

# **Doctor of Philosophy in Soil Science**

## **Soil Science Department, College of Agriculture**

### **King Saud University**

Soil Science Department, King Saud University offers graduate work leading to Ph.D. degree in soil science which started recently in year 2002 (1423). The program requirements are 22 credit hours and preparation of thesis in one of soil science areas such as: Environmental soil physics, Environmental soil chemistry, Soil pedology, Soil mineralogy, Soil fertility and plant nutrition, Soil microbiology, Soil and water management, Soil plant water relationships, Soil and water contamination, The use of remote sensing in land survey and evaluation. The main goal of this program is to train researchers and develop scientific research in soil and environmental sciences in Saudi Arabia.

**The Degree: Ph.D. in Soil Science**

#### **Program Objectives:**

Graduate study program at Soil Science Department, College of Agriculture aims to prepare well qualified students to carry out the required academic and applied research programs in soil and environmental sciences under Saudi Arabian conditions. Therefore the aims of the program are as follows:

- 1- Activate scientific research in soil science related to Saudi Arabian conditions with emphasis on the following:
  - Arid and semi-arid soil characteristics studies.
  - Problems of irrigated agriculture and sustainable soil management practices
  - Evaluation of arid lands quality for agriculture land use.
  - Soil, water and plant relations for conservation of water and other agriculture inputs.
  - Maximizing the use of new technologies such as remote sensing, GIS and biofertilizer in soil science studies.
- 2- Preparation of scientifically qualified students in soil science to serve the Kingdom development plans such as:
  - Academic staff for education and scientific research at the universities and agriculture institutes.
  - Scientific staff capable of supervising applied research at research institutions.
- 3- Creation of new opportunities for cooperation between Ph.D. soil graduates working at research institutions and the university through cooperative applied research programs.

## **Admissions:**

- 1- Admission is open to all qualified students who hold Master degree in soil science or other related specialization from King Saud University or other qualified university.
- 2- Students should pass personal meeting (interview) with the department graduate committee.
- 3- The student is required to have TOEFL score of 450 or other equivalent English language examination or M.Sc. degree from non-Arabic university with English study language.

## **Degree requirements and study program:**

- 1- The study leading to Ph.D. in Soil Science is basically by dissertation and some courses. The program requires a minimum of 22 units, see attached, in which 6 units may be taken from the M.Sc. level not studied before.
- 2- The department decides the study plan for the students at the beginning of the 1<sup>st</sup> level according to the minor specialization.
- 3- A comprehensive exam is required
- 4- Preparation of dissertation (700 level) in the student specialization that are original and specific.

# Graduate Courses Plan

## Ph.D. in Soil Science

### Department of Soil Science, College of Agriculture

**FIRST LEVEL:**

No.	COURSE No. & SYMBOL	COURSE TITLE	UNITS
1	621 SOSC	Soil Physical Chemistry	3(3+0)
2	652 SOSC	Soil Classification and Evaluation	3(2+1)
3	... SOSC	Dep. selects one course from the courses list	3
	Total		9

**SECOND LEVEL:**

No.	COURSE No. & SYMBOL	COURSE TITLE	UNITS
1	690 SOSC	<b>Selected Topics in Soil Science</b>	2(2+1)
2	691 SOSC	<b>Seminar (1)</b>	1(1+0)
3	... SOSC	Dep. selects 2 courses from the courses list	6
	Total		9

**THIRD LEVEL:**

No.	COURSE No. & SYMBOL	COURSE TITLE	UNITS
2	692 SOSC	<b>Seminar (2)</b>	1(1+0)
3	... SOSC	Dep. selects one courses from the courses list	3
	Total		4

**THE FOLLOWING LEVELS:**

No.	COURSE No. &	COURSE TITLE	UNITS
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	<b>SYMBOL</b>		
1	700 SOSC	<b>Thesis</b>	

**Courses List Selection  
Ph. D. in Soil Science  
Department of Soil Science, College of Agriculture**

<b>COURSE No. &amp; SYMBOL</b>	<b>COURSE TITLE</b>	<b>UNITS</b>
622 SOSC	Chemistry of Soil Organic Matter	3(2+1)
623 SOSC	Chemistry of Soil Colloids	3(2+1)
631 SOSC	Organic Manure and Biofertilizers	3(3+0)
651 SOSC	Applications of Remote Sensing in Soil	3(2+1)
661 SOSC	Transport Processes in Soil Environment	3(3+0)
662 SOSC	Soil, Water, Plant Relationships	3(3+0)
671 SOSC	Soil Biochemistry	3(2+1)
672 SOSC	Bioremediation of Environmental Soil Pollutants	3(3+0)
Any graduate courses offered at KSU which the department of soil science approved to meet student's specialization need.		

