



UNIVERSITI TEKNOLOGI MARA

AGA704: CONTROLLED ENVIRONMENT CROP PRODUCTION

Course Name (English)	CONTROLLED ENVIRONMENT CROP PRODUCTION APPROVED
Course Code	AGA704
MQF Credit	3
Course Description	This course discusses controlled environment crop production as the effective technique to maximize yield and to produce high quality products with limited amount of resources and minimal impact to the environment. Major environmental factors affecting plant growth and development like lighting, gas supply, nutrient supply, temperature and humidity, can be strictly controlled by automated system under such crop production system. Knowledge on the interactions between plants and their microenvironments will be used to maximize harvest index. Lectures will also cover critical controlled environment issues and practices of plant production in greenhouses and growth chambers.
Transferable Skills	knowledge and skill of controlled environment crop production
Teaching Methodologies	Lectures, Discussion, Journal/Article Critique
CLO	CLO1 Explain the basis of energy and mass transfer in the plant-environment interactions CLO2 Utilize the knowledge on growth resource availability and species requirement to optimize quantum efficiency of crop canopies, water-use efficiency, and nutrient recycling during crop production under controlled environment CLO3 Relate the plant growth optimization requirement in proposing or designing automated and/or robotic crop production systems
Pre-Requisite Courses	No course recommendations
Topics	
1. Introduction 1.1) Traditional (earth-based) and non-traditional (extraterrestrial) system 1.2) Overview of plant responses to environmental conditions 1.3) Fundamentals to controlled environment crop production	
2. Supplemental Lighting and Temperature Control 2.1) Photomorphogenesis 2.2) Artificial light sources 2.3) Light waveband, uniformity and photoperiod 2.4) Quantum efficiency of crop canopies 2.5) Temperature control for optimum functional efficiency 2.6) Ventilation 2.7) Carbon dioxide enrichment system	
3. Medium 3.1) Soilless mixtures 3.2) Hydroponic production 3.3) Aeroponic production 3.4) Plant spacing 3.5) Sanitation 3.6) Pathogen control	
4. Water Source 4.1) Non-recirculating system vs recirculating system 4.2) Water use efficiency 4.3) Management of relative humidity 4.4) Water quality	

5. Nutrient Delivery System

- 5.1) Hardware components
- 5.2) Automated pH/conductivity control
- 5.3) Nutrient film technique
- 5.4) Deep flow technique

6. Plant Growth Analysis

- 6.1) Relative growth rate
- 6.2) Juvenile phase
- 6.3) Reproductive growth
- 6.4) Critical growth period
- 6.5) Proximate composition and caloric partitioning
- 6.6) Optimum plant age at harvest

7. Automated Monitoring and Control System

- 7.1) Glass house
- 7.2) Growth chamber
- 7.3) Total power consumption
- 7.4) Maintenance

Assessment Breakdown	%
Continuous Assessment	70.00%
Final Assessment	30.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Assignment 1	15%	CLO1 , CLO2
	Assignment	Assignment 2	15%	CLO1 , CLO2
	Attendance	n/a	5%	CLO1 , CLO2 , CLO3
	Presentation	engagement	5%	CLO1 , CLO2
	Test	Mid Term Test	30%	CLO1 , CLO2

Reading List	This Course does not have any book resources
Article/Paper List	This Course does not have any article/paper resources
Other References	<ul style="list-style-type: none"> • Book Acquah, G 2001, <i>Principles of Crop Production</i>, Prentice Hall • Book Barker, A.V. and Pilbeam, D.J. 2007, <i>Handbook of Plant Nutrition</i>, CRC Press • Book Hashimoto, Y., Bot, G.P.A., Day, W., Tantau, H.J. and Nonami 1993, <i>The Computerized Greenhouse: Automatic Control Application in Plant Production.</i> , Academic Press. • Book Hopkins, W.G., and Huner, N.P.A. 2009, <i>Introduction to Plant Physiology (4th Edition).</i> , John Wiley & Sons, Inc. • Book Les, B. 2003, <i>Hydroponics: Soilless Gardening Explained.</i> , The Crowood Press. • Book Mazumdar, B.C. 2004, <i>Orchard Irrigation and Soil Management Practices.</i> , Daya Publishing House, New Delhi. • Book Sharma, R.K. and Sharma, T.K. 2002, <i>Irrigation Engineering.</i>, Ram Nagar, New Delhi. • Book Srivastava, H.S. and Singh, R.P. 1999, <i>Nitrogen Nutrition and Plant Growth.</i>, Science Publisher.