

# **WoodLINKS**

## **Wood Products Manufacturing Curriculum Overview**

### ***Introduction***

This wood products manufacturing education program is the result of a partnership of secondary, post-secondary, and wood industry representatives. The goal of this group is to provide a product that will offer a relevant, rigorous, and timely experience to all students. It is intended that this program, 2 courses at the senior secondary school level, will better prepare students for direct entry into the wood products industry after graduation, or for a smooth transition to post-secondary education and training programs. One of the results of the work of this group has been the creation of a non-profit society called WoodLINKS. The mandate of WoodLINKS is to insure that students, teachers and parents are knowledgeable about the wood industry and the exciting, high growth potential careers it offers.

The development of the wood products manufacturing program has been guided by a desire to provide students with real world experience in wood products manufacturing and by these principles of learning:

- Learning requires the active participation of the learner;
- People learn in a variety of ways and at different rates;
- Learning is both an individual and a group process.

### ***Context***

Forestry is still one of the major "engines" of the North American economy. As we become more attuned to the competing requirements of resource sustainability, industry economics, and the environment it is clear that better utilization of the wood fibre we harvest is essential. One of the keys to more effective use of our forests is the development of a vigorous secondary manufacturing, sometimes called value added, industry that results in finished products like milled components, engineered homes, industrial products and furniture exported rather than raw logs and squared cants. A major requirement for a successful shift in our forest resource industry is a locally trained and highly skilled work force, prepared to continue learning and developing new techniques, new products, and new markets.

Communities, parents, and students tend to think of the forest sector as providing jobs in harvesting operations or lumber and commodities plants like sawmills. The Wood Products Manufacturing curriculum and the courses it describes are designed to introduce students to the current and rapidly expanding range of manufacturing opportunities while providing them with a skill set that will prepare them to participate in and help develop a more vigorous industry. It is important that young people understand the wide range of career opportunities open to them in the wood products manufacturing industry.

### ***Preparing for the Workplace***

The wood products curriculum looks at the skills, knowledge and attitudes that students require to be successful in this industry. Students must have a sound understanding of the entire industry and a working knowledge of current practices. They must be good communicators and problem solvers. Through teamwork based activities and projects they learn the importance of sharing, independence, interdependence, and leadership. By emphasizing plant based industry exploration and study in Introduction to Wood Products Manufacturing, and manufacturing processes in Advanced Wood Products Manufacturing, students gain valuable insights into both the current industry and the potential for entrepreneurial development and begin to explore where their interests and talents may take them.

## ***Relevance***

Extensive consultation with post secondary institutions and industry has shown that wood products manufacturing education and training is essential to the further development of the North American industry. There is unlimited opportunity for men and women who possess the skills to develop the sector.

Specifically there is a need for training and trained workers in the following sectors of the secondary wood industry:

- remanufacturing
- finger jointed, specialty grade, and profiled lumber products
- engineered building products
- log home kits
- prefab housing components
- gluelam lumber, laminated beams
- millwork
- decorative components (e.g. moldings), windows, doors
- furniture
- indoor softwood (e.g. pine) and outdoor (e.g. cedar) products
- industrial products
- pallets, containers, fruit boxes, construction items
- many others locally and regionally

In communities across the continent there are jobs and positions available for individuals possessing the necessary knowledge, skills and attitudes. Today's youth are well positioned to play a major part in the growth and development of this new and exciting sector of the North American economy.

## ***Preparing for Further Education***

Wood industry related education and training opportunities at both the post high school (graduation) level and post-secondary (college and university) level are being developed. Employment, operation, and product specific training programs could be linked to existing post-secondary education programs in:

- supervisor certification
- certified trades training: millwright, machinist, fabricator etc.
- business certification: accounting, marketing, sales, management
- vocational training (machine operators)
- technical training; programmers, designers, etc.
- engineering/wood science research

## ***Wood Products Manufacturing Programs in High Schools***

Wood products manufacturing education course are a logical and relevant continuation of existing Woodwork and Construction programs in secondary schools. Building on the skills taught in these courses the Wood Products Manufacturing courses take the student beyond the one-off project creation concept into the realm of producing a product for the marketplace. These courses examine and analyze all of the components and processes of the industry that take the raw material from the forest to the consumer. WoodLINKS is the driving force behind the development and delivery of wood products manufacturing education programs in secondary schools.