**Courses Content**  
**Ph. D. in Soil Science**  
**Department of Soil Science, College of Agriculture**

**621 SOSC Soil Physical Chemistry**  
**3(3+0)**

The solid-liquid interface in soils. Application of surface charge and electrical double layer in soil system. Chemical reactions in soils. Kinetic reactions in pure and heterogeneous systems. Equations to describe kinetic reactions in clay and soil. Thermodynamics of soil solution. Precipitation and dissolution reactions in soils.

**622 SOSC Chemistry of Soil Organic Matter**  
**3(2+1)**

The nature of organic matter in soil. Molecular structure of organic matter in soil. Classification of organic matter in soil. The processes and factors of humus formation in soil. Functional groups of organic substances. Nature binding of humus substance with mineral components. Adsorption complexes in soil. The role of organic matter in soil formation and soil fertility.

**623 SOSC Chemistry of Soil Colloids**  
**3(2+1)**

Introduction to colloidal systems. Properties of soil colloids. Electric potential of clay particles. Equilibrium between attraction and repulsion forces. Interactions of soil colloids, amorphous materials in soils. Silica, Aluminum, and Iron oxides and hydroxides in soils. Organic colloids in soils.

**631 SOSC Organic Manure and Biofertilizers**  
**3(3+0)**

Organic manure sources. Production methods. Types of organic manure. Factors affecting their quality. Biofertilizers types. Microorganisms used. Methods of proliferation. Carriers, preservation and expiry date. Efficiency of Biofertilizers.

**651 SOSC Applications of Remote Sensing in Soil**  
**3(2+1)**

Development of remote sensing systems. Relationship between sensing systems and electromagnetic energy. Sensors and wavelength limits. Satellite data and images and its application in agriculture. Light energy interactions with soil surface, plants, and water. Use of aerial photograph in natural resources survey. Application of remote sensing data in: Soil spatial variability, farm management, monitoring changes in land use, and soil degradation.

### **652 SOSC Soil Classification and Evaluation** **3(2+1)**

Pedological and artificial systems. FAO system. American system of soil taxonomy and the subsequent developments. Diagnostic characteristics used. Detailed studies of the different levels. Aridisol , Entisol and Mollisol orders. Field applications of soil classification to Saudi soils. Land evaluation systems for different land use. Soil evaluation for irrigated agriculture. Geographic Information Systems (GIS) and Soil Information Systems (SIS).

### **661 SOSC Transport Processes in Soil Environment** **3(3+0)**

Transport processes of water, heat, and solutes in soils. Physical and mathematical description of nonsteady transports in unsaturated zone with emphasis on analytical and numerical solutions to water and chemical contaminants transport in soil environment. The theory of convection and dispersion flow of reactive solutes. The chemical and biological reactions affecting solute movements. The environmental importance of transport processes in soils.

### **662 SOSC Soil, Water, Plant Relationships** **3(3+0)**

Soil as medium for plant growth, with emphasis on interactions between soil physical properties and plant growth. Basic environmental variables (temperature, humidity, wind and radiation) and their relations with plant- soil-atmosphere exchange processes. Factors affecting movement of water from soil to plant. Mathematical equations and computer models will be used to study the water movement from soil to plant.

### **671 SOSC Soil Biochemistry** **3(2+1)**

Biodegradation of organic compounds. Enzyme activity of soil microorganisms. Bio-oxidation of inorganic compounds. Relationship between enzyme activity and microbial growth kinetics. Metabolites produced from biological activity of soil microflora. Microbial growth regulators. Microbial polymers and soil properties.

**672 SOSC Bioremediation of Environmental Soil Pollutants**  
**3(3+0)**

Soil pollutants and their role in the inhibition of some biological processes in soil. Microorganisms used in bioremediation. Selection of most active strains. Methods of application. Factors affecting their activity. Rate of Bioremediation of different pollutants. Byproducts and their persistence in soil. Bio- volatilization of some toxic heavy metals.

**690 SOSC Selected Topics in Soil Sciences**  
**2(2+0)**

Advanced and current topics in one of the soil science fields (Soil chemistry, soil fertility, plant nutrition, soil pedology, soil physics, soil microbiology, and soil mineralogy). Student registers with one of the staff in the respective field.

**691 SOSC Seminar (1)**  
**1(1+0)**

Discussion of Advanced research problems in soil science.

**692 SOSC Seminar (2)**  
**1(1+0)**

Discussion of Advanced research problems in soil science.

**700 SOSC Thesis**