

*For Restricted Circulation Only*

**POST GRADUATE DIPLOMA COURSE  
in  
WOOD AND PANEL PRODUCTS TECHNOLOGY**

**PROSPECTUS  
2011-2012**



**INDIAN PLYWOOD INDUSTRIES RESEARCH & TRAINING INSTITUTE  
(IPIRTI)**

(An Autonomous body of the Ministry of Environment and Forest, Govt. of India)  
P.B. No. 2273, HMT Link Road of Tumkur Road, Yeshwantpur, Bangalore-560 022  
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## **Indian Plywood Industries Research and Training Institute**

(An Autonomous body of the Ministry of Environment and Forests, Government of India)

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IPIRTI Centre

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B-65, Phase 7,

Industrial Area,

Mohali, Punjab.

## **Preface**

*Human resource development is concerned with the "people" dimension in management. Training, an important HRD tool is a learning process that seeks to prepare an individual to perform efficiently in the chosen profession.*

*Global concern for environment and bio-diversity conservation in recent years is shared by the nation and is reflected in various national policies. Complexity of values attached to environment, forests, bio-diversity often seems to conflict with the basic needs of human survival. The role of wood product research and training of personnel in the wood product manufacturing technology are even more critical now than ever before.*

*IPIRTI is especially mandated for research and training on all aspects of wood products/composites. It has established itself as the premier training institute to meet the HRD needs of the wood based industry in the country.*

*Post Graduate Diploma Course in Wood and Panel Products Technology offered by the Institute, the only one of its type in the country, is highly recognized by the allied panel industry and the Diploma holders are in good demand. Since the establishment of a training center in 1989 more than 500 graduates have successfully completed the PG Certificate/Diploma course.*

*The PG diploma course provides a unique opportunity to the young science and engineering graduates for a career in one of the green industrial processing sectors viz. wood based industry, responsible for processing wood and other renewable fiber materials to meet certain vital human needs in most environment friendly manner.*

*This brochure provides brief information about the PG Diploma Course offered by IPIRTI for science and engineering graduates.*

*Bangalore  
August 2011*

**Director**

## 1. INTRODUCTION

From a modest beginning in 1962 as a cooperative research laboratory IPIRTI is now an internationally recognized research and training institute in the Field of wood and panels from wood and other lignocellulosic (renewable fibers) materials. Located in the garden city and technology city of India, Bangalore, the institute is an autonomous organization of the Ministry of Environment and Forests, Government of India.

## 2. MANDATE & VISION

**Institute is mandated** to undertake Research, testing and standardization, information, extension and training on all aspects related to processing and production of sawn timber, Manufacture of plywood and other allied engineered and reconstituted panel products from wood other lignocellulosics including bamboo.

Institute's **vision** is to become an apex institution of international repute by equipping itself with concurrent state-of-the art technology and develop inhouse frontline expertise to be able to carry out necessary R& D towards advising and /or providing competitive consultancy to the academia as well as wood and other lignocellulosic based panel industry sector regarding the conservation of natural forests through development and adoption of efficient technologies for manufacturing wood alternates and panel products from renewable fibers, including plantation timbers & bamboo to meet the vital needs of the developing society.

## 3. RESEARCH AND DEVELOPMENT ACTIVITIES

The institute is specially mandated to undertake research on all aspects of wood and panel products made from wood and other renewable fibers.

### RESEARCH:

|                            |   |
|----------------------------|---|
| Wood/Wood Based Composites | - Plywood, Block Board, Flush Doors and LVL, Particleboard  |
| Composites from non-wood   | - Saw milling, Finger Jointing, Glulam<br>- Agro/ Forest/Wood residues, Bamboo<br>And other Lignocellulosic materials, etc. |

Treatment for Enhancing Service Life of Wood and wood based composites

### Training & Education

- HRD for industries.
- For Officers of regulatory/resource management departments, viz Forests
- Customs, Bureau of Indian Standards (BIS, the national standardization organization)
- Projects for Engineering students as partial fulfillment for completion of engineering degree in Chemical/ Mechanical engineering.
- To facilitate research leading to Ph.D. Degree from FRI deemed university in the

field of Wood Science & Technology.

**Standardization and Testing**

- Evolving/Revising national material/product standards,
- Testing for conformity to Indian Standard Specifications.

**Extension**

- Transfer of technology for communication to existing wood panel industry and entrepreneur

**4. TRAINING PROGRAMMES**

The training Centre with modern training facilities for mechanical wood industries was established in the Institute with the assistance of FAO/UNDP/GOI in the year 1989 to cater to HRD needs of the wood based industry in the country. The Institute offers one year Post Graduate Diploma Course (PGDC) in Wood and Panel Products Technology (WPPT). In addition, short term vocational courses are organized on different aspects related to WPPT and other allied subjects. Courses are also organized for forest officers for enhancing their appreciation about the role of technology in efficient utilization of wood and development of wood alternates from renewable fibers.

**5. PG DIPLOMA COURSE**

The PGDC in WPPT aims at imparting professional knowledge and skills with regard to processing technologies for efficient utilization of wood through conversion into engineered wood and a variety of panel materials/products viz. plywood, particle/fiber board, block board, flush door. The course also includes processing technology on bamboo mat based panel products and adhesive technology. Standardization aspects with respect to quality management and BIS certification are dealt with in details. Working knowledge on use of computers and internet is also imparted. Emphasis is given not only to theoretical background of various technologies but also practical and hands on exercises. The PGDC in WPPT is the only course of its type available in the country that has been widely recognized by the Industry. Annual intake of candidates for the course is restricted to 30.