Locally developed wood products manufacturing programs have been in existence for a number of years. It was not until a committee of educators (secondary and post-secondary) and industry representatives was formed and a set of expectations, requirements, and outcomes was produced in the form of a dacum, that a standardized curriculum could be developed. A set of Learning Guides, produced by the University College of the Cariboo (UCC) in British Columbia, Canada, evolved from the dacum.

The learning outcomes of the WoodLINKS Wood Products Manufacturing curriculum reflects the work done at UCC, and the expectations of industry, as indicated by the information in Appendix A of the complete curriculum document.

Additionally, work is on going, to ensure recognition and a smooth transition process for successful wood products manufacturing students into related post-secondary programs throughout North America. Articulation agreements have been completed with the following Canadian post-secondary institutes: British Columbia's University College of the Cariboo (UCC) Wood Processing Technology diploma program, the University of British Columbia (UBC) undergraduate Advanced Wood Products Processing program, and Conestoga College's, Woodworking Technology programs, in Ontario.

Programs in post-secondary institutions often differ in content and areas of specialization. Teachers should be aware of these differences in order to ensure that their students have the necessary depth of knowledge appropriate to the program to which they apply.

### ***Occupational Certification in Wood Products Manufacturing***

The WoodLINKS certificate indicates that the graduate has met all of the requirements for successful completion of either 120 or 240 hours of education in Wood Products Manufacturing and has a skill set appropriate for entry-level employment in the wood products industry or access to related post secondary education.

The WoodLINKS certification process consists of a standardized test given at the end of both the Introduction to Wood Products Manufacturing and Advanced Wood Products Manufacturing courses; a "Checklist" of skills, habits and attitudes, verified by the instructor at the end the of the courses; and a teacher's evaluation of classroom achievement. The minimum standard for success, and therefore certification, in each course is 70 %. The WoodLINKS certification process credentials what the students knows and what the student can do and is expressed through the WoodLINKS Certificate.

### ***The WoodLINKS Final Exam***

The final exam for each course is an instrument that is set and maintained by a neutral, external group and provided to the school at the appropriate time for the assessment of students. While the exam is supported by both industry and education, due to a number of specific issues the process addresses, there are several global intentions of the instrument and the process.

The WoodLINKS exam forms a key component of the experience of the learner. It reinforces key concepts studied and indicates to the learner areas of weakness for further study and continued learning. It allows the learner to demonstrate acquired knowledge and competencies and reports the information out in an easily understood form. For the student, the exam provides a validation of the relevance of the activities and of the competencies achieved.

The instrument also acts as a change agent, impacting on the teacher's knowledge base and curricular philosophy as well as on the course design and completeness. It sets a benchmark for standardized curriculum delivery and competency that match the expectations of the industry.

Additionally, it is an assurance to industry personnel that WoodLINKS students, regardless of where they are from, have consistent knowledge, skills and competencies that are current and relevant. Industry is confident in the instrument, knowing that the exam represents a significant portion of the assessment and certification process for the courses.

The final exam will be created each year from a database of questions. The data base on which the exam is based will be available to teachers and students at the beginning of the school year to be used as a course resource. The database, maintained by WoodLINKS, will be reviewed and updated annually and expanded over time to reflect new materials and information; however, questions will only be added between school years and will not be included on any exam until the following school year.

