IIRD PDC Class Session Outline

Main Class Session Sequence

This 48 class sequence of 90-minute sessions covers all of the base material required to complete the 72-hour lecture requirement for a full Permaculture Design Certification course.

(Day One)

M01 – Introduction and Overview

Welcome and introductions
Overview of course and course requirements
Definition of Permaculture
Basic History and Goals of Permaculture
Permaculture as Design Science
High Tech vs. Low Tech

M02 – Ethics in Design

The Rules of Three and the Purpose of Design
The Permaculture Prime Directive
The Principle of Cooperation
The Three Ethics
The Fractal Nature of the Three Ethics
Applying Ethics to Design
The Precautionary Principle

M03 – Design Concepts 1

The Earth-Space Battery
Basic Thermodynamics
Systems & Boundaries
Mechanistic vs. Complex vs. Ecological Systems
The Burden Shifts to the Intervener
Mollisonian Design Principles
Resources & Yields
Birch's Six Principles of Natural Systems
Be Careful What You Incentivize

M04 – Design Concepts 2

Holmgren's Permaculture Flower
Holmgren's 12 Design Principles
Yeoman's Orders of Permanence
Diversity, Stability, Resilience, & Interconnection of Elements
"It Depends"

(Day Two)

M05 – Methods of Design Part 1

- Definition of Design
- Definition of Permaculture Design
- Stacking Functions (Prime Directive of Function)
- Principle of Self-Regulation
- Bottom-up vs. Top-down Design
- Fabrication vs. Generation
- Observation in Design
- Element Analysis
- Sun Movement throughout the Day & Seasons

M06 – Methods of Design Part 2

- Defining Zones and Sectors
- Zones
- Sectors
- Applying Zones and Sectors and Varying Scales

M07 – Methods of Design Part 3

- Succession
  - R-Selected vs K-Selected Species
  - The Successional Mosaic
  - Bacterial and Fungal Balance through Succession
- Edge Effect
- Successional Edges

M08 – Methods of Design Part 4

- Definition of Polyculture, Guilds, and Companion Planting
- Tree Guilds
- Creating Microclimates
- Design Approaches
  - Using Yeoman's Orders of Permanence
  - Base maps
  - Flow Diagrams
  - Articulation from Observed Pattern
  - Random Assembly
  - Incremental Design
- Design for Catastrophe

(Day Three)

M09 – Pattern Understanding Part 1

Introduction to Pattern Understanding
General Model of a System
Definition of Pattern
The General Pattern Model of Events
Chaos, Complexity, and Strange Attractors
Pattern Languages
Defining Anti-pattern
Categories of Patterns
A Pattern Definition of Sustainable and Regenerative

M10 – Pattern Understanding Part 2

The Fractal Structure of Nature
Properties of Media
Emergent Properties
Orders of Scale & Relative Abundance
Surface Area and Interactions at the Edges
Boundary Conditions and Harmonics
Tessellations and Tiling

M11 – Pattern Understanding Part 3

Compatible and Incompatible Borders and Components
Branching & Spirals
Meshes & Nets
Flow over Landscapes & Objects
Accretion and Expulsion
The Time-Sequencing of Patterns

M12 – Pattern Understanding Part 4

Patterns in Human Thought: Schema vs. Procedural Thinking
Examples of Tribal Uses of Patterns
Patterning to Encode and Transmit Information
Patterns in Human Society & Settlements
Human Scale & Dunbar's Number

(Day Four)

M13 – Climate Factors Part 1

Introduction to Climate
Classification of Climate Zones
Climate Analogues
Biomass Above/Below Ground in Various Climate Zones
USDA Hardiness Zones
What to Consider When Designing for a Specific Region
Evaporation vs. Precipitation
Savory Brittleness Scale
Condensation & Dew
Orographic Effects, Physical Geography, and Bodies of Water
Urban Heat Island Effect

M14 – Climate Factors Part 2

Solar Radiation
Heat Transfer – Conduction, Convection, and Radiation
Density vs. Temperature
Albedo & Absorption
Frost
Wind, Windbreaks, and Shelter Belts
Continental vs. Maritime Climates
Valley Climates
Latitude and Altitude

M15 – Trees & Their Energy Transactions Part 1

The Place of Trees in Ecosystems
The Biomass of Trees
Non-photochemical Quenching
The Ecological Importance of Fire
Wood Vinegar
Wind Effects on Trees

M16 – Trees & Their Energy Transactions Part 2

The Time Scale of Trees
Trees and Precipitation
Evapotranspiration
Rain Nucleation by Trees
The Tree's Interaction with Rain
The Dynamics of Rain Landing on Bare Soil
Trees and Sacred Spaces

