To create the knowledge in process and equipment design in safety aspects.

UNIT I ERGONOMICS AND ANATOMY
Introduction to ergonomics: The focus of ergonomics, ergonomics and its areas of application in the work system, a brief history of ergonomics, attempts to humanize work, modern ergonomics, future directions for ergonomics
Anatomy, Posture and Body Mechanics: Some basic body mechanics, anatomy of the spine and pelvis related to posture, posture stability and posture adaptation, low back pain, risk factors for musculoskeletal disorders in the workplace, behavioural aspects of posture, effectiveness and cost effectiveness, research directions

UNIT II HUMAN BEHAVIOR

UNIT III ANTHROPOMETRY AND WORK DESIGN FOR STANDING AND SEATED WORKS
Designing for a population of users, percentile, sources of human variability, anthropometry and its uses in ergonomics, principals of applied anthropometry in ergonomics, application of anthropometry in design, design for everyone, anthropometry and personal space, effectiveness and cost effectiveness
Fundamental aspects of standing and sitting, an ergonomics approach to work station design, design for standing workers, design for seated workers, work surface design, visual display units, guidelines for design of static work, effectiveness and cost effectiveness, research directions

UNIT IV MAN - MACHINE SYSTEM AND REPETITIVE WORKS AND MANUAL HANDLING TASK
Applications of human factors engineering, man as a sensor, man as information processor, man as controller – Man vs Machine.
Ergonomics interventions in Repetitive works, handle design, key board design- measures for preventing in work related musculoskeletal disorders (WMSDs), reduction and controlling, training Anatomy and biomechanics of manual handling, prevention of manual handling injuries in the work place, design of manual handling tasks, carrying, postural stability

UNIT V HUMAN SKILL AND PERFORMANCE AND DISPLAY, CONTROLS AND VIRTUAL ENVIRONMENTS
A general information-processing model of the users, cognitive system, problem solving, effectiveness.
Principles for the design of visual displays- auditory displays- design of controls- combining displays and controls- virtual (synthetic) environments, research issues.
COURSE OUTCOMES:
CO1. Students can have the knowledge in work procedure and applications in hazardous workplaces.
CO2. Students can design their own safety devices and equipment to reduce the accidents possibilities.
CO3. Students will be able to incorporate human factors in design of Personal protective equipment.
CO4. They know the risk factors, guide lines for safe design of man machine systems considering human factors.

REFERENCES:
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<td>Students will be able to incorporate human factors in design of Personal protective equipment</td>
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OBJECTIVE
This course will make the students to understand the regulations and practices associated with safety and occupational health.

UNIT I SAFETY PHILOSOPHY 9
Place of industry in society Industrial management role – supervisor’s role - role of workers – role of trade unions - role of govt. and various other agencies - Factory Act 1948 and the rules. Hazardous Industry - need for safety, legal humanitarian, economic safety and productivity. Factors impeding safety.

UNIT II ACCIDENT PREVENTION AND SAFETY TRAINING 9

PREVENTION - ACCIDENT INVESTIGATION
Methods - developing safety training programme - training of supervisors - training of workers- Inplant& External courses - training of new workers - role of supervision - need for re-training.

UNIT III SAFE GUARDING OF MACHINERY AND MATERIAL HANDLING 9

UNIT IV FIRE HAZARDS AND CONTROL 9
Chemistry of fire, classification of fire, portable fire extinguishers and their operation – Industrial fire. Types of all fire protection equipment. Hazard Identification: Fire, explosions, indices consequence analysis, HAZOP, likelihood analysis, risk concepts and criteria, risk management Toxicity.

UNIT V OCCUPATIONAL HEALTH 9
Physical hazard, noise vibration, x-rays - ultra violet radiation - permissible exposure limits -effects of exposure - preventive & control measures. Chemical Hazards: toxic chemicals, dirt gases, furies, mists, vapours. Noise pollution, exposures evaluation, common occupational diseases, etc.

COURSE OUTCOMES:
At the end of the course, the students will be in the position to understand the

CO1. Legal framework of safety and health in India and international conventions.
CO3. Productive machine safety in the footwear industry.
CO4. Emergency prevention and preparedness safety and health management.
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<td>Hazard identification and assessment</td>
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<td>CO3</td>
<td>Productive machine safety in the footwear industry</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE

- To facilitate understanding of the conceptual framework of marketing and its applications in decision making under various environmental constraints.

