“Let it Grow” SAMPLE MONTH BY MONTH LESSON PLANS

Class Outline: Month One

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| TIME | OVERVIEW | MAIN IDEA | SUBTOPICS |
| 25 MINUTES | Introductions and Agenda Review |  Introduction to the class and review of course |  Introduction of instructors Introduction of students Discussion of what will be covered in the course |
| 25 MINUTES | Slide show presentation over Chapter 1 Introduction to Aquaponics; handout given |  Introduction to aquaponics as a form of agriculture |  Aquaponics Hydroponics Aquaculture Comparison of methods Advantages of aquaponics Challenges and areas yet to be refined |
| 15 MINUTES | Discussion over Chapter 1 Introduction to aquaponics |  Question and answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES | Slide show presentation over Chapter 2 History of Aquaponics; handout given |  The history of aquaponics |  When/where it started Contributors to the science of aquaponics |
| 20 MINUTES  | Discussion over Chapter 2 History of Aquaponics |  Question and answer |  Students can ask instructors questions and discuss what was presented to them |
| 15 MINUTES | Break |  |  |
| 20 MINUTES  | Slide show presentation over Chapter 3 The Process; handout given |  How aquaponics works |  What the fish do What the plants do What the bacteria does Water Oxygen  |
| 15 MINUTES | Discussion over Chapter 3 |  Question and answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES | Slide show presentation over Chapter 4 System Components and Chapter 5 System Designs; handout given |  The components of an aquaponics system Different aquaponic designs |  Fish tanks Stand pipes and bottom drains Aeration system Solids removal device Bio-filtration and mineralization tanks Degassing tank Grow bed Sump tank and water pumps Plumbing Water heater/chiller Back up power equipment Plant lighting Greenhouse and environmental control Raft NFT Media-filled bed (flood and drain) Airlifts |
| 10 MINUTES  | Discussion over Chapter 4 System Components and 5 System Design |  Question and answer |  Students can ask instructors questions and discuss what was presented to them |
| 15 MINUTES | Video from Let Us Grow how to set-up a mini-system |  Viewing of video |  Step by step instructions on how to set up a mini-system |
| 30 MINUTES | Students to practice set-up of mini-system |  Hands on practice |  Students will have the opportunity to set up a mini-system after viewing the step by step video  Students will be given the Let Us Grow SOP for setting up a mini-system |
| PAU | Class ends |  |  |
| HOMEWORK | Students to set up mini-system at home; complete handouts if unable to do so during class; read chapters 1-5 and complete take home open book quiz over chapter 1-5 hand in quiz at next class |  |  |

Class Outline: Month Two

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| TIME | OVERVIEW | MAIN IDEA | SUBTOPICS |
| 25 MINUTES | Hand in quiz and completed handout from previous month followed by Q&A |  Review of previous month |  Assignment to be handed in Quiz to be handed in Students can ask instructors questions and discuss what was presented to them the previous month |
| 25 MINUTES | Slide show presentation over Chapter 8 System Start Up and Chapter 9 Daily Operation and Maintenance; handout given |  What is needed to start up a system Types of monitoring and work involved in daily maintenance |  Water source Fish stocking Planting the grow bed Monitoring water quality Monitoring fish health Fish harvesting Cleaning filters and components Plant seeding, transplanting, and harvesting Monitoring crop health The importance of cleanliness |
| 15 MINUTES | Discussion over Chapters 8 System Start Up and Chapter 9 Daily Operation and Maintenance |  Question and answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES | Break |  |  |
| 20 MINUTES  | Hand out and read over Let Us Grow SOPs |  Reading of the Let Us Grow SOPs |  Let Us Grow Assembly SOP Let Us Grow Adding LECA SOP Let Us Grow Adding Fish and Plants SOP Let Us Grow Fish Feeding SOP Let Us Grow Water Quality Testing SOP Let Us Grow Fish Tank Cleaning SOP Let Us Grow Bed and LECA Cleaning SOP Let Us Grow What to do When the System Floods SOP |
| 30 MINUTES | Hands-on training with students over SOPs |  Students to participate in the execution of the Let Us Grow SOPs |  Hands on application of SOPs will allow students to maintain the mini-systems they have set up |
| PAU | Class ends |  |  |
| HOMEWORK | Students to start daily documentation (maintenance log) of their mini systems at home; complete handouts if unable to do so during class; read chapters 8-9 complete take home open book quiz over chapter 8-9 hand in quiz at next class |  |  |

Class Outline: Month Three

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| TIME | OVERVIEW | MAIN IDEA  | SUBTOPICS |
| 25 MINUTES | Hand in quiz and completed handout from previous month followed by Q&A |  Review of previous month |  Assignment to be handed in Quiz to be handed in Students can ask instructors questions and discuss what was presented to them the previous month |
| 25 MINUTES | Slide show presentation over Chapter 6 Fish Selection; handout given |  What fish can be used in aquaponics |  Tilapia Largemouth Bass Blue Gill Catfish Koi Barramundi, Jade Perch, Silver Perch, and Murray Cod (species used in Australia) Marine Fish and Freshwater Crustaceans |
| 15 MINUTES | Discussion over Chapter 6 Fish Selection |  Question and Answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES | Slide show presentation over Chapter 14 Fish Health; handout given |  Biology of fish  Factors that affect there health |  Basic anatomy of fish Basic physiology of fish |
| 20 MINUTES  | Break |  |  |
| 15 MINUTES | Continue presentation |  Continuation of Chapter 14 Fish Health presentation |  Extra time to finish the presentation  |
| 20 MINUTES  | Discussion over Chapter 14 Fish Health |  Question and Answer |  Students can ask instructors questions and discuss what was presented to them |
| 15 MINUTES | Slide show presentation over Chapter 15 Fish Feeds and Feeding; handout given |  What the fish need nutritionally Factors in fish feeding |  Fish feeds and feeding Feed conversion Feed components Fishmeal alternatives Alternative feeds Feeding behaviors |
| 20 MINUTES | Discussion over Chapter 15 |  Question and Answer |  Students can ask instructors questions and discuss what was presented to them |
| PAU | Class ends |  |  |
| HOMEWORK | Students continue daily documentation (maintenance log) of their mini-system at home; complete handouts if unable to do so during class; read chapters 6, 14, and 15 complete take home open book quiz over chapter 6, 14, 15 hand in quiz at next class |  |  |