**5.1 Eligibility and Admission Procedure**

Candidates possessing degree in Science/Engineering from a recognized university are eligible to apply for the PGD course. Candidates are selected from all over the country on the basis of marks obtained at the qualifying (degree/engineering) examinations by preparation of state-wise merit lists. Preference in admission is given to candidates sponsored by industries or organizations. Upper age limit is 28 years as on 1<sup>st</sup> November of the course year. Relaxation in age limit for SC/ST/OBC/PH is as per the Government of India rules. There is, however, no age limit for sponsored candidates.

**5.2 Hostel accommodation**

There is a Trainees' Hostel (only for boys) on the campus. Accommodation is provided on twin sharing basis and rent is Rs.300 per trainee per month. Trainees are required to bring their own bed linen, mosquito nets, blanket (woolen), towel etc. No accommodation is provided for spouse and children of the trainees. (Trainees Hostel Rules - Annexure 3)

### **5.3 Boarding**

Mess facilities in the hostel are provided through a contractor on cost sharing basis. The mess facilities are compulsory for all trainees staying in the hostel. Present charges are about Rs.2000/- per month.

### **5.4 Course fee**

A non-refundable Course fee of Rs.30000/- payable at the time of admission. In addition to the course fee, amount of Rs. 4000/- is to be paid as caution money and advance mess deposit of Rs. 2500/- to be refunded at the time of the completion of the course (**fee structure available on page 8**). These amounts are to be deposited in the form of demand draft on any nationalized bank drawn in favor of 'Director, IPIRTI' payable at Bangalore within two weeks of issue of letter regarding selection or before the commencement of the course whichever is earlier. Candidates sponsored by members of IPIRTI Society are eligible for concession as approved by the Board of Governors.

### **5.5 Training Methods**

#### ***Class room teaching***

Class room lectures are designed to enhance the trainees' ability to comprehend the analytical methods, which help trainees to assimilate knowledge through interaction with the faculty members. In class room lectures, audio-visual aids are used very frequently.

#### ***In Plant Training***

The aim of in plant training is effective absorption of essentials of technologies, processes and practices learnt during theory and lab practicals through implementation in simulated factory floor conditions. Trainees deal with various production processes at the institute's in-house pilot plant facilities complete in all respects related to saw milling, adhesive manufacturing/plywood/block board manufacturing, testing and evaluation.

#### ***Computer Facilities***

Computer will be provided to student with internet facility during the training period for collecting information, project works etc.

#### ***Study tour and Excursions***

The excursion visits and study tour are aimed at broadening the perspective of the trainees from actual production systems view point. This also helps the trainees to

1. Learn about strategic approaches used in some factories and to identify critical areas for improvement.
2. Observe merits and demerits of various processing methods adopted by different factories and have discussions with the factory personnel regarding improvement in quality and productivity.

The journey and other arrangements for excursions/study tour out of Bangalore are made by Institute but the actual costs are to be borne by the trainees themselves. These programs are compulsory for all the trainees. It costs around Rs.2000/- for (4-5 days).study tour.

### **Seminars**

Seminar presentations by trainees are organized with a view to develop effective communication skills and to bring out leadership qualities.

### **Project Work**

Project works on specific topics related to the courses of studies allotted by the Institute are undertaken by trainees in groups of 3 or 4 under the guidance of one of faculty members. The trainees are required to present their work at specially organized seminar and also to submit project report through respective project guides. The project work is designed to inculcate the skills required for team works as also to prepare them to undertake analytical studies for problem identification and approach solutions as may come up on factory floor as practicing wood technologists. (for detailed course contents see Annexure I)

### **5.6 Sports and Entertainment**

Sports and Entertainment facility are available for the trainees in given below:

- Table Tennis, Volleyball plus other indoor games,
- Television (For restricted period),
- Students are permitted to participate in All India annual Forest sports meet along with scientists,
- Annual sports meet of the institute on 15<sup>th</sup> August.

### **5.7 Evaluation and Grading**

Evaluation system of trainees' performance is designed to encourage them for active participation in all the components of the training viz. class room lectures, laboratory/in plant practical classes, seminars, project work, excursions and tours, as also general conduct. Evaluation system helps each trainee to measure his achievement in various activities that are essential to make him a professional. (Examination rules at Annexure 2)

## **6. CAMPUS SELECTION**

The Institute facilitates recruitment of successful trainees by wood based industries in various parts of the country through placement process for which campus interviews are arranged towards the end of the course.

## **7. TEACHING FACULTY**

The teaching faculty comprises of highly qualified and experienced scientists and technical staff in addition to guest faculty invited from recognized institutes and/or industry.