UNIT I UNDERSTANDING MARKETING AND CONSUMERS 9


UNIT II CREATING AND MANAGING PRODUCT 9


UNIT III PRICING DECISIONS 9


UNIT IV DELIVERING AND PROMOTING PRODUCT 9


UNIT V EMERGING TRENDS IN MARKETING 9


TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of the course students will be able to:

- CO1. Examine and discuss the key concepts and principles of marketing
- CO2. Identify and explain the main factors involved in understanding the marketplace
- CO3. Demonstrate an integrative understanding of the steps involved in marketing planning
- CO4. Analyse the components of the marketing mix

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<tr>
<td>CO1</td>
<td>Examine and discuss the key concepts and principles of marketing</td>
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<td>CO2</td>
<td>Identify and explain the main factors involved in understanding the market</td>
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<td>CO3</td>
<td>Demonstrate an integrative understanding of the steps involved in marketing planning</td>
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<td>CO4</td>
<td>Analyse the components of the marketing mix</td>
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<td>Marketing Management</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVES
This course is to highlight the students on the properties and behavior of various materials

UNIT I  FUNDAMENTALS OF MATERIAL SCIENCE  10
Atomic structure and interatomic bonding; classification of materials; structures of metals, ceramics and polymers; types and application of materials; materials selection and design consideration; Environmental issues in materials science.

UNIT II  ADVANCED MATERIALS  10
Smart materials, ferroelectric, piezoelectric, optoelectric, semiconducting behavior, lasers and optical fibers, photoconductivity and superconductivity, nano materials, super alloys, shape memory alloys.

UNIT III  MECHANICAL AND THERMAL PROPERTIES  10
Stress-strain diagrams of metallic, ceramic and polymeric materials, modulus of elasticity, yield strength, tensile strength, toughness, elongation, plastic deformation, viscoelasticity, hardness, impact strength, creep, fatigue, ductile and brittle fracture. Heat capacity, thermal conductivity, thermal expansion of different materials.

UNIT IV  CHARACTERISATION OF MATERIALS  8
Outline of spectroscopy methods, x-ray diffraction, electron microscopy, optical microscopy and applications to material characterization and Identification of polymeric materials, glass transition in polymers, methods of measuring it.

UNIT V  SYNTHETIC FOOTWEAR MATERIALS  7
Types of synthetic materials for footwear, Characterization – Manufacturing process. Selection criteria of synthetic material for footwear.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course, the students will

CO1. Understand the properties of various materials.
CO2. Have knowledge about the methods to characterize them.
CO3. Aware about the selection criteria of synthetic material for footwear industry.

REFERENCES:
## Course Articulation Matrix:

<table>
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<tr>
<th>Course Outcomes</th>
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<td>PO1</td>
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<tr>
<td>CO1</td>
<td>Understand the properties of various materials.</td>
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<tr>
<td>CO2</td>
<td>Have knowledge about the methods to characterize them</td>
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<tr>
<td>CO3</td>
<td>Aware about the selection criteria of synthetic material for footwear industry</td>
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<td>Materials Science</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively.
OBJECTIVE
The objective of this course is present the students on the footwear fashion trends and their consideration in product development.

UNIT I  HISTORICAL EVALUATION AND INTERNATIONAL TRENDS  6
Historical evaluation of footwear styling. Seasonal influences on fashion, cultural and geographical instances on footwear fashion. Market research and track record.

UNIT II  ELEMENTS OF DESIGN AND FASHION CONSIDERATIONS  9
Elements and theories of design, Application of the basic elements of design, Ergonomics and interactive scenario of the design elements, Design Criteria through effect of shape, colour, pattern, texture and decorative materials. Life cycle of fashion

UNIT III  DESIGN METHODOLOGY AND PRODUCT DEVELOPMENT  12
Brainstorming method of idea generation, Understanding the consumer need and demand, Concept of space and patterns in nature, Product usage and its categories, Product mix and innovation, Design process for accessories, Types, categories and usage of footwear and leather goods. Market Strategy - Prototype Development - Field test and evaluation - Standard preparation - Second prototype - Final run. Costing

UNIT IV  PRESENTATION TECHNIQUES  8
Organisation of shows and preparation of art portfolios; advertising; effect of foreign languages in the presentation and promotional activities.

