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| **وزارة التعليم العالي**  **جامعة الملك سعود**  **عمادة الدراسات العليا**  **كلية علوم الأغذية والزرعة**  **قسم علوم التربة** |  |

**PhD in Soil Science**

**(Courses and Thesis Option)**

1434 / 1435 AH

2013 / 2014

**Introduction:**

Soil science (SOCS) is considered as the most important and necessary disciplines for agricultural and environmental sciences in many prestigious universities of the world. The soil plays an important and main role in agriculture and the environment issues. The SOCS fields includes; soil genesis, soil survey and classification, soil physical and chemical properties, soil water relationships, water resources management, the movement of water into the soil, soil water retention, soil fertility and plant nutrition, soil microbiology, soil mineralogy, soil conservation and reclamation, sources of soil and water contamination, movement of contaminants in the soil and others related to soil ad war environment.

The arid regions in general and the Kingdom of Saudi Arabia (KSA) in particular, suffers from water scarcity and limited current and future water resources and environmental problems. To cope with these limitations and problems, the department of SOCS - King Saud University (KSU), studied its current status and human expertise and physical resources (ex., well equipped Labs) as compared to other prestigious soil science departments concluded a need to develop and modernized its postgraduate programs. The soil science department at the KSU has a leading role in the adoption and carrying out many researches related to water scarcity and environmental issues in the kingdom.

The Department SOCS - KSU has been offering a Ph.D. program in Soil Science since 1423 Higri (2002). The requirement of Ph.D. program in SOCS was to fulfill study of 22 credits in addition to dissertation. This was in accordance with section 2, article 34 of postgraduate studies consolidated regulations of Saudi universities (PSCRSU). To follow the KSU university new approach with respect postgraduate studies, the department improved the Ph.D. degree requirement to be in accordance with section 1, article 34 of the PSCRSU, which stated that the required credits should be not less than 30 credits. After these new modifications, the requirements of Ph.D. program is to fulfill 34 credits in addition to dissertation preparation in one of the following soil science fields: Environmental Soil Physics; Environmental Soil Chemistry; Soil Pedology; Soil Mineralogy; Soil Fertility and Plant Nutrition; Soil Microorganisms; Soil and Water Management; Soil-Plant-Water Relationships; Soil and Water Contaminations; Remote-sensing Applications in soil survey and land evaluation……etc.

Finally, the overall objective of this Ph.D. program is to develop highly trained and scientifically qualified students able to carry out scientific research in the different aspects of soil, water and environmental sciences as pertaining to the KSA; and can link the university with research centers, educational institutions, and community.

**Degree Name:**

Doctor of Philosophy in Soil Science (Ph.D. in Soil Science)

**Significance and Justifications of Program Amendment**

1. Responding to the knowledge and qualification developments in the fields of soil science in order to meet the status of water and environments in the Kingdom.
2. In response to the King Saud university new approach with respect postgraduate studies, the department improved the Ph.D. degree requirement to be in accordance with section 1, article 34 of the PSCRSU, which stated that the required credits should be not less than 30 credits.

**Program’s Vision**

To graduate national and international qualified personals in the field of soil science.

**Program’s Mission**

Providing high quality learning environment that combines curriculum, advanced professional skills, and scientific research in order to graduate students that have great high qualification, scientific knowledge, and practical skills and thus able to contribute and developing the sustainable and suitable use of soil and water and can deal with the current and future problems which are related to soil systems in the rural and urban areas.

**Program’s Objectives**

1. Activate scientific research in soil science related to arid desert conditions of Saudi Arabia.
2. Graduate qualified academic personals in soil science to serve as academic staff at universities and agriculture institutes.
3. Graduate qualified scientist in soil science to lead the applied scientific research in research centers.
4. Creation new opportunities for cooperation between KSU represented in soil science department and other research centers, educational institutions, and community through cooperative applied research programs

* **Program’s Outcomes**

1. **Knowledge and Comprehension:**
2. Providing the student with deep understanding of soil and environmental sciences the principles and their interrelationships.
3. The student should be able to builds up their ability to realize and understands the environment problems related to soil, and how to solve them.
4. Providing the student the ability to know the scientific methodology for scientific research, and knows how to use the scientific tools.

**B- Mental Skills:**

1. Providing the student with the ability to obtain the required information that helps to understand the soil problem and able to suggest suitable solutions.

2. Providing the student with the ability to distinguish between the possible management and technical alternatives to solve the problems in the fields of soil science.

3. Providing the student with the ability to know how to criticize and discuss the researches in the fields of soil science.

4. providing the student with the ability know how to draw results ad conclusions

**C- Professional and Practical Skills:**

1. Providing the student with the ability to use the scientific research tools to plan and implement scientific experiments.