1. Dr. C. N. Pandey, Ph.D  
Expertise in Wood Seasoning
2. Dr. Sushil Kumar Nath. Ph.D.  
Expertise in Adhesive and Plywood Manufacturing Technology  
Diploma in Plywood & Wood Adhesive Technology from CSIRO,  
Australia, Diploma in Technology Training from Australia.
3. Ms. D.Sujatha, B.E. (Chemical)  
Expertise in Adhesive technology

4. Shri D.N.Uday, B.E. (Mechanical)  
Specialized in Peeling, Sawmilling, Saw doctoring
5. Shri K.Thanigai, B.Tech.(Production Engineering) M.Tech(Polymer Science and Engineering) Specialized in adhesives, fire retardants, weathering on panels
6. Shri Anand Nandanwar, B.E.(Civil), M.Tech( Building Engineering & Management)
7. Dr. Vipin K. Chawla Ph.D. (W. Sc. & T)
8. Shri Jagadeesh Vengala, M.Tech.(Construction technology)
9. Mrs. B. S. Mamatha M.Sc. (Chemistry)
10. Dr. Ranjana Yadav Ph.D. (Applied Chemistry)
11. Dr. V. K. Upadhyay Ph.D. ( Ag. Statistics)
12. Mrs. Ravikala Kamath, M.L.I.S. (Library & Information Science)
13. Shri Narasimha Murthy, M. Sc., M.Phil. (Botany).
14. Shri M. C. Kiran, B. E. (Mech. Engg.).
15. Dr. Aparna Kalawate Ph. D. (Agriculture Entomology)
16. Mr. Prakash V. , B. E. (Mech. Engg.) M.Tech. (Mechatronics).
17. Dr. K.Ch. Varaderajulu, Ph.D. (Nanotechnology)
18. Shri A.C.Ashok Kumar, B.E. (Mech. Engg.)
19. Shri S.S.Banajiger, D.E.E

**Guest Faculties from the field of specialization in management and quality control in industry are invited from highly reputed management institute in Bangalore to conduct course on management.**

### **Fee structure:**

|   |                    |
|---|--------------------|
| a) Tuition fees (Non-refundable)          | : ₹ 30000/-        |
| b) Hostel lodging charge (Non-refundable) | : ₹ 3600/-         |
| c) Caution deposit-Lab (Refundable)       | : ₹ 2000/-         |
| d) Caution deposit-Hostel (Refundable)    | : ₹ 2000/-         |
| e) Study tour (Non-refundable)            | : ₹ 2000/-         |
| f) Mess charges (Advance)                 | : ₹ 2500/-         |
| <b>Total</b>                              | <b>: ₹ 42100/-</b> |

**POST GRADUATE COURSE CONTENT****Semester I****Paper I- Forestry and Wood Science****Theory 52 hrs.****Forestry**

Forests and forestry with particular reference to India - functions of forests, importance of forests, effect on climate and soil.

Forest based industries in India - definition, general characteristics, outlook for the future classification of industries both wood based and non-wood based industries. Evolution of National Forest Policy, Forestry principles and management practices in relation to forest based industries.

**Wood Science****A) Biology**

- **Elements of Wood Anatomy**- Gross structure of wood. Physical characteristics of wood.
- **Identification of wood** - Card Keys, Dichotomous Keys, Natural durability of timber, Wood destroying fungi and their control, Wood destroying marine organisms and their control.
- **Wood destroying insects** - Insect attacking freshly felled timber, converted timber, seasoned timber, and control measures.
- **Termites** - Mound dwelling, dry wood termites, subterranean termites and control measures.
- **Defects in wood** - Natural defects. Figure in wood, growth anomalies, tension wood, compression wood.
- **Wood preservation** - Principles, requirement of an ideal preservative, method of testing toxicity in laboratory and Field, types of preservatives, methods of treatment, testing. Preservatives in treated timber by spot tests and penetration. Protection of plywood against decay and insects, methods of treatment and testing of treated plywood by spot tests and penetration.

**B) Chemistry**

- **Basic chemistry** - Atomic structure of matter, atomic number, atomic weight, molecular weight, mole concept, equivalent weights, electronic configuration, ionic bond, covalent bond, hydrogen bond and Vanderwals forces.
- **Chemical constituents of wood** - Cellulose, hemicelluloses, lignin, extractives. Dimensional stabilization of wood, cross laminating, surface coatings, heat treatment, bulking treatments with various bulking agents, acetylation, cross linking of structural units. Analysis of raw materials - estimation of the purity of phenol, formalin, para-formaldehyde, urea and melamine, estimation of free

formaldehyde in urea formaldehyde resin, estimation of protein content in protein based extenders. Purification and softening of water for boilers.

### **C) Physics**

- **Density of wood** - Factors affecting density, significance of density.
- **Moisture content of wood** - Definition, equilibrium moisture content, fiber saturation point, methods of measuring moisture content of wood, swelling and shrinkage of wood.
- **Electrical properties of wood** - D.C. resistance, dielectric constant, electrical moisture reading, radio frequency heating.
- **Thermal properties of woods** - thermal expansion, thermal conductivity, specific heat of wood.
- **Mechanical properties of wood** - strain, elasticity, ultimate strength, tensile strength, compressive strength, bending and shear strengths, impact strength, hardness of wood, nail and screw holding properties of wood, factors affecting the strength properties of wood.

### **Practical 120 hrs**

#### **A) Biology**

**Laboratory testing of wood preservation against fungi** - Treatment of specimens, calculation of retention, media preparation for culturing fungi, inoculation, incubation, introduction of specimens, evaluation of results. Identification of wood destroying insects and termites through their method of attack. Field identification of 40 timbers using dichotomous keys, Detection of preservatives in treated timber and products through spot testing- and penetration. Demonstration of vapour phase boron treatment for timber and products.