UNIT V  FASHION TREND AND FORECAST ANALYSIS  10
Definition and entomology of fashion, trend, style and elements of trend direction, Types of trend direction review process, Development of forecast and understanding of styling, Direction of fashion trends in footwear production and marketing.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
This course will help the students

CO1. Have knowledge on market strategy for developing a new product.
CO2. To understand the factors contributing to the fashion trends in footwear industry.
CO3. Have learned about the preparation of art portfolios and presentation techniques.

REFERENCES:
3. “Shoes and Leather News”, Published by bureau of foreign and domestic commerce, Dept of commerce, US, 1940.
Course Articulation Matrix:

<table>
<thead>
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<th>Course Outcomes</th>
<th>Statement</th>
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<td>Have knowledge on market strategy for developing a new product</td>
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<td>To understand the factors contributing to the fashion trends in footwear industry</td>
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<tr>
<td>CO3</td>
<td>Have learned about the preparation of art portfolios and presentation techniques</td>
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<td>Modern Footwear Styling</td>
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</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
The objective of this course is present students on various aspects on the organization management in footwear manufacture.

UNIT I PRODUCTION MANAGEMENT
Overview of production management and organization in a factory. The functions of a production manager in production planning and control. Production cost, Introduction to work study. Method study and work measurement, materials handling, Manpower planning lay outing equipment selection. Specified layout for footwear industries - case study.

UNIT II MARKETING STRATEGY
i. Consumer psychology - factors affecting supply and demand - Market channels in the domestic market - Export Import policy.

UNIT III PERSONNEL MANAGEMENT

UNIT IV ERGONOMICS AND COMMUNICATION

UNIT V FOOTWEAR TRADE AND INDUSTRY IN INDIA
Structure and concentration of the industry, production, employment, sub-contracting systems and trade practices in different sectors of industry. Origin of industry and its growth trends. Industrial/trade policies and role of various developmental organisations. International trade in footwear in relation to leather manufactures, export procedures, incentives, duties and major importing countries and competitors.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students will be able to

CO1. Understand the organizational management associated with footwear sector
CO2. Have knowledge on man/machine relationship
CO3. Aware about the Consumer psychology
REFERENCES:

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<th>Course Outcomes</th>
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<tr>
<td>CO1</td>
<td>Understand the organizational management associated with footwear sector</td>
<td>PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO1 PO1 PO2 PSO1 PSO2 PSO3 PSO4</td>
</tr>
<tr>
<td>CO2</td>
<td>Have knowledge on man/machine relationship</td>
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<tr>
<td>CO3</td>
<td>Aware about the Consumer psychology</td>
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<td></td>
<td>Organisation and Management of Footwear Sector</td>
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</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE

The objective of this course is to present the complications associated with foot and strategies to fabricate appropriate footwear.

UNIT I INTRODUCTION

Pedorthics – Role of Pedorthist – Pedorthic evaluation – Patient management - implementation and Practice management.

UNIT II FOOT DEFORMITIES AND Locomotion

Descriptive knowledge on High arches, Flat feet, Forefoot varus, Calluses, Plantar fascitis, Metatarsalgia, Mortons neuroma, Hallux valgus, Hallux Rigidus, Hammer or Claw toes, Heel spur, Talgia, Frequent ankle sprains. Gait analysis - gait cycle, Gait patterns. Types of forces friction.

UNIT III FOOT ORTHOSES

Orthoses; Raw material - Kind of foot orthoses - Fabrication techniques and Finishing. Clinical management.

UNIT IV FOOT COMPLICATIONS AND LIFESTYLE DISEASES

Enumeration of Lifestyle diseases such as Diabetes, Obesity etc; Foot related complications; Risk levels of foot; Foot characteristics – low risk to high risk; Principles of therapeutic footwear and Bio-mechanical principles in design and development of footwear.

UNIT V CORRECTIVE FOOTWEAR FABRICATION TECHNOLOGY


TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of this course the students will be able

CO1. To understand the foot deformities.
CO2. To know about the need/means for the development of specialty footwear.
CO3. Have knowledge on fabrication techniques of corrective footwear.

