“Let it Grow” SAMPLE MONTH BY MONTH LESSON PLANS

Class Outline: Month One

|  |  |  |  |
| --- | --- | --- | --- |
| 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

|  |  |  |  |
| --- | --- | --- | --- |
| 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

|  |  |  |  |
| --- | --- | --- | --- |
| 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

|  |  |  |  |
| --- | --- | --- | --- |
| 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

|  |  |  |  |
| --- | --- | --- | --- |
| 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

|  |  |  |  |
| --- | --- | --- | --- |
| 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 |  |  |