#### **B) Chemistry**

Preparation of standard solutions of potassium hydrogen Nephthalate and potassium dichromate. Standardization of sodium hydroxide, sodium thiosulphate and hydrochloric acid solutions. Estimation of purity of phenol, formalin, Para formaldehyde, urea and melamine. Estimation of free formaldehyde in urea formaldehyde resins, Estimation of protein in protein based extenders.

#### **C) Physics**

Determination of density, moisture content, swelling and shrinkage characteristics, compression strength, bending strength, nail and screw holding power and modulus of electricity in bending of wood.

## **Paper II- Saw Milling & Saw Doctoring Technology**

**Theory 40 hrs.**

### **Saw Milling Technology**

Introduction and type of sawmills – Raw material for sawmills -Log measurement and volume -Log yard operations Conversion of logs-Safety in sawmills-Bandsaw machines-Circular saw machines-Edger and multiple rip saws machine-Layout of sawmills-Conveyors Oil, grease and bearing-Small diameter log processing-Log grading-Sawn timber sawing variations, size control, etc.-Sawn timber grading-Seasoning-Productivity improvement-Basic management aspects. Finger jointing and edge lamination.

### **Saw Doctoring Technology**

Saw yield - kerf loss, Sawmill tool economy, Sawmill tool maintenance, Edge of cutting tools, Composition of saw-tools, Grinding wheels and grinding, Glossary for maintenance of circular saws, Calculations - circular saws, Tungsten carbide tipped saws. Glossary for maintenance of band saw blades, Saw tensioning, Band saw cracks, Feeds and speeds, Methods of improving wear resistance of saw teeth, Composition of knife steels. Planning the saw shop in sawmill. Preventive maintenance and store keeping.

Band saws - wide and narrow band saws, effect of quality production of swaged and spring set saws, straining methods of band saws, tooth profile, cutting speed, chip formation with relation to feed speed, depth of cut and density.

Circular saws - ordinary spring set saws and TCT saws, saws for ripping, cross cutting and trimming, Horse power requirements.

**Practicals 78 hours**

### **Saw Milling Technology**

General demonstration of saw milling operation: Horizontal band head-rig, narrow band saw machine parts and functions including log carriage, vertical band head rig, wide band saw parts and functions including log carriage, log yard operations/grading. Mill alignment: Head rig, re-saws and multiple edger, edger saw fixing and handling of circular saws, selection of saws of multiple edger and cross cut machine, calculation of sets and fixing the saws at the edger for various sizes, sawing operation, head-rig, re-saw, edger and cross cut saws, operation of head rig and set works, operation of re-saw for maximum recovery and quality control, sawmill operation, sawing of small girth logs, machinery, operation, cross cutting of sawn timber, stacking of sawn timber for air drying, mill maintenance, seasoning kilns, batten preparation and core composing for flush door and block board. . Finger jointing and edge lamination

### **Saw Doctoring Technology**

#### ***Circular Saws***

Safety of hand tools and machinery. Levelling and tensioning, Spring setting, Fabrication of setting gauges and straight edges. Carbide tip brazing and brazing by electrical and

oxy-acetylene methods, Face and side grinding of TCT saws, Plate saw sharpening by grinding machine, Plate saw sharpening and gulleting by manual grinder, Sharpening of planer knives and cutters. Maintenance of hand saw axes and saw chain. Preventive maintenance of equipments for TCT, circular and wood working tools, Circular saw alignment, setting and control. Trouble shooting in circular and TCT saws.

### ***Band saws***

Safety of hand tools and machinery, Levelling, tensioning and back gauging. Spring setting, Jointing by oxy-acetylene welding and brazing. Finishing of joints, Profile grinding by grinding machines. Swaging, pneumatic and manual, Sharpening by grinding machines. Preventive maintenance of equipments for band saw blade maintenance, Preparation for stellite tipping and welding of stellite tips, Side grinding, Alignment and band wheel maintenance, Trouble shooting in band saws.

## **Paper III- Plywood Manufacturing Technology - I (Veneer Production)**

**Theory 50 hrs**

### **Introduction to plywood manufacturing technology.**

General layout for veneer and plywood mill - objectives, type of arrangement, machines, equipment, space requirement.

Log storage - need for storage, dry storage, wet storage, precautions in storage.

Steaming and boiling - heating schedules, effect of heating on properties of wood, advantages and disadvantages of heating.

Preparation of logs for peeling - cross cutting, debarking and cleaning.

Log centering - purpose and economic importance of centering, centering errors and their influence on veneer yield, methods of centering.

Veneer peeling lathe - machine parts, cutting action, undesirable movement of wood on lathe, play in lathe machine parts, spindle overhanging, dynamic equilibrium and slackness. Peeling lathe settings- setting of knife, setting of pressure bar, setting of the gap.

Rotary cutting of veneer - lathe settings and veneer quality, mechanism of veneer formation, type A and B veneer, effect of pressure bar compression and temperature on veneer yield. Peeling defects, their cause and control - thickness variation, roughness, loose veneer corrugation, raised grain, torn grain, bump formation, wooliness, knife and pressure bar marks. Maintenance of peeling lathe - general procedures, lubricants and lubrication, storage of spare parts for replacement.

Veneer Clipping - functions, types, clipping efficiency, clipping allowance, veneer yield, dry clipping.

Veneer drying - purpose, drying variables, moisture movement in veneers during drying, special measures for controlling Final moisture content, drying defects and their control, types of dryers, drying time, dryer productivity, dryer capacity. Preparation of flitches for slicing - sawing patterns, cutting plan, tangential cutting, radial cutting, box flitches, half sawn flitches, quarter sawn flitches.