REFERENCES:

## Course Articulation Matrix:

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<tr>
<td>CO1</td>
<td>To understand the foot deformities</td>
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<tr>
<td>CO2</td>
<td>To know about the need/means for the development of specialty footwear</td>
<td>2</td>
</tr>
<tr>
<td>CO3</td>
<td>Have knowledge on fabrication techniques of corrective footwear</td>
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<tr>
<td>Pedorthic Footwear</td>
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</tbody>
</table>

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVES

- To enable the students to learn the Production Operations Management
- To make the students understand the steps involved in production operation Management.

UNIT I MODELLING AND OPERATIONS
Transformation process model: Inputs, process and outputs; Classification of operations; Responsibilities of Operations Manager; New Product Development, Selection and Design of Product / Services.

UNIT II PROCESS FLOW STRUCTURE
Process types in manufacturing: project, jobbing, batch, line, mass, continuous; Process types in services: professional services, services shops, mass services; Plant location; Layout planning.

UNIT III PRODUCTION, PLANNING AND CONTROL
Production Planning & Control: Production planning techniques for various process choices, techniques of production control, aggregate planning techniques.

UNIT IV QUALITY MANAGEMENT
Quality management: Introduction; Meaning; Quality characteristics of goods and services; Tools and techniques for quality improvement: check sheet, histogram, scatter diagram, cause and effect diagram, Pareto chart, process diagram, statistical process control chart; Quality assurance; Total quality management (TQM) model; Service quality, concept of Six Sigma and its application.

UNIT V PRODUCTIVITY IMPROVEMENT TECHNIQUES
Productivity Improvement Techniques: Work study; Method study; Work measurement: time study: stop watch time study; Work sampling. Maintenance: maintenance policies for facilities and equipment; Time of failure; Preventive versus breakdown maintenance; Procedure for maintenance, total productive maintenance (TPM).

COURSE OUTCOMES:
Upon successful completion of this course, students should be able to:
CO1. Apply techniques to measure quality control.
CO2. Understand the importance of forecasting and able to apply mathematical forecasting techniques.
CO3. Understand the problems involved in inventory management and concepts of operations scheduling.

REFERENCES:
6. Haleem A- Production and Operations Management (Galgota books, 2005)
7. Shanker Ravi- Industrial Engineering (Galgota Publications, 2000)
Course Articulation Matrix:

<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<tr>
<td>CO1</td>
<td>Apply techniques to measure quality control</td>
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<tr>
<td>CO2</td>
<td>Understand the importance of forecasting and able to apply mathematical forecasting techniques</td>
<td>PO1 2 3 4 5 6 7 8 9 1 2 3 4</td>
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<tr>
<td>CO3</td>
<td>Understand the problems involved in inventory management and concepts of operations scheduling.</td>
<td>PO1 2 3 4 5 6 7 8 9 1 2 3 4</td>
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<tr>
<td>Production Operations Management</td>
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<td>PO1 2 3 4 5 6 7 8 9 1 2 3 4</td>
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</table>
OBJECTIVE
The objective of this course is present students on the quality control and management aspects associated with footwear manufacture.

UNIT I CONCEPTS OF QUALITY
Definition of quality, quality control theory, fundamentals of statistics and probability, confidence intervals, testing significance, statistical process control techniques, analysis, defect diagnosis and prevention.

UNIT II QUALITY IMPROVEMENT
Concepts of TQM, TQC, KANBAN, Zero defects, JIT – continuous improvement – HRD in quality management – quality grades, Dr. Deming’s 14 points management concept, TQA.

UNIT III STANDARDIZATION
Historical development of standards, aims techniques, management, formulations, implementation of international and national standards – economic benefits.

UNIT IV QUALITY ASSURANCE SYSTEM
Introduction to ISO – 9000 and 14000 and related international /national standards, case study.

UNIT V ACCREDITATION AND CERTIFICATION BODIES
Relevant standards, internal and external audit, corrective action, remedies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students will be able

CO1. To understand the requirement of different quality control and management tools and their application in footwear manufacture.
CO2. Apply structured problem-solving statistical techniques and tools to improve quality in the leather sector.
CO3. Aware of various accreditation and certification bodies.