(Day Five)

M17 – Water Part 1

Introduction to Water
The Unique Properties of Water
The Duties of Water
The Large and Small Hydrological Cycles
Watersheds
Drinking Water Sources
Springs and Spring Lines
Water Storages
Water for Irrigation
Water Conservation
Pond/Dam Types and Locations
Sealing Dams & Ponds
Ram Pumps

M18 – Water Part 2

Roof Catchment of Rain Water & Storage Tanks
Definition of Swales and Diversion Drains
The Problems of Irrigation & Aquifer Pumping
Purification of Polluted Waters & Reduction of Waste Water
Natural Swimming Pools
Flow Forms & Aeration

M19 – Soils Part 1

The Importance of Soil
The Structure of Soils & Inorganic Constituents of Soil
Flocculation of Clay Soils
Important Elements for Life in Soil and Water
Soil Elements Critical for Plant Life
How Plants Uptake Nutrients
Cation Exchange Capacity (CEC)
pH and Soils
The Biological Dimension of pH
Soil Testing
Methods to Re-mineralize Soils

M20 – Soils Part 2

Soil Composition – Organic, Inorganic, Water, Gas, and Soil-Life Components
Measuring Soil Composition with the Jar Test
Estimating Soil Composition by Hand Feel
Soil Tilth, Pore and Crumb Structure
Atterberg Limits & the 4 Phases of Soil Dynamics
Gaseous Content and Processes in the Soil
Soil Compaction, Causes of Compaction, Measuring Compaction
Angle of Repose
The Structural and Biological Effects of Plowing

(Day Six)

M21 – Soils Part 3

The Soil-Food Web & Soil Biota
Soil Life: Good Guys vs. Bad Guys
Korean Natural Farming
Difficult Soils
Soil Erosion & Preventing Erosion
Soil Remediation
Soils in House Foundations

M22 – Compost & Aerated Compost Tea

Types of Compost
Making Thermophilic Compost
Sheet Mulching
Vermicomposting
Aerated Compost Teas
Biochar
Using Black Soldier Fly Larvae

M23 – Annual Crop Gardening

Introduction to Annual Crop Gardens
Biological vs. Chemical Cultivation of Crops
Brix & Brix Measurement
The Kitchen Garden and the Production Garden
Common Vegetable Families
Bio-intensive Gardening
The Double-digging Method

M24 – Seeds & Seed Saving

Propagation by Seed vs. Propagation by Cuttings
Heirloom Seeds & Open Pollinated Seeds
Cross-pollination
Choosing Seed to Save
Saving & Storing Seed
The Importance of Careful Genetic Selection
Breeding Locally Adapted Varieties
Local Seed Sharing & Seed Libraries
Seed Balls (Seed Pelleting)

(Day Seven)

M25 – Earthworks Part 1

Introduction to Earthworks
The Energy Audit of Earthworks
Planning Earthworks
Types of Earthworks & Earth Constructs
Types of Earthwork Equipment
Restoring Topsoil & Planting after Earthworks

M26 – Earthworks Part 2

Calculating Slope
Contour & Contour Lines
A-frame Levels, Water Levels, Transit Levels, and Laser Levels
Marking Sites using Flags and Paint
Working with Equipment Operators

M27 – Earthworks Part 3

Designing Swales & Diversion Drains
Berms and Basins
Level-Sill Spillways & Designing Overflows
Review of Pond Types and Locations
Designing Ponds & Dams
Keyways in Dam Walls
Methods of Tapping and Draining Ponds
The 3-D Topology of the Soil Strata

M28 – Earthworks Part 4

Overview of Keyline Design
Definition of Key Point and Key Line
The Keyline Plough
Patterns of Keyline Ploughing
Siting Roads

(Day Eight)

M29 – Humid Tropics Part 1

Introduction to Major Climate Zones for Design
Wet Tropics, Wet-Dry Tropics, & Monsoon Tropics
Soils in Tropical Climates
Earth Shaping for the Tropics
Building Design Strategies for Tropical Climates
Gardening in the Tropics

M30 – Humid Tropics Part 2

Integrated Land Management and the *Ohana* System of Hawaii
Village Organization in the Tropics
Developing Polycultures in Tropical Systems
Coconut and Palm Polycultures
Rehabilitation of Degraded Tropical Systems via Pioneering

M31 – Dryland Strategies Part 1

Definition and Characteristics of Drylands
Precipitation & Temperature Variation in Arid Environments
Dryland Soils
Features of Desert Landscapes
Harvesting & Storing Water in Arid Lands

M32 – Dryland Strategies Part 2

Broad Strategies for Desert Settlements
Houses for Desert Conditions
Desert Gardens
Establishing Trees in Deserts