Veneer slicer - machine parts, cutting action, advantages of slicing, undesirable movement of wood on slicer, play in slicer machine parts, feed by pawl and ratchet, feed to a stop plate offset on vertical face veneer slicer, heat distortion, effect of speed of cutting on veneer quality, slicer settings and veneer quality - setting of knife, setting of pressure bar, effect of knife and pressure bar settings on veneer quality. Tenderizing and veneer finger jointing.

Matching of sliced decorative veneers - side matching or drawn across, book matching or tuned over or cathedral matching, quartered matching, half quartered matching. Slicing defects, their causes and control. Maintenance of slicer-general maintenance procedure, lubrication.

Knife grinding machine and grinding wheels - knives, grinding machines, composition, abrasives, grain size, grade, structure, bond, wheel selection, grinding head, grinding bed, coolant, grinding procedures, maintenance. Jointing and splicing of veneers.

Glue spreaders - components of the machine, operation and maintenance. Hydraulic presses - cold and hot.

Trimming - machines and operation.

Drum and belt sanders - machines and operation.

Hydraulic system, Pascal's law, advantages and disadvantages over mechanical system. Pneumatic system.

Material handling - why and how of handling, indirect and direct handling, handling equipments and devices.

Boilers - boiler house, types of boilers and their working methods, problems and remedies, boiler water treatment.

Different measuring instruments - micrometer, vernier caliper, dial gauge, thickness gauge, bevel protractor, horizontal gap indicator, knife angle indicator, knife height gauge. Types of electric motors used in different machines used in a plywood factory.

**Practical 120 hrs.**

Log centering. Peeling lathe parts and operational functions, Lathe setting with instruments. Changing of peeling lathe knife. Collection of data on logs, Peeling of logs.

Collection of veneers/reeling. Clipping of veneers. Measurement of veneer recovery, Yield calculation, Quality evaluation, Drying of veneers, Shrinkage and moisture content.

Slicer parts and operational functions, Setting of slicer with instruments, Changing of knife, Flitching and boiling, Collection of veneers and drying. Quality evaluation of veneers. Jointing of veneers. Matching of veneers. Veneer recovery measurement and yield calculation, Splicing of veneers. Knife grinding, Grinding wheel fixing, dressing Operation of grinder, concave grinding, cleaning of knife, bevel angle setting, honing, wire edge removal, micro bevelling.

Thermic fluid boiler parts and functions. Steam boiler parts and functions.

#### **Paper IV -Human resource, Financial, and accounting management**

Principles of management, management as science and art, functions of management. Planning, organizing, staffing and controlling. Introduction to HRM, recruitment, training, motivation, appraisal of employees. Labor management and Conflict Management. Effective Communication and Conflict Management. Principles of Financial Accounting and Records Maintenance. Principles of Costing and Cost Management. Cash and Credit Management. Financial statements. Trading and Profit & Loss Account, balance Sheet Time value of money, cost of capital, financial decisions Risk Management: Insurance.

Training in Basic computer education will be an integral of the PGD programme.

#### **II Semester**

#### **Paper V - Plywood Manufacturing Technology - II (Resin and Plywood Manufacturing)**

**Theory 60 hrs**

General aspects of resins, raw materials and resin manufacture - introduction to synthetic resins and adhesives, raw materials, resources, characteristics, safety aspects in handling raw materials and resin manufacture. Wood adhesives - types, classification - natural and synthetic origin.

Natural glues - animal glue, Fish glue, casein glue, blood glue, soya bean glue, starch glues.

Polymers - nature of chemical bonds, functional group and its importance in polymerization process, classification of polymers based on monomers, classification based on special arrangement, random polymers, copolymers, linear polymers, branched polymers, cross linked polymers, types of chemical reactions with reference to addition and condensation polymerization.

Theory of adhesion - Forces of cohesion and adhesion of matter in relation to wood,

bonding/adhesion mechanism, mechanical adhesion, specific adhesion, aspects of glue line in wood bonding, development of glue line, effect of glue line thickness on bonding. Phenolic resins - phenol formaldehyde reaction mechanism, preparation of phenol formaldehyde resin; Partial replacement of phenol with naturally occurring phenolic materials - preparation of phenol cardanol formaldehyde, phenol lignin formaldehyde, and tannin based adhesives. Amino resins - urea formaldehyde reaction mechanism, preparation of urea formaldehyde, urea melamine formaldehyde resins.

Adhesive compositions - fillers and extenders, solvents, tackifiers, thinners, catalysts, plasticizers, thickeners, accelerators, pigments, preservatives, factors affecting glue mixing. Working properties of resins and adhesives - nonvolatile content, viscosity, water tolerance, gelation time, pH value, storage life of resin, pot-life of adhesive mix.

Specialty resins - Polyvinyl acetate and isocyanate resins - reaction mechanism, reaction with wood; Polyester resins - classification, preparation, properties and uses of linear unsaturated polyesters.

Spreading and assembly - mechanical glue spreader, components of glue spreader and their functions, factors affecting the spread, adhesive spread and coverage, causes of spreading problems, organizing assembly place, plywood construction, method of doing assembly, important factors in assembly work, gluing faults caused by wrong assembly.

Pre-pressing - concepts and terminologies of pre-pressing technique, advantages and limitations of pre-pressing technique, required facilities and layout.