REFERENCES:
Course Articulation Matrix:

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<th>Course Outcomes</th>
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</table>
| CO1             | To understand the requirement of different quality control and management tools and their application in footwear manufacture | PO1 2 3 2 − − − − − − 2 − 2 − − − − 2 |}
| CO2             | Apply structured problem-solving statistical techniques and tools to improve quality in the leather sector       | − 2 3 2 − − − − − − 2 − 2 − − − − 2 |}
| CO3             | Aware of various accreditation and certification bodies.                  | − 2 3 2 − − − − − − 2 − 2 − − − − 2 |}
|                 | Quality Control Management in Footwear Industries                         | − 2 3 2 − − − − − − 2 − 2 − − − − 2 |}

1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OBJECTIVE
To provide understanding on the need to self-manage and other management competency for a successful entrepreneurship.

UNIT I   SELF-MANAGEMENT
Defining self-management - Writing a mission statement - Self-discipline - Self-evaluation - Self-analysis by personal SWOT; Planning & Goal setting; Developing a career plan

UNIT II   BUSINESS DEVELOPMENT
Intellectual property and copyright; Trademarks and patents; Types of businesses – Pvt, Public, Partner; Business development report - Institutions & organization for business development;

UNIT III  FINANCE MANAGEMENT
Pricing your work & budgeting; Building an online portfolio; Branding; Networking and Partnership building; The elevator pitch Fundraising; Establishing a value network

UNIT IV   TIME MANAGEMENT
Time management; Project management; Time map and project management plan; Reflection on perfectionism

UNIT V    MARKETING MANAGEMENT
Publicity and advertising; Press releases; Digital and social media marketing

COURSE OUTCOMES:
At the end of the course, one can
CO1. Differentiate between multiple leadership styles and ways of managing individuals
CO2. Recognize the various roles of managers and types of business management
CO3. Identify the fundamentals of managing the time and finance

REFERENCES:
**Course Articulation Matrix:**

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<th>Course Outcomes</th>
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<td>CO1</td>
<td>Differentiate between multiple leadership styles and ways of managing individuals</td>
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<td>CO2</td>
<td>Recognize the various roles of managers and types of business management</td>
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<td>CO3</td>
<td>Identify the fundamentals of managing the time and finance</td>
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<td>Self Management and Entrepreneurship</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
The objective of this course is to present the students on the technology of specialty and non-leather footwear.

UNIT I  GOOD YEAR WELTED CONSTRUCTION  5
Principle of Good Year Welted construction; preparation of uppers; Insoles – Rib attaching – Sewing in welt sole attaching – Variation in the welted method. Finishing and machinery

UNIT II  STITCHDOWN AND OTHER CONSTRUCTION  12

UNIT III  SPORTS AND MOULDED FOOTWEAR  10
Footwear’s for sports. Relation between surface, activity and footwear. Materials and method of construction Preparation of uppers, sequence of operations, sponge rubber, moulded on slippers, soled rubber moulded on footwear, thermoplastic injection moulded on footwear, cellular polyurethane moulded on footwear, Health and Safety

UNIT IV  ORTHOPEDIC AND THERAPEUTIC FOOTWEAR  10
Need of Pedorthic and anatomically-correction, friction reduction and comfort qualities, offloading technique, materials and construction, evaluation technique

UNIT V  SAFETY SHOES  8
Requirements, Manufacturing techniques and Characterization of Safety shoes; Specification of safety shoes for different types of industries- mining, steel, etc.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students will be able

CO1. To understand the techniques in making non-leather.
CO2. Have knowledge in fabrication of sports and safety footwear.
CO3. Have knowledge in fabrication of orthopedic and therapeutic footwear.

REFERENCES:
<table>
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<tr>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>CO1</td>
<td>To understand the techniques in making non-leather</td>
<td>PO1  PO2  PO3  PO4  PO5  PO6  PO7  PO8  PO9  PO10  PO11  PO12  PSO1  PSO2  PSO3  PSO4</td>
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<td>CO2</td>
<td>Have knowledge in fabrication of sports and safety footwear</td>
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<tr>
<td>CO3</td>
<td>Have knowledge in fabrication of orthopedic and therapeutic footwear</td>
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<td>Technology for Specialty and Non Leather Footwear</td>
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1, 2 and 3 are correlation levels with weightings as Slight (Low), Moderate (Medium) and Substantial (High) respectively
OPEN ELECTIVE COURSES (OEC)

OE5091 BUSINESS DATA ANALYTICS

OBJECTIVES:
- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.