Class Outline: Month Four

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| TIME | OVERVIEW | MAIN IDEA | SUBTOPICS |
| 25 MINUTES | Hand in quiz and completed handout from previous month followed by Q&A |  Review of previous month |  Assignment to be handed in Quiz to be handed in Students can ask instructors questions and discuss what was presented to them the previous month |
| 25 MINUTES | Slide show presentation over Chapter 7 Plant Selection; handout given |  Types of plants used in aquaponics |  Lettuce Chives Watercress Basil Mint Chinese Cabbage Tomatoes |
| 15 MINUTES | Discussion over Chapter 7 Plant Selection |  Question and Answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES | Slide show presentation over Chapter 11 Plant Nutrition; handout given |  What plants need Factors that affect plant nutrition |  pH and nutrient availability to plants Concentration of elements Plant uses of individual elements Deficiencies and excesses Nutrient concentration testing |
| 20 MINUTES  | Break |  |  |
| 15 MINUTES | Discussion over Chapter 11 Plant Nutrition |  Question and Answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES  | Slide show presentation over Chapter 12 Photosynthesis and Plant Lighting; handout given |  Plant physiology Factors of lighting |  Photosynthesis and transpiration Light spectrums Measuring light Artificial lighting Plant lighting |
| 15 MINUTES | Discussion over Chapter 12 Photosynthesis and Plant Lighting |  Question and Answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES | Speaker to come in and talk about Plant Health and Care (Chapter 10); Chapter 10 handout given |  To be announced |  To be announced |
| 25 MINUTES | Discussion and Q&A with speaker over Plant Health and Care (Chapter 10) |  Question and Answer |  Students can ask guest speaker questions and discuss what was presented to them |
| PAU | Class ends |  |  |
| HOMEWORK | Students continue daily documentation (maintenance log) of their mini-system at home; complete handouts if unable to do so during class; read chapters 7, 10-12 complete take home open book quiz over chapters 7, 10-12 hand in quiz at next class |  |  |

Class Outline: Month Five

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| TIME | OVERVIEW | MAIN IDEA | SUBTOPICS |
| 25 MINUTES | Hand in quiz and completed handout from previous month followed by Q&A |  Review of previous month |  Assignment to be handed in Quiz to be handed in Students can ask instructors questions and discuss what was presented to them the previous month |
| 25 MINUTES | Slide show presentation over Chapter 16 Water Quality Dynamics; handout given |  Components of water quality Why water quality is important |  pH pH adjustment and nutrient supplementation Microbial processes Ammonia Nitrite Nitrate Water temperature Dissolved oxygen Alkalinity |
| 15 MINUTES | Discussion over Chapter 16 Water Quality Dynamics |  Question and Answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES | Break |  |  |
| 20 MINUTES  | Slide show presentation over Chapter 17 Greenhouse and Environmental Control; handout given |  Why greenhouses are beneficial in aquaponics |  Greenhouse styles Greenhouse components Reducing greenhouse energy costs |
| 15 MINUTES | Discussion over Chapter 17 Greenhouse and Environmental Control |  Question and Answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES  | Slide show presentation over Chapter 18 Renewable Energy and Aquaponics; handout given |  Alternatives to electricity |  Anaerobic digesters and biogas Wood and waste burners for heat Geo-thermal energy Solar energy |
| 15 MINUTES | Discussion over Chapter 18 Renewable Energy and Aquaponics |  Question and Answer |  Students can ask instructors questions and discuss what was presented to them |
| 20 MINUTES | Hands on Water Quality Activity |  Lab on pH adjustment |  How to raise pH How to lower pH |
| PAU | Class ends |  |  |
| HOMEWORK | Students continue daily documentation (maintenance log) of their mini-system at home; complete handouts if unable to do so during class; read chapters 16-18 complete take home open book quiz over chapters 16-18 hands in quiz at next class. Students will also be asked to make notes of questions they have for the exam review to take place the following month. |  |  |

AGENDA / Outline: MONTH SIX

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| TIME | OVERVIEW | MAIN IDEA | SUBTOPICS |
| 25 MINUTES | Hand in quiz, file containing daily documentation (maintenance log) of the students mini-systems, and completed handout from previous month followed by Q&A |  Review of previous month |  Assignment to be handed in Quiz to be handed in Students can ask instructors questions and discuss what was presented to them the previous month |
| 25 MINUTES | Review of Course Materials |  Review of the course materials |  |
| 15 MINUTES | Break |  |  |
| 20 MINUTES | Written Exam over Course content |  Students given Exam |  |
| 20 MINUTES  | Assign day/time for students to complete the Practical part of the Exam in the greenhouse |  One on one with students to set a time that they can be monitored for completion of the hands on Practical portion of the exam |  |
| 15 MINUTES | Class ends |  |  |