Hot pressing - effect of moisture content of veneers, effect of pressure and temperature pressure calculations, press schedules for different adhesives, dual cycle pressing.

Gluing faults and remedies - delamination, blisters, pre-curing, bleed through, warping, starved joints, spotty bonding.

Sanding and finishing types of Sanders, abrasive papers, sanding defects and their remedies, surface quality, use of putty for repairing plywood - types of putty, nitrocellulose based and UF based putties, putty application, hand finishing and sealants.

Decorative overlays and laminates - types of overlays, advantages of overlaid panels, process for the manufacture of overlays and overlaid panels.

**Practical 120 hrs.**

Preparation of conventional and modified PF resins, UF resin and UMF, CPF resin, Characterization of the resins prepared, UF resin adhesive formulation for MR grade plywood, PF resin adhesive formulation for BWR and BWP plywood, Adhesive application and board making(both in laboratory and pilot plant).

## **Paper VI - Panel products from wood and Other Lignocellulosics**

### **Theory 50 hrs.**

Particle board (from wood and other lignocellulosics) - introduction, particle preparation, drying of particles, adhesives, inorganic binders, additives, adhesive binding, mat forming, hot pressing, dimensioning and sanding, oriented particle board, mineral binders for particle board, formaldehyde emission in particle board.

Fiber board including MDF - historical aspects of fibre board development, classification of fibre board based on density range, raw materials, adhesives and adhesive blending, dry and wet processes for manufacturing fiber boards, applications, insulation boards.

Bamboo composites - characteristics of raw material i.e. bamboo mats, strips; matboard - mat veneer composites - corrugated sheets- bamboo laminates - strip boards - technology development, adhesives, resin application, conditioning and hot pressing, important strength characteristics, and end uses.

Compregs - process of making compregs, adhesives, and uses.

Block boards and flush doors - core preparation, veneers, adhesives, construction, hot press schedules.

### **Practical 40 hrs.**

Particle board : Resin preparation, blending and hot pressing.

Bamboo mat composites : Resin preparation, application to bamboo mats, conditioning of resin coated mats, hot pressing. Compregs - process of making compregs, adhesives, and uses.

Block boards and flush doors - core preparation, veneers, adhesives, construction, hot press schedules.

## **Paper VII - Testing, Standards and codes**

### **Theory 15 hrs**

### **Practical 60 hrs**

Theory of testing, test methods for different panel materials/products from wood and other lignocellulosic materials.

Role of National Standardization Organization (Bureau of Indian Standards).

Specifications related to different wood based panel material as per Indian Standards.

Specification for synthetic resin adhesives: terminologies, scope and tests.

Non- destructive testing of wood - Principles, importance, current scenario.

## **Paper VIII – Panel products and Application**

**Theory 15 hrs**

Joints in wood, carpentry tools and wood working materials.

Finger jointing and glue laminating techniques.

Wood fasteners and their application in joints.

Design and production of wood and lignocellulosic door shutters.' Introduction to timber engineering and construction.

Utilization of wood & lingo-cellulosic based panel materials in construction, interiors, packaging, transport etc.

Wood finishing - materials and methods.

**Practicals 45 hrs.**

Mechanical drawings(Architectural and furniture drawings) on wood finishing, Fabrication of a panel door – Demonstration.

## **IX. Production management, Quality control & Marketing management**

**55 hrs.**

Principles of Quality Control & Assurance(QC), organizing quality control in a plywood industry, structure, objectives, seven tools of quality measurement relevant to plywood manufacturing, application of QC in wood based panel industry, SQC, chance causes, assignable causes, quality characterization, selection of sub groups, control charts for measurements and construction, pattern of control charts, attributes charts, process capability studies, interpretation, uses and risks of control charts, quality assurance programme.

Total quality management - introduction, objectives and importance of TQM in plywood industries - quality management in plywood industry, Quality circles, pollution control, waste management, effluent treatment for chemical and adhesive waste, ISO 9000-2000, ISO 14001 EMS, Production planning in wood based industries Machine/capacity utilization, Time & motion study, job scheduling, Elements of Work Study, (Methods & Measurement), pollution control, Waste management & Effluent treatment of wood and other wastes from wood based panel products, Energy management Logistics and Supply Chain Management Trading procedures. Auction systems Basics of Marketing Management. strategic marketing and 4 Ps of marketing, Marketing Information Systems Product Promotion.

**IPIRTI, Bangalore**

**Post Graduate Diploma Course in Wood and Panel Products Technology**

**Rules and Regulations for Examinations**

### 1. General

The Post Graduate Diploma Course in Wood and Panel Products Technology provides an exciting opportunity for fresh science and engineering graduates for career in the wood based industry sector. It involves both theoretical and practical training in the science and art of manufacturing panel materials from wood and other renewable natural fibers for various end use applications.

Academic year is generally from November to October of the next calendar year. The eleven-month course, divided in two semesters, includes theory and practical classes, demonstrations, seminars, project work, study tour etc. The performance of the trainees is assessed through snap tests, theory and practical examinations at the end of each semester. The Project work and tours are also assessed.