UNIT I OVERVIEW OF BUSINESS ANALYTICS


Suggested Activities:
- Case studies on applications involving business analytics.
- Converting real time decision making problems into hypothesis.
- Group discussion on entrepreneurial opportunities in Business Analytics.

Suggested Evaluation Methods:
- Assignment on business scenario and business analytical life cycle process.
- Group presentation on big data applications with societal need.
- Quiz on case studies.

UNIT II ESSENTIALS OF BUSINESS ANALYTICS


Suggested Activities:
- Solve numerical problems on basic statistics.
- Explore chart wizard in MS Excel Case using sample real time data for data visualization.
- Use R tool for data visualization.

Suggested Evaluation Methods:
- Assignment on descriptive analytics using benchmark data.
- Quiz on data visualization for univariate, bivariate data.

UNIT III MODELING UNCERTAINTY AND STATISTICAL INference


Suggested Activities:
- Solving numerical problems in sampling, probability, probability distributions and hypothesis testing.
- Converting real time decision making problems into hypothesis.

Suggested Evaluation Methods:
- Assignments on hypothesis testing.
- Group presentation on real time applications involving data sampling and hypothesis testing.
- Quizzes on topics like sampling and probability.
UNIT IV  ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK

Suggested Activities:
- Practical – Install and configure Hadoop.
- Practical – Use web based tools to monitor Hadoop setup.
- Practical – Design and develop MapReduce tasks for word count, searching involving text corpus etc.

Suggested Evaluation Methods:
- Evaluation of the practical implementations.
- Quizzes on topics like HDFS and extensions to MapReduce.

UNIT V  OTHER DATA ANALYTICAL FRAMEWORKS
Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

Suggested Activities:
- Practical – Installation of NoSQL database like MongoDB.
- Practical – Demonstration on Sharding in MongoDB.
- Practical – Install and run Pig
- Practical – Write PigLatin scripts to sort, group, join, project, and filter data.
- Design and develop algorithms to be executed in MapReduce involving numerical methods for analytics.

Suggested Evaluation Methods:
- Mini Project (Group) – Real time data collection, saving in NoSQL, implement analytical techniques using Map-Reduce Tasks and Result Projection.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of the course, the student will be able to:
- Identify the real world business problems and model with analytical solutions.
- Solve analytical problem with relevant mathematics background knowledge.
- Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
- Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce
- Use open source frameworks for modeling and storing data.
- Apply suitable visualization technique using R for visualizing voluminous data.

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OBJECTIVES:
- Summarize basics of industrial safety
- Describe fundamentals of maintenance engineering
- Explain wear and corrosion
- Illustrate fault tracing
- Identify preventive and periodic maintenance

UNIT I INTRODUCTION
Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT II FUNDAMENTALS OF MAINTENANCE ENGINEERING
Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT III WEAR AND CORROSION AND THEIR PREVENTION

UNIT IV FAULT TRACING
Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V PERIODIC AND PREVENTIVE MAINTENANCE
Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TOTAL: 45 PERIODS

OUTCOMES:
CO1: Ability to summarize basics of industrial safety
CO2: Ability to describe fundamentals of maintenance engineering
CO3: Ability to explain wear and corrosion
CO4: Ability to illustrate fault tracing
CO5: Ability to identify preventive and periodic maintenance

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OE5093 OPERATIONS RESEARCH LT P C 3 0 0 3

OBJECTIVES:
- Solve linear programming problem and solve using graphical method.
- Solve LPP using simplex method
- Solve transportation, assignment problems
- Solve project management problems
- Solve scheduling problems

UNIT I LINEAR PROGRAMMING 9
Introduction to Operations Research – assumptions of linear programming problems - Formulations of linear programming problem – Graphical method

UNIT II ADVANCES IN LINEAR PROGRAMMING 9
Solutions to LPP using simplex algorithm - Revised simplex method - primal dual relationships – Dual simplex algorithm - Sensitivity analysis

UNIT III NETWORK ANALYSIS – I 9
Transportation problems - Northwest corner rule, least cost method, Voges’s approximation method - Assignment problem - Hungarian algorithm

UNIT IV NETWORK ANALYSIS – II 9
Shortest path problem: Dijkstra’s algorithms, Floyds algorithm, systematic method - CPM/PERT

UNIT V NETWORK ANALYSIS – III 9
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models