2. Providing the student with the ability to use at least two main instruments in the fields of soil science.

3. Providing the student with the ability to realize the professional and ethical responsibilities of implementing scientific research.

4. Providing the student with the ability to realize the importance of the continuing education and involvement as trainee and trainer.

**D- General Skills:**

1. Accustoming the students to work together in teams in planning and implementing scientific research.

2. Providing the student with the ability to communicate efficiently verbally and in writing with specialists and non-specialist (common people).

* **Program’s Beneficiaries:**

-The Educational Sector

Saudi, Arab, and international universities

Saudi, Arab, and international institutes

Technical colleges

-Research Sector

King Abdul Aziz's scientific and technical city

King Abdullah's City of Atomic Energy

The Saudi Geological Survey

Research centers of the ministry of agriculture

-General Sector

Ministry of agriculture

Ministry of water

Ministry of Municipalities and rural affairs

General presidency of environment and meteorology

General organization of wildlife and conservation

Saudi Organization of food and drug

Saudi organization of Standardization, Metrology, and Quality

-Industrial Sector

Major national industrial enterprises such as Saudi Aramco, SABIC, and Maaden (Saudi Arabian Mining Company).

Fertilizer plants companies.

- Private sector:

Agricultural companies

Private Laboratories

Fertilizer companies

Agricultural and Environmental consulting and Advisory studies centers

* **Employment Opportunities Available:**

Graduating qualified cadres of PhD holders in the field of soil science allows them to work in many posts like:

1. Staff members in universities and institutes of agriculture inside ond outside the Kingdom.

2. To work as scientist in advisory and research centers of general or private sectors.

3. To work as leaders in various governmental sectors such as the ministry of agriculture, ministry of water, municipalities …etc

4. To work in private sectors companies especially those related to agriculture, soil, water, environment and fertilizers manufacturing.

5. To work in national and international organizations for agriculture, food, and international cooperation, as well as in joint agricultural and environmental projects between different countries.

* **Admission Requirements**
* **Admission requirements enumerated in the Unified Law Organizing Graduate Studies at Saudi Universities**

1. Admission is open to all qualified students who hold Master degree in soil science or other related specializations from King Saud University or other qualified university.
2. The student is required to have a TOEFL score of 450 or other equivalent English language examination or M.Sc. degree from non-Arabic university teaching with English language.

* **Additional admission requirements stipulated by college/ department (if any):**

1. Student should pass personal interview which held by the department.
2. Student from other specialization (Other than Soil Science) may require studying prerequisite credits units determined by the department depending on the background of the student.

* **Requirements for Obtaining the Degree:**
* **Courses and Thesis Option**

1. Passing 34 study units of the program
2. Successful completion of doctoral dissertation

* **Program’s General Structure:**
* **Courses and Thesis Option**

Number of required units is 34 in addition to a thesis as follows:

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| **Type of Courses** | **No. of Courses** | **No. of Units Required** |
| **Core** | 8 | 19 |
| **Elective (if any)** | 5 | 15 |
| **Thesis** | 700 SOSC | -- |
| **Total** | 13 | 34 |

* **Program’s Study Plan:**

**First Level:**

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| --- | --- | --- | --- |
| **#** | **Course Code** | **Name** | **No. of Study Units** |
| **1** | 601 SOSC | New trends in Soil Science Research | 3 (3+0) |
| **2** | 621 SOSC | Soil Physical Chemistry | 3(3+0) |
| **3** | 651 SOSC | Applications of Remote Sensing in Soil | 3(2+1) |
| **Total** | | | **9** |

**Second Level:**

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| **#** | **Course Code** | **Name** | **No. of Study Units** |
| **1** | 633 SOSC | Urban Soils | 3(2+1) |
| **3** |  | Selection (1) | 3 |
| **4** |  | Selection (2) | 3 |
| **Total** | | | **9** |

**Third Level:**

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| **#** | **Course Code** | **Name** | **No. of Study Units** |
| **1** | 623 SOSC | Chemistry of Soil Colloids | 3(2+1) |
| **2** | 691 SOSC | Seminar (1) | 1 (1+0) |
| **3** |  | Selection (3) | 3 |
| **4** |  | Selection (4) | 3 |
| **Total** | | | **10** |

**Fourth Level:**

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| **#** | **Course Code** | **Name** | **No. of Study Units** |
| 1 | 690 SOSC | Selected Topics in Soil Science | 2 (2+0) |
| **2** | 692 SOSC | Seminar (2) | 1 (1+0) |
| 3 |  | Selection (5) | 3 |
| **Total** | | | **6** |

**THE FOLLOWING LEVELS:**

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| **#** | **Course Code** | **Name** | **No. of Study Units** |
| **1** | 700 SOSC | Dissertation |  |

