



UNIVERSITI TEKNOLOGI MARA

AGR521: SOIL FERTILITY

Course Name (English)	SOIL FERTILITY APPROVED
Course Code	AGR521
MQF Credit	3
Course Description	This course is designed to provide an overview of the fundamental concepts of soil fertility and plant nutrition. Different areas of soil science that play important role in influencing the soil properties which will directly or indirectly affect soil fertility will be examined. This course will complement the students existing knowledge of soil science and help the student understand soil conditions affecting the availability of different plant nutrients; function and movement of different nutrients in plants and methods of determining nutrient levels in plants and in soils. Upon completion, students should understand and know the principles of managing plant nutrient for crop production, fertilizer materials, techniques of crop fertilization, soil fertility maintenance and management practices for optimizing fertilizer use and understand the process of carrying out soil and plant tissue testing as diagnostic tools in nutrient management. The knowledge gained will provide students with the basic knowledge of soil fertility management and fertilizer requirement for plantation and agricultural crops.
Transferable Skills	Basic knowledge of soil fertility management and fertilizer requirement for plantation and agricultural crops
Teaching Methodologies	Case Study, Problem Based Learning (PBL), Presentation
CLO	<p>CLO1 Represent and relate the concept of soil fertility, plant nutrition and nutrient management.</p> <p>CLO2 State and discuss the influence of soil chemical, biological and physical properties on nutrient availability to plants.</p> <p>CLO3 Differentiate and interpret data on soil fertility and plant nutrition problems and recommend proper correction measures.</p> <p>CLO4 Communicate to peers verbally on maximizing soil productivity while maintaining or enhancing environmental quality.</p>
Pre-Requisite Courses	No course recommendations
Topics	
1. Soil Fertility and Plant Nutrition 1.1) Soil productivity, fertility and fertilizer consumption 1.2) World population and food production 1.3) Yield limiting factors 1.4) Essential and minor nutrients	
2. Basic Soil-Plant Relationship 2.1) Soil solution and ion exchange 2.2) Role of clay minerals and organic matter 2.3) Cation exchange capacity and base saturation 2.4) Movement of ions from soil to root 2.5) Root interception, mass flow and diffusion	
3. Nutrients Transport in Plants 3.1) Passive and active ion uptake by plants 3.2) Long distance transport of nutrients 3.3) Membrane transport	

<p>4. Soil Acidity and Alkalinity</p> <p>4.1) Acid and base concepts 4.2) Active acidity and potential 4.3) Determination of lime requirement 4.4) Soil pH for crop production 4.5) Soil liming 4.6) Soil acidification, saline and sodic soils</p>
<p>5. Nitrogen</p> <p>5.1) The N cycle 5.2) Nitrogen additions and fixation from the atmosphere 5.3) Nitrogen transformations and losses in soil 5.4) Nitrogen sources for crop production 5.5) Forms and functions of N in plants 5.6) Nitrogen transport and metabolism in plants 5.7) Deficiency and toxicity symptoms</p>
<p>6. Phosphorus and Potassium in Soil</p> <p>6.1) The P cycle 6.2) Forms of P in soil and factors affecting P fixation 6.3) P sources for crop production 6.4) The K cycle and K forms in soil 6.5) Leaching of K 6.6) Factors affecting K availability</p>
<p>7. Phosphorus and Potassium in Plants</p> <p>7.1) P transport and forms of P in plants 7.2) Functions of P in plants 7.3) Deficiency and toxicity symptoms of P 7.4) K transport in plants 7.5) Function of K in plants 7.6) Deficiency and toxicity symptoms of K</p>
<p>8. Sulfur, Calcium and Magnesium in Soil</p> <p>8.1) The S cycle 8.2) Forms of S in soil and sulfur mineralization/ immobilization 8.3) Sulfur volatilization 8.4) Sources of S for crop production 8.5) The Ca cycle and forms in of Ca in soil 8.6) Sources of Ca for crop production 8.7) The Mg cycle and forms of Mg in soil 8.8) Sources of Mg for crop production</p>
<p>9. Sulfur, Calcium and Magnesium in Plants</p> <p>9.1) Forms of S, Ca and Mg in plants 9.2) S, Ca and Mg transport and functions in plants 9.3) S, Ca and Mg deficiency and toxicity symptoms</p>
<p>10. Micronutrients in Soil and Plants</p> <p>10.1) Micronutrients requirement by plants 10.2) Micronutrients in soils 10.3) The Fe, Zn, Cu and Mn cycle 10.4) The B, Mo, Cl and Ni cycle</p>
<p>11. Evaluation of Soil Fertility and Plant Nutrition</p> <p>11.1) Nutrient deficiency symptoms of plants 11.2) Plant analysis 11.3) Field and Lab tests 11.4) Biological tests 11.5) Soil analysis</p>
<p>12. Nutrient Management</p> <p>12.1) Crop characteristics 12.2) Soil characteristics 12.3) Nutrient placement 12.4) Specific recommendations 12.5) Fertilization with manure sludge and wastes</p>
<p>13. Agricultural Productivity and Environmental Quality</p> <p>13.1) Sustainable agriculture 13.2) Soil and crop productivity 13.3) Environmental quality</p>

Assessment Breakdown	%
Continuous Assessment	60.00%
Final Assessment	40.00%

Details of Continuous Assessment	Assessment Type	Assessment Description	% of Total Mark	CLO
	Assignment	Assignment	20%	CLO1
	Journal/Article Critique	Review paper	20%	CLO3
	Presentation	Video presentation	20%	CLO4

Reading List	Recommended Text	<ul style="list-style-type: none"> • John L. Havlin, Samuel L. Tisdale, Werner L. Nelson, James D. Beaton 2014, <i>Soil Fertility and Fertilizers: An Introduction to Nutrient Management</i>, 8th Ed., Pearson Hall Upper Saddle River, NJ • Roland N Issaka 2012, <i>Soil Fertility</i>, InTech • James F Power, Rajendra Prasad 2010, <i>Soil Fertility Management for Sustainable Agriculture</i>, Taylor & Francis • Kowligi R Krishna 2002, <i>Soil Fertility and Crop Production</i>, Science Publishers • Rattan Lal, B.A. Stewart 2012, <i>Soil Water and Agronomic Productivity</i>, CRC Press • Rattan Lal, B.A. Stewart 2013, <i>Principles of Sustainable Soil Management in Agroecosystems</i>, CRC Press • Havlin, J.L 2006, <i>Fundamental Soil Science Lab Manual</i>, Thompson Delmar Learning Clifton Park, NY • Brady, N.C and R.R. Weil 2012, <i>Elements of the Nature and Properties of Soils</i>, 12th Ed., Prentice Hall Upper Saddle River, NJ
Article/Paper List	This Course does not have any article/paper resources	
Other References	This Course does not have any other resources	