TOTAL: 45 PERIODS

OUTCOMES:
CO1: To formulate linear programming problem and solve using graphical method.
CO2: To solve LPP using simplex method
CO3: To formulate and solve transportation, assignment problems
CO4: To solve project management problems
CO5: To solve scheduling problems

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REFERENCES:
OBJECTIVES:
- Summarize the costing concepts and their role in decision making
- Infer the project management concepts and their various aspects in selection
- Interpret costing concepts with project execution
- Develop knowledge of costing techniques in service sector and various budgetary control techniques
- Illustrate with quantitative techniques in cost management

UNIT I  INTRODUCTION TO COSTING CONCEPTS  9
Objectives of a Costing System; Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost; Creation of a Database for operational control.

UNIT II  INTRODUCTION TO PROJECT MANAGEMENT  9
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents, Project team: Role of each member, Importance Project site: Data required with significance, Project contracts.

UNIT III  PROJECT EXECUTION AND COSTING CONCEPTS  9
Project execution Project cost control, Bar charts and Network diagram, Project commissioning: mechanical and process, Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Pricing strategies: Pareto Analysis, Target costing, Life Cycle Costing.

UNIT IV  COSTING OF SERVICE SECTOR AND BUDGETERY CONTROL  9
Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis, Budgetary Control: Flexible Budgets; Performance budgets; Zero-based budgets.

UNIT V  QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT  9
Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Learning Curve Theory.

TOTAL: 45 PERIODS

OUTCOMES
CO1 – Understand the costing concepts and their role in decision making
CO2–Understand the project management concepts and their various aspects in selection
CO3–Interpret costing concepts with project execution
CO4–Gain knowledge of costing techniques in service sector and various budgetary control techniques
CO5 - Become familiar with quantitative techniques in cost management

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2. Charles T. Horngren and George Foster, Advanced Management Accounting, 1988
OBJECTIVES:
• Summarize the characteristics of composite materials and effect of reinforcement in composite materials.
• Identify the various reinforcements used in composite materials.
• Compare the manufacturing process of metal matrix composites.
• Understand the manufacturing processes of polymer matrix composites.
• Analyze the strength of composite materials.

UNIT I INTRODUCTION
Definition – Classification and characteristics of Composite materials - Advantages and application of composites - Functional requirements of reinforcement and matrix - Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II REINFORCEMENTS
Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers - Properties and applications of whiskers, particle reinforcements - Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures - Isostrain and Isostress conditions.

UNIT III MANUFACTURING OF METAL MATRIX COMPOSITES

UNIT IV MANUFACTURING OF POLYMER MATRIX COMPOSITES

UNIT V STRENGTH
Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TOTAL: 45 PERIODS

OUTCOMES:
• CO1 - Know the characteristics of composite materials and effect of reinforcement in composite materials.
• CO2 – Know the various reinforcements used in composite materials.
• CO3 – Understand the manufacturing processes of metal matrix composites.
• CO4 – Understand the manufacturing processes of polymer matrix composites.
• CO5 – Analyze the strength of composite materials.
REFERENCES:

OE5096 WASTE TO ENERGY L T P C 3 0 0 3

OBJECTIVES:
- Interpret the various types of wastes from which energy can be generated
- Develop knowledge on biomass pyrolysis process and its applications
- Develop knowledge on various types of biomass gasifiers and their operations
- Invent knowledge on biomass combustors and its applications on generating energy
- Summarize the principles of bio-energy systems and their features

UNITI INTRODUCTION TO EXTRACTION OF ENERGY FROM WASTE 9
Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNITII BIOMASS PYROLYSIS 9
Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNITIII BIOMASS GASIFICATION 9

UNITIV BIOMASS COMBUSTION 9
Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNITV BIO ENERGY 9
Properties of biogas (Calorific value and composition), Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production -Urban waste to energy conversion - Biomass energy programme in India.

TOTAL: 45 PERIODS

OUTCOMES:
CO1 – Understand the various types of wastes from which energy can be generated
CO2 – Gain knowledge on biomass pyrolysis process and its applications
CO3 – Develop knowledge on various types of biomass gasifiers and their operations
CO4 – Gain knowledge on biomass combustors and its applications on generating energy
CO5 – Understand the principles of bio-energy systems and their features

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AUDIT COURSES (AC)

AX5091  ENGLISH FOR RESEARCH PAPER WRITING  L T P C  2 0 0 0

OBJECTIVES

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I  INTRODUCTION TO RESEARCH PAPER WRITING  6
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II  PRESENTATION SKILLS  6

UNIT III  TITLE WRITING SKILLS  6
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV  RESULT WRITING SKILLS  6
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V  VERIFICATION SKILLS  6
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS

OUTCOMES

CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

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OBJECTIVES

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT II REPERCUSSIONS OF DISASTERS AND HAZARDS

UNIT III DISASTER PRONE AREAS IN INDIA
Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics.