### ***The WoodLINKS Practical Skills CheckLIST***

This document is intended as a tool for both the teacher and the student. It is designed to record and report the personal, safety and practical skills and proficiencies of WoodLINKS students as observed and evaluated on a day-to-day basis, in the classroom, by the teacher. A completed Practical Skills CheckLIST is a key component of the student's personal and career portfolio as it communicates some of the "Who I am" and "What I can do" information to interviewers and prospective employers. A clear and complete document describing the skills and competencies possessed by an applicant helps an employer to match the candidate to an appropriate position, thereby saving training time and dollars. For the teacher, the Practical Skills CheckLIST will act as a guide and an organizer. It is also a monitoring device to help ensure a match with current industry process and practices. It will serve as an end-point summary of the success of the student on units of instruction, delivered and evaluated by the teacher, during the practical components of the course. The intent of the categories of competency is to establish a benchmark standard for the student.

The Practical Skills CheckLIST should be presented to the student at the beginning of the course as a tool for learning and goal setting. The CheckLIST is intended to be reviewed and completed through consultation and consensus throughout the course.

### ***Course Concepts***

In both the Introduction to Wood Products Manufacturing curriculum and the Advanced Wood Products Manufacturing curriculum, the key concepts of the courses are:

- personal skills (communications, team work, safety, stress management)
- business skills (identifying products, marketing, distribution, management)
- manufacturing skills (materials, processes, management)
- citizen skills (human and natural resource management)

#### Personal Skills

It is important that students develop the skills and attitudes necessary for success in the modern workplace. Communications skills, especially the presentation of an idea to a group in both written and verbal form, as well as the ability to work independently or as a member of a team are essential for long term success in the wood products industry. Equally important is a clear awareness of safety issues and related health issues connected to stress and a willingness to apply appropriate standards and procedures to deal with these issues.

#### Business Skills

Though most of the students will initially enter the workforce as employees of a wood products manufacturer, educators and industry partners must begin to encourage and foster inventiveness, ingenuity and entrepreneurial spirit to ensure long-term development, growth, and stability in the wood products industry. Students need the skills and confidence to try new ideas and create new manufacturing jobs, to utilize better the raw material that will be available in the future. Success in this area will be based on the student having an understanding of the structure of business and the realities of managing an enterprise. Students also need to understand the broad range of

costs, production, manufacturing, design and marketing issues associated with doing business in the wood products industry. Students will be exposed to a broad overview of business in the wood products industry in Introduction to Wood Products Manufacturing and will be able to fine tune that knowledge and apply it to the creation of a business and products in Advanced Wood Products Manufacturing.

#### Manufacturing Skills

Introduction to Wood Products Manufacturing will provide exposure to the manufacturing sector based on extensive experiences in the plant, the classroom, and the wood shop. Advanced Wood Products Manufacturing will focus on the use of current manufacturing techniques, technology, and where possible, equipment, to produce a product ready for the marketplace.

#### Citizen Skills

Students need to understand the importance of ecologically sound and sustainable forest resource management. They need to be aware of current legislation and how it affects resource based companies and communities. Students will explore ways to maximize the use of a limited natural resource within the context of realizing economic benefits individually, locally and globally.

### ***Expectations of the WoodLINKS Wood Products Manufacturing Program***

Upon completion of this program students will be able to:

- describe the wood products industry and the types of career options this sector offers them
- demonstrate the skills necessary to make a successful transition to post-secondary wood products programs at the college and university level
- demonstrate the skills necessary for entry level positions with wood product companies
- begin to apply fundamental entrepreneurial skills to explore alternatives to the volume based forest economy

### ***Curriculum Organizers***

Both of the WoodLINKS Wood Products Manufacturing courses have been organized around four themes:

- Fundamentals
- Manufacturing
- Products
- Industry issues

Prescribed learning outcomes for each course are grouped under each organizer to guide the instructor in developing an effective learning environment for their students.

#### **Fundamentals**

Upon completion students will have acquired basic employment skills and an understanding of the industry as a whole. Though students may be specializing in value added manufacturing or fine furniture production, it is necessary for them to have a broad view of the entire industry. This is important on two levels. It provides them with a perspective that allows sensible interpretation of ongoing trends and market changes that will affect them and the industry. It also provides them with a basis for developing entrepreneurial attitudes and skills.