### 2. Scheme of Examination

Examinations are conducted at the end of each semester comprising of theory and practical

Examinations as mentioned below:

#### First Semester

| Sl.No. | Paper  | Max. Marks |
|--------|--|------------|
| 1.     | Forestry and Wood Science<br>Theory<br>Practical                             | 100<br>100 |
| 2.     | Saw Milling & Saw Doctoring<br>Technology<br>Theory<br>Practical             | 100<br>100 |
| 3.     | Plywood Manufacturing Technology-1(Veneer Production)<br>Theory<br>Practical | 100<br>100 |
| 4.     | Principles, Human resource, and financial management<br>Theory               | 50         |

## Second Semester

| Sl.No. | Paper  | Max. Marks |
|--------|--|------------|
| 5.     | Plywood Manufacturing Technology -II(Resin and plywood manufacturing)<br>Theory<br>Practical         | 100<br>100 |
| 6.     | Particle/Fiber Boards and Panel Composites from wood & other Lignocellulosics<br>Theory<br>Practical | 100<br>50  |
| 7.     | Testing of Panel Products<br>Theory<br>Practical   | 50<br>50   |
| 8      | Products, Processing and Applications<br>Theory  | 50         |
| 9.     | Production, Quality and Marketing Management   | 50         |
| 6.     | Project work - 60 Marks<br>Project Seminar - 20 Marks<br>Study tour - 20 Marks                       | 100        |

### 3. Attendance

80 % attendance in theory and practical classes is compulsory for a trainee to be eligible for taking a semester examination. Absence in even a single theory/practical class on any day will be computed as absence for half a day absence, and one theory and one practical class on the same day will be computed as absence for one day, unless permitted by the concerned teacher and agreed to by the officer-in-charge training for reasons to be recorded in writing. Trainees whose attendance falls short of 80% in a particular semester will not be allowed to appear at the examination.

### 4. Pass Marks

Trainees should obtain minimum of 35% in Paper separately in theory and practical examinations.

A trainee who fails to secure 35% in any subject will be given one chance to reappear for supplementary exam. For the subjects for the First semester such chance will be given along with the second semester examinations during the same academic year and for the subject of second semester along with the First semester examination during the next academic year after paying prescribed examination fee. Such trainees will be ranked separately and will not be eligible for any awards.

## **5. Award of PG Diploma in WPPT**

Post Graduate Diploma will be awarded to trainees who are found successful in the examinations. Merit list will be drawn based on total marks obtained in the first and the second semester examinations of the related academic year and the following classes will be given:

|                              |   |                            |
|------------------------------|---|----------------------------|
| First Class with Distinction | : | 70% and above              |
| First Class                  | : | 60 and above and below 70% |
| Second Class                 | : | 50 and above and below 60% |
| Pass Class                   | : | 35 and above and below 50% |

## **6. Medals and Prizes**

Following medals are awarded to the meritorious trainees from each course:

1. Dr. Narayanamurti medal for the trainee securing highest total marks.
2. Keith Baddeley medal for the trainee securing highest marks in 'Sawmilling Technology'
3. CIBATUL medal for trainee standing second in the merit list
4. Two cash prizes (from the interest of amount donated by Shivhari Plywood Industries) for the trainees securing highest marks in
  - (i) 'Plywood Manufacturing Technology'
  - (ii) 'Quality Management & Testing of Panel Products'
5. One cash prize (from the interest of amount deposited by M/s. Arunachal Plywood Industries) for the trainee securing highest marks in 'panel products and application'.

## **7. Exemptions**

The authority to relax any of the provisions is vested in the Director, IPIRTI, for reasons to be recorded in writing.

**Issued by the order of the Director  
HOD, SORIT**

## **IMPORTANT DATE**

**Last date for receipt of filled-in  
Application at the Institute along : 15 September 2011  
With DD for Rs.250/-, drawn in  
favour of Director, IPIRTI, Bangalore**

**IPIRTI, Bangalore**

**Rules and Regulations of the Trainees Hostel**

The following are the Rules and Regulations of the IPIRTI Trainees Hostel

**A. General**

1. All trainees are required to behave and conduct themselves in a disciplined way.
2. Each room of the hostel has been provided with the items as per list pasted on the backside of the door in each room. Occupancy of each room is restricted to only two trainees. Hostel inmates are expected to maintain all the items provided to them including furniture and fixtures in a good condition. Any breakages or malfunctioning of the articles should be reported immediately to the Officer-in-charge, Hostel.
3. Defacing of walls, furniture are strictly prohibited. Good hygiene has to be maintained in all the living rooms, common room and surrounding areas.
4. Economy in use of water and electricity must be observed at all times. All the light switches, geysers, water taps, etc. should be switched-off or closed when not in use.
5. Furniture provided in the common room should not be disturbed and good usage of such items is necessary. The common room has been provided with a TV placed in the TV cabinet which should be handled carefully. Any damage caused to the furniture and fixtures provided will be dealt seriously and calls for reimbursement from the trainees depending upon the seriousness of damages/food and tea carrying to common room is strictly prohibited.
6. The common room will be closed at 10 p.m. by group leader of the trainees/security men. It will be opened only in the morning at 7 a.m.
7. One of the trainees will work as group leaders by rotation for liaison between Officer-in-Charge, Hostel and trainees.
8. Good hygiene should be maintained in all the public places especially in bathrooms, toilets, common-room, etc. Throwing of all paper bills, plastics, shampoo cover, thrashes, etc. should be avoided and have to be deposited in dustbins provided. Smoking/Alcoholic drinks are strictly prohibited within campus.
9. The trainees who want to have their rooms moped must tell the sweeper to mop in their presence only once a week i.e., on Saturday.
10. Trainees in their own interest have to secure their valuables, cash, in their safe custody. Institute is not at all responsible for any theft, damage or loss, etc.
11. The hostel is meant only for trainees. No outsiders are allowed to stay in the hostel.