UNIT IV DISASTER PREPAREDNESS AND MANAGEMENT
Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V RISK ASSESSMENT

TOTAL :30 PERIODS

OUTCOMES

CO1: Ability to summarize basics of disaster
CO2: Ability to explain critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches

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AX5093 SANSKRIT FOR TECHNICAL KNOWLEDGE  2 0 0 0

OBJECTIVES
- Illustrate the basic sanskrit language.
- Recognize sanskrit, the scientific language in the world.
- Appraise learning of sanskrit to improve brain functioning.
- Relate sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
- Extract huge knowledge from ancient literature.

UNIT I  ALPHABETS
Alphabets in Sanskrit

UNIT II  TENSES AND SENTENCES
Past/Present/Future Tense - Simple Sentences

UNIT III  ORDER AND ROOTS
Order - Introduction of roots

UNIT IV  SANSKRIT LITERATURE
Technical information about Sanskrit Literature

UNIT V  TECHNICAL CONCEPTS OF ENGINEERING
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

TOTAL: 30 PERIODS

OUTCOMES
- CO1 - Understanding basic Sanskrit language.
- CO2 - Write sentences.
- CO3 - Know the order and roots of Sanskrit.
- CO4 - Know about technical information about Sanskrit literature.
- CO5 - Understand the technical concepts of Engineering.

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REFERENCES
1. “Abhyasputakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbhashstri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
OBJECTIVES

Students will be able to
- Understand value of education and self-development
- Imbibe good values in students
- Let the should know about the importance of character

UNIT I


UNIT II


UNIT III


UNIT IV


TOTAL: 30 PERIODS

OUTCOMES

Students will be able to
- Knowledge of self-development.
- Learn the importance of Human values.
- Developing the over all personality.

Suggested reading
OBJECTIVES
Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional role and entitlement to civil and economic rights as well as the emergence nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION:
History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION:
Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES:

UNIT IV ORGANS OF GOVERNANCE:
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT V LOCAL ADMINISTRATION:

UNIT VI ELECTION COMMISSION:
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reform sliding to revolution in India.
- Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- Discuss the passage of the Hindu Code Bill of 1956.

Suggested reading
1. The Constitution of India, 1950(BareAct), Government Publication.
OBJECTIVES
Students will be able to:

- Review existing evidence on there view topic to inform programme design and policy
- Making under taken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development.

UNIT I INTRODUCTION AND METHODOLOGY:
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II THEMATIC OVERVIEW
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

UNIT III EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

UNIT IV PROFESSIONAL DEVELOPMENT
Professional development: alignment with classroom practices and follow up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriers to learning: limited resources and large class sizes

UNIT V RESEARCH GAPS AND FUTURE DIRECTIONS
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to understand:

- What pedagogical practices are being used by teachers in formal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

Suggested reading
OBJECTIVES
- To achieve overall health of body and mind
- To overcome stress

UNIT I
Definitions of Eight parts of yoga.(Ashtanga)

UNIT II
Yam and Niyam - Do’s and Don’t’s in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha,
ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.

UNIT III
Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to:
- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

SUGGESTED READING
1. “Yogic Asanas for Group Training-Part-I”: Janardan Swami YogabhyaasiMandal, Nagpur
2. “Rajyoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
OBJECTIVES
- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

UNIT I
Neetishatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dont’s) - Verses- 71,73,75,78 (do’s)

UNIT II
Approach to day to day work and duties - Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.

UNIT III
Statements of basic knowledge - Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 -Personality of role model - shrimadbhagwadgeeta - Chapter2- Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to
- Study of Shrimad- Bhagwad- Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and man kind to peace and prosperity
- Study of Neetishatakam will help in developing versatile personality of students.

Suggested reading
1. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari’s Three Satakam, Niti-sringar-vairagya, New Delhi,2010