#### **Manufacturing**

Introduction to Wood Products Manufacturing approaches manufacturing theory largely through field trips to local manufacturing plants, with product development focused on regional opportunities. Students will receive an overview of the processing of raw material into a finished product and what that requires in terms of raw material, technical planning, plant design, human resources and skills, and management decision-making.

Advanced Wood Products Manufacturing expands on each of the concepts introduced in the introductory course and moves the students into the practical application of their knowledge and skills to all aspects of the wood products manufacturing enterprise.

## Products

Through both Introduction to and Advanced Wood Products Manufacturing courses, a theme of entrepreneurship is present. Students look at the current products being made of wood and are encouraged to think of new uses both for solid wood and for the waste materials generated in the production of solid wood. This requires a basic understanding of the characteristics of wood, manufacturing constraints and potential markets.

## Industry Issues

The major issues facing the wood products industry are: training, development of the work force, the environment, use of waste materials, technological advance and competition in a global marketplace. Wood Products Manufacturing education explores these issues and sensitizes students to the main ideas and concerns.

## Course Overviews

Introduction to Wood Products Manufacturing: focuses on:

- overview of the industry
- tours and analysis of local primary and secondary manufacturers
- visits from wood products representatives and professionals
- hands-on development of wood products
- entrepreneurship development

Advanced Wood Products Manufacturing:

continues to reinforce and develop earlier material but is clearly focused on:

- product concept identification
- manufacturing feasibility
- product design, development
- production planning, cost
- production
- handling, packaging, marketing
- profit

## Suggested Text Resources:

- *The World of Wood*
- *Understanding Wood*
- *Forestopia - The New Value Added Forest Economy*
- *Canadian Woods- Their Properties and Uses*
- *The Tree Book*
- *FOREM- Forest Education Modules*
- *The Woodworkers Handbook*
- *WoodLINKS, Wood Products Manufacturing Resource Guide – Introduction*

## ***Additional Support Resources***

There are three major resource collections available to help the teacher to plan their programs. These are to be used as the instructor sees fit and not to be viewed as “prescriptive”. It is the responsibility of the classroom instructor to utilize appropriate resources and materials to create an environment and provide an experience that satisfies the expectations of the prescribed learning outcomes and adequately prepares the student to achieve the course credential and WoodLINKS certification.

The first is the “**Wood in the Box**” (abbreviated as WIB in the learning resources column) a collection of books and materials. This “core library” of material is available to registered WoodLINKS sites. Reference to these resources and how they support suggested instructional strategies to satisfy various prescribed learning outcomes is located in the Learning Resources column of the document and identified by the WIB notation.

The second is the “**Value-Added Wood Products Manufacturing Modules**” from the Value-Added Skill Centre in Abbotsford, British Columbia, Canada. These are provided for the use of instructors in registered WoodLINKS schools only. Information may be reproduced for distribution to students to support units of their WoodLINKS Wood Products Manufacturing programs but may not be reproduced for any other distribution. These have not been included in the learning resources column but their relevance to each section of the curriculum is obvious.

The third is the “**Wood Products Technology Learning Guides**” (abbreviated as WPTLG in the learning resources column). These are based on the earlier described dacum and the associated skill competencies that the University College of the Cariboo is using as the foundation for the entry-level courses of their Wood Products Manufacturing Program. Each relevant learning guide is noted in the learning resources column of this curriculum. Additionally, there is an appendix that correlates the WoodLINKS Wood Products Manufacturing prescribed learning outcomes with the Learning Guide skill competencies.

WoodLINKS will make every effort to maintain these resources in a current and relevant state. In so doing, WoodLINKS reserves the right to remove, replace, substitute, etc., an item as seen appropriate without notification or obligation to resources currently in use by teachers. The lists of the contents of these resource collections will be updated and referenced with each revision of this curriculum package.