**B. Mess**

12. Boarding is mandatory for all hostel inmates (trainees). The Mess charges are calculated as a package on monthly basis. On the day of official tour outside

Bangalore/Vacation rebates will be allowed, as decided by the authorities.

13. A trainee has to avail leave with prior permission from OIC, HOD/Jt. Director and also inform the OIC, Hostel and in writing the Canteen Contractor about his leaving the Hostel. For a period of leave of more than 4 days, rebate in mess charges will be decided from time to time. No rebate will be allowed for the extended leave period unless the same is intimated in advance and duly approved by the authorities.
14. A trainee shall get a 50% rebate on mess charges provided he goes on leave for minimum 4 days, and 100% rebate for more than 7 days.
15. If the trainee returns to Hostel later than the date mentioned in his leave application, he shall get rebate only till the date mentioned in his application.
16. The trainees shall pay the Mess charges on or before 10<sup>th</sup> of each month failing to pay a fine of Rs.2/- per day will be charged. Only vegetarian food will be served in the hostel at the rates approved by the Food Committee. One trainee on the Food Committee will be nominated by J.D. as a food committee member.
17. The following timings will be observed in the hostel canteen for catering.

|                        |    |                       |
|------------------------|----|-----------------------|
| Morning bed coffee/Tea | .. | 6.00 a.m. to 6.30 a.m |
| Breakfast              | .. | 7.30 a.m. to 8.30 a.m |
| Lunch                  | .. | 1.00 p.m. to 2.00 p.m |
| Refreshments           | .. | 5.15 p.m. to 6.00 p.m |
| Dinner                 | .. | 7.30 p..m to 9 00 p.m |

Food will not be served in the rooms or in the common room. Trainees must not take food/tea to their rooms or to the common room.

#### C. Games and Sports

18. Trainees can play games badminton/T.T. between 5.30 - 6.30 p.m. at the venue meant for these games. Trainees are required to dress appropriately for games.

Playing games inside hostel quadrangle is strictly prohibited.

**Issued by the order of the Director**

**Officer-in-Charge,  
IPIRTI Hostel**



**INDIAN PLYWOOD INDUSTRIES RESEARCH AND TRAINING INSTITUTE (IPIRTI)**  
(An Autonomous body of the Government of India, Ministry of Environment and Forests)

**P.B.No.2273, Tumkur Road, Bangalore-560 022, INDIA**

**Phone: 8394231-32-33 (Gen.); Fax: 91-80-8396361**

**Application form for admission to One Year Post Graduate Diploma Course in  
Wood and Panel Products Technology 2011-2012**

Application form No.(For office use only).....

D.D. No.....Dated.....

Bank Name .....

Amount ₹.....

**Affix  
Passport size  
photograph**

**APPLICATION FORM**

**I. GENERAL (1-7)**

|    |  |   |
|----|--|---|
| 1. | Name of the candidate<br>(in BLOCK CAPITAL LETTERS)  |   |
| 2. | i) Age, as on 1.11.2011<br>ii) Date of birth as recorded in<br>SSLC/Matriculation Certificate  | Years<br>Day                  Month                  Year |
| 3. | Name of your Father/Guardian<br>and Occupation   |   |
| 4. | Full postal address for communication<br>(in Block capitals)<br>with phone/mobile no. and email:<br><br>State to which you belong to |   |
| 5. | Do you belong to Reservation<br>Category. Say Yes/No<br>If Yes, please furnish the category you<br>belong (enclose certificate)      | Yes                  No<br><br>SC/ST/OBC/PH               |
| 6. | Are you a Sponsored candidate by<br>Wood based Industry  | Yes                  No                                   |
| 7. | Whether you need Hostel<br>Accommodation   | Yes                  No                                   |

II Academic Record

7. Educational Qualifications:

| Sl. No. | *Exam passed | Subject Branch | Year of passing | No. of attempts | Board/ University | Maximum Marks | Marks obtained | % of Marks | Class declared | Remarks |
|---------|--------------|----------------|-----------------|-----------------|-------------------|---------------|----------------|------------|----------------|---------|
|         | 1            | 2              | 3               | 4               | 5                 | 6             | 7              | 8          | 9              | 10      |
| 1       |              |                |                 |                 |                   |               |                |            |                |         |
| 2       |              |                |                 |                 |                   |               |                |            |                |         |
| 3       |              |                |                 |                 |                   |               |                |            |                |         |
| 4       |              |                |                 |                 |                   |               |                |            |                |         |

N.B: \*Please use additional sheets, if need be.

Please enclose attested copies of certificates (original certificates not to be sent)

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III. FOR SPONSORED CANDIDATES

7. If your answer is 'Yes' for item No.6 under I, please forward this application through your Sponsoring authority:

I hereby sponsor Shri ..... Graduated from ..... University for undergoing One Year Post Graduate Diploma Course in Wood and Panel Products Technology at IPIRTI, Bangalore.

Date: .....

Signature of the Sponsoring Authority with their company

seal

Place: .....

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**Declaration**

IV I hereby declare the particulars furnished in this form are true to the best of my knowledge and belief. If any information is found to be untrue/false, I am liable to be disqualified from PG Course.

Date: .....

Signature of the Candidate

Place: .....