(Day Nine)

M33 – Temperate Climates Part 1

Introduction to Humid Cool & Cold Climates
Characteristics of Temperate Climates
Soils in Temperate Climate Areas
The General Landscape Profile of a Temperate Climate Site
Attributes of Settlements & Buildings for Temperate Climates

M34 – Temperate Climates Part 2

The Lawn
Gardens for Temperate Climates
The Hunger Gap
Timber Production Forests
Coppicing & Pollarding
Strategies for Colder Climates
Hugelkultur Beds
Dealing with Wildfire Risks

M35 – Pasture Systems & Rotational Grazing

Rotational Grazing & the Holistic Management System
Simulating Predator/Grazer Interaction
Using Chickens and Dung Beetles to Help Manage Fertility
Managing Perennial Polyculture Pastures
Electric Fencing & Cell Size
Over-wintering livestock
Savanna Landscapes, Silvopasture & Alley-cropping
Providing Water for Livestock
Mineral Supplements
Livestock Protection Animals

M36 – Food Forests and Perennial Production Systems

Introduction to Food Forests
Using Swales in Food Forests
Food Forest Layers in Tropical & Temperate Climates
Establishing Food Forests – Creating Perennial Polycultures
The Time-Sequencing of a Food Forest – Accelerating Succession
Using Chickens, Goats, and Pigs to Prepare the Ground
Selecting Species & Cultivars
Animal Systems in Food Forests

(Day Ten)

M37 – Working with Energy Flows

Definition of Energy
Embodied Energy and Emergy
Energy Returned on Energy Invested (EROEI)
Sustainable Energy Systems – Biogas, Solar, Wind, Hydro-power
Energy Conservation
Managing Heat Flows
Designing for Passive Solar Gain
The Energy and Environmental Audit of Burning Wood
Rocket Mass Stoves for Heating
High-value Uses of Electricity
The Energy Audit of Tools

M38 – Natural Building Methods

Introduction to Natural and Non-toxic Buildings
Building with Cob
Straw bale Buildings – in-fill and load-bearing systems
Earth Bags
Natural Plasters & Natural Paints
Natural Flooring Systems
Roof types – Thatch Roofs, Metal Roofs, Tiled Roofs, Living Roofs
Greenhouses & Thermal Batteries
The Walipini

M39 – The Permaculture Kitchen

Introduction to the Permaculture Kitchen
The Garden Sink
Cooking with the Sun – Solar Stoves & Solar Ovens
Cooking with Wood & Methane
Cob Ovens
Barrel Ovens & Rocket Ovens
Rocket Stoves
The Zeer and Other Evaporative Coolers
Outdoor Kitchens
Cast Iron and Food-Safe Surfaces

M40 – Sanitation & Health

Maintaining Optimal Human Health
Sanitation in the Kitchen
The 4-Bucket System for Sanitizing Dishes
Composting Toilets
Waste Disposal & Waste Elimination
Types of Medical Care & the Medicine Pyramid
Hunting & Wildcrafting

(Day Eleven)

M41 – Aquaculture

Introduction to Aquaculture
Aquaculture Approaches for Different Climate Zones
General Factors Affecting Aquaculture Systems
Species for Aquaculture Systems
Configuration of Fish Ponds
Growing Food for Aquaculture Systems
Canals & Chinampas
Aquaponic Systems

M42 – Animal Systems Part 1

Introduction to Animal Systems
Dairy Animals – Using Cows, Sheep, and Goats for Dairy
Pigs: Paddock-shift Systems, Forest Grazing, & Pigs as Cultivators
Rabbits
Ducks, Geese, & Turkeys
Using Goats & Sheep for Meat & Fiber

M43 – Animal Systems Part 2

Using Animals for Land Clearing & Tilling
Chickens in the Annual Production Garden
Chicken Tractors, Egg-Mobiles & Feather-net
Chickens Paddock Shift Systems in Food Forest, Soil Preparation
Pollinators – Honey Bees, Mason Bees, & Native Pollinators
Pigeons and Bats
Restoring Trophic Layers & Working with Predators

M44 – Food Storage & Seasonal Eating

Introduction to Food Storage
Lacto-Fermentation
Drying & Smoking
Bulk Grain Storage
Dairy Ferments
Root Cellars
Growing Season Extension Techniques

(Day Twelve)

M45 – Designing Invisible Structures

Types of Invisible Structures
Shared Stories as Community Glue
Narratives as Drivers of World View
Patterns of Change and the S-Curve of Adoption
Local Production & Exchange as a Center of Mass for Community