## ***Learning Outcomes: Introduction to Wood Products Manufacturing (IWPM)***

### ***Fundamentals***

It is expected that students will be able to:

- investigate and analyze the wood products industry
- explore career paths within the wood products industry
- apply appropriate computer software and skills to prepare reports and demonstrations
- identify the high technology aspects and trends in the wood products industry
- survey law and environmental issues and their impact on the wood products industry
- communicate effectively in the workplace
- apply wood products vocabulary and terminology
- apply wood products mathematics
- investigate and apply industry safety strategies and techniques
- interpret and produce common industry reports: blueprints, flowcharts, technical drawings and reports, spreadsheets, etc.

### ***Manufacturing***

It is expected that students will be able to:

- examine and analyze manufacturing processes
- describe key historical developments in the wood products manufacturing field
- summarize the future trends that are most likely to change manufacturing processes
- compare different forms of company structure
- explain long term planning issues for wood products manufacturing companies
- develop and illustrate a theoretical manufacturing process for different wood products
- identify safe and proper set-up and use of cutting tools, hand and machine, in manufacturing processes
- evaluate various types of wood, wood composites, and industry related materials
- identify the fundamentals of wood defects and the principles of basic wood grading
- explain wood seasoning, wood conditioning and wood drying processes

## ***Products***

It is expected that students will be able to:

- describe the wide range of wood products
- explore raw material sources for wood products
- apply product design factors to wood products
- define product development steps
- create a business plan for a product
- manufacture a product
- describe product marketing steps and strategies
- define product life cycles
- describe inventory systems and controls
- describe wood commodity product pricing

## ***Industry Issues***

It is expected that students will be able to:

- define the role of organized and unorganized labour in the wood products industry
- present both management and labour perspectives on key issues in the wood products industry
- explain rotation and non-rotation types of work schedules for various manufacturing enterprises
- describe the education and training required for entry level, technical, professional, and management positions
- describe the effect of supply and demand of raw materials on the wood products industry
- analyze forest harvesting methods in relation to product manufacturing
- explain the impact of regional regulatory issues relative to the wood products industry
- outline the effects of politics, economics, and environmental concerns on the supply of raw materials for the wood products industry.

## ***Learning Outcomes: Advanced Wood Products Manufacturing (AWPM)***

### ***Fundamentals***

It is expected that students will be able to:

- describe quality control processes in the wood products industry
- evaluate recent high technology manufacturing plant upgrades in the local community
- communicate effectively in the workplace
- apply appropriate safety regulations and standards
- assess a manufacturing operation to determine if the safety of any of the operations can be improved
- apply appropriate equipment safety in the production shop

### ***Manufacturing***

It is expected that students will be able to:

- describe major shifts in the manufacturing of products since the industrial revolution
- define productivity
- explain the free enterprise system in relation to the global wood products industry
- describe the characteristics of an entrepreneur
- present the steps for starting a business and participate in a business enterprise
- select appropriate wood seasoning, wood conditioning and wood drying processes for products
- identify different materials for a variety of wood products
- conduct destructive and non-destructive materials testing
- analyze wood by-products and their potential uses
- differentiate between types of wood joints
- classify assembly methods, components, and adhesives
- describe and apply finishing processes
- use appropriate furniture fixtures, fasteners, and display products

## ***Products***

It is expected that students will be able to:

- use components of various furniture products
- describe major product lines: industrial, remanufactured, and engineered wood products
- conduct market research for a product
- design a product
- create and implement a business plan for a product
- manufacture a wood product
- use CAD/CAM equipment to manufacture a product or component
- select testing systems for wood products
- create a marketing plan for a wood product
- design advertising for a wood product
- select packaging for a wood product
- examine and develop inventory systems for wood products
- explain wood commodity and product pricing

## ***Industry Issues***

It is expected that students will be able to:

- analyze management and labour perspectives associated with various situations and issues
- investigate and evaluate rotation and non-rotation work schedules for various manufacturing enterprises
- describe how laws, regulations and environmental issues impact the wood products industry
- explain supply and demand of raw materials in relation to wood products manufacturing