**Elective courses list fo Ph.D. in soil science:**

**Soil Science Department, College of Food and Agricultural Sciences**

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| **No** | **COURSE No.** | **Course  Title** | **Credits** |
| 1 | 622 SOSC | Chemistry of Soil Organic Matter | 3(2+1) |
| 2 | 627 SOSC | Applications of Soil Mineralogy | 3(2+1) |
| 3 | 631 SOSC | Organic Manure and Biofertilizers | 3(3+0) |
| 4 | 632 SOSC | Nutrient Management | 3 (2 +1) |
| 5 | 652 SOSC | Soil Classification and Evaluation | 3(2+1) |
| 6 | 661 SOSC | Transport Processes in Soil Environment | 3(3+0) |
| 7 | 662 SOSC | Soil, Water, Plant Relationships | 3(3+0) |
| 8 | 671 SOSC | Soil Biochemistry | 3(2+1) |
| 9 | 672 SOSC | Bioremediation of Environmental Soil Pollutants | 3(3+0) |
| Any additional graduate courses from other departments deemed by the soil science department to be important for the student study. | | |  |

* **Description of Courses:**

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **601 SOSC Recent trends in soil science research 3 (3 +0)**  Discussion of the latest research trends in the area of soil science , which include: quality and evaluation of the soil, treatment of contaminated soils, the availability of natural resources and usage in agriculture, recycling of agricultural and industries wastes, organic farming and the development of quality standards, characterization and conservation of agricultural biodiversity, soil and water management, urbanization and decline in agricultural soil, effects of amendments and organic materials on environmental processes, climatic changes and their effects on soil and water quality. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **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. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **622 SOSC Chemistry of Soil Organic Matter 3 (2 +1)**  The nature of organic matter. Molecular structure of organic matter. Classification of organic matter. The processes and factors of humus formation. Functional groups of organic substances. Nature binding of humus substance with mineral components. Adsorption complexes. The role of organic matter in soil formation and soil fertility. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **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. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **627 SOSC Applications of Soil Mineralogy 3 (2 +1)**  Introduction to soil minerals, Dominant minerals in the soils and sediments of Saudi Arabia , Fractionation of clay minerals from soils and geological deposits , Chemical and Physical properties of soil minerals , Usage of clay minerals in the fields of environment and agriculture , Clay minerals as a row material in chemical industries , Applications of clay minerals in the field of Nano-technology. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **631 SOSC Organic Manure and Bio-fertilizers 2 (2 +0)**  Organic manure sources-production methods, types of organic manure and its evaluation factors-affecting their quality-types of Bio-fertilization proliferation, carriers-preservation and expiry date, efficiency of Bio-fertilizers. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **632 SOSC Nutrient Management 3 (2 +1)**  Introduction-Soil nutrient management-Precision nutrient management-Integrated nutrient management system-Efficient use of fertilizers-Fertilizer quality standards- Reducing the impact of nutrients on environmental quality-New technologies and programs for nutrients management and fertilizers recommendations-The 4R approach to soil and nutrients management**.** | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **633 SOSC Urban Soils 3 (2 +1)**  Concepts and goals of urban soils study, Importance of mapping and GIS in planning the usage of urban soils, Usage of urban soils in Saudi cities, Problems and pollution of urban soils, rehabilitation and management of urban soils, Sustainable development of urban soils. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **651 SOSC Applications of Remote Sensing in Soil 2 (2 +0)**  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 air photograph in natural resources survey. Application of remote sensing data in: Soil spatial variability, farm management, monitoring changes in land use, and soil degradation. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **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). | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **661 SOSC Transport Processes in Soil Environment 3 (3 +0)**  Transport processes of water, heat, and solutes in soils. Physical and mathematical description of non steady transports in unsaturated zone with emphasis on analytical and numerical solutions to water and chemical contaminants transport in soil environment. Detailed study on the convection and hydrodynamic dispersion. The chemical and biological reactions affecting solute movements. The environmental importance of transport processes in soils. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **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. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **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 micro flora. Microbial growth regulators. Microbial polymers and soil properties. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **672 SOSC Bioremediation of Environmental Soil Pollutants 2 (2 +0)**  Soil pollutants and their role in the inhibition of some biological processes in soil. Microorganisms used in bio-remediation. Selection of most active strains. Methods of application. Factors affecting their activity. Rate of Bioremediation of different pollutants. Byproducts and their persistence in soil. Microbial volatilization of some toxic heavy metals. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **690 SOSC Selected Topics in Soil Science 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 respected field. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **691 SOSC Seminar (1) 1 (1 +0)**  Discussion of Advanced research problems in soil science. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **692 SOSC Seminar(2) 1 (1 + (0)**  Discussion of Advanced research problems in soil science. | | |

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| **Course Code & No.** | **Name** | **No. of Units (Theoretical & Practical)** |
| **700 SOSC Dissertation**  Prepare dissertation in the fields of soil science. | | |