M46 – Legal Structures & Community Organization

Trusts and Corporations (LLC's)
Managing Liability
Land Access Strategies (co-housing, co-farming, intentional community, urban community block)
Land Lease and Intergenerational Farming

M47 – Economics & Money Systems

An Ecologically-Based Economic Model
Forms of Capital
Triple Bottom Line Accounting
Formal and Informal Complementary Currencies
Household and Community Economies
Community Lending and Banking
Entrepreneurship
Right Livelihood

M48 – Village Development & Human Scale

Defining Human Scale
Community Governance at Human Scale
Creating and Maintaining Social Fabric
Intergenerational Connections
The Local & Global Permaculture Community (networks, organizations, and how to get involved)

Design Project Sessions

D01 – Design Project Overview

Description of the Design Project
Brief Overview of the Property
Requirements for the Design Project
Explanation of the Process and Schedule

D02 – Property Tour

Virtual Walk-through using Maps & Online Resources
Observation Skills Checklist
Physical Tour of Property
Individual Exploration Time

D03 – How to Conduct a Client Interview

The Client Interview Process
Preparing Before the Interview
Conducting the Interview
The Client Interview Checklist

D04 – The Client Interview

Introduction of the Client
Students Conduct the Interview
Interview Debrief with Instructor

D05 – Software Design Tools

Paper vs. Software Design
Making Initial Design Sketches on Paper
Online Tools for Information Gathering
Software Tools for Design and Presentation

D06 – Gathering Climate & Land-form Data

Sources of Climate Data
Sources of Typographic Data
Sources of Soil and Geologic Data

D07 – Building a Base Map

How to Gather Information for a Base Map
Making Your Base Map To-Scale
Use of Colors, Symbols, and Labels
Designing the Base Map Using Layers & Transparency

D08 – Sector Analysis and Zone Analysis

Performing a Sector Analysis for Your Design Project
Identifying Resource and Energy Flows into and out of the System
Sector Analysis Checklist
Performing an Early Zone Analysis (existing structures & traffic flows)

Creating a Sector and Zone Map

D09 – Designing Water & Access

Starting the Design Process with Water
Assessing Existing Water Flows & Storages
Identifying Deficits and Excesses of Water
Specifying Earthworks & Land-forming
Designing Access around the Water

D10 – Designing Mainframe Forestry & Siting Buildings

Deciding Where to Place Long-term Forests
Identifying Buildings Required
Siting Buildings and Creating a Nexus of Activity

D11 – Designing Zones & Permanent Fencing

Revisiting and Completing the Zone Map
Checking Zones and Access against Traffic Flows
Locating Permanent Fencing

D12 – Designing the In-fill Mosaic

Locating the Kitchen Gardens & Production Gardens
Locating Food Forests
Locating Pasture Systems
Stacking Animal Systems into the Mosaic
Designing for Succession over Time

D13 – Stacking in Aquaculture

Stacking Aquaculture into Ponds, Lakes, & other Water Catchments into Your Design
Assessing the Suitability of Aquaponics and Other Intensively Managed Aquaculture Systems

D14 – Preparing for the Design Presentation

Review of the Presentation Process
Organizing Materials for the Presentation
The General Format of a Good Design Presentation
Hints on Making a Good Design Presentation

D15 – Design Project Workshop

In-class Time for Students to Work on the Design Project
Instructors Available to Answer Questions

D16 – Presentation of the Design Projects

Individual Student Presentations
Instructor Debrief of Overall Design

Hands-On Sessions

The Hands-on Sessions involve either live demonstrations or student involvement in learning a technique by direct experience.

H01 – Solar Stove Demonstration

H02 – Black Soldier Fly Larvae System Demonstration

H03 – Rainwater Harvesting System Walk-through

H04 – Using a Dissolved Oxygen Meter

H05 – Measuring Soil Compaction with a Penetrometer

H06 – Assessing Soil Composition with the Jar Test

H07 – Soil Microscopy Demonstration

H08 – Building a Thermophilic Compost Pile and the Compost Thermometer

H09 – Measuring Brix with a Refractometer

H10 – The Double Digging Method of Garden Bed Preparation

H11 – Brewing Aerated Compost Tea

H12 – Finding Contour Using A-frame Levels, Water Levels, and Laser Levels

H13 – Making Biochar

H14 – Performing Radiological Surveys Using the Geiger Counter

H15 – Cooking with the Rocket Stove

H16 – Assessing Building Energy Performance via Infrared Imaging

H17 – Straw-bale and Cob Hands-on

H18 – Solar Oven Cooking

H19 – Aquaponic Systems Operation

H20 – Processing Poultry Demonstration

H21 – E-Field and B-Field Surveys with an EM Meter