COLEGIO DE POSTGRADUADOS

Programa de Estudios

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| PROGRAMA DE POSTGRADO: | Hidrociencias |
| CURSO: | El agua en el sistema suelo-planta atmósfera I |
| PROFESOR TITULAR: | Leonardo Tijerina Chávez X00436 |
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| EDIFICIO/PLANTA/NÚMERO | Edafología-Hidrociencias, Planta baja N° 131 |
| CLAVE DEL CURSO: | HID-601 |
| PRE-REQUISITOS: | Fisiología Vegetal, Edafología, Agrometeorología |

TIPO DE CURSO:
[ ] Teórico
[ ] Práctico
[x ] Teórico-Práctico

PERIODO:
[ x ] Primavera
[ ] Verano
[ ] Otoño
[ ] No aplica

SE IMPARTE A :
[ x ] Maestría en Ciencias
[ x ] Doctorado en Ciencias
[ ] Maestría Tecnológica

MODALIDAD:
[ x ] Presencial
[ ] No presencial
[ ] Mixto

HORAS CLASE:

Presenciales 36

Extra clase 108

Total 144

HORAS DE PRACTICA: 48

¨CREDITOS TOTALES: 3 (tres)

Nota: Un crédito equivale a 64 horas totales (presenciales y extra clases)

**OBJETIVO GENERAL DEL CURSO**

Enseñar la complejidad de los procesos en que interviene el agua (transporte de agua, sales, nutrimentos, calor, etc.), y que tienen lugar en el sistema suelo-planta-atmósfera y para su estudio y entendimiento es necesario separarlos, aunque en la naturaleza dichos procesos ocurren en forma simultánea. Esta área es básica en la formación de profesionistas de cualquier área de las ciencias biológicas como la agronomía. Con esta idea, se quiere dar a entender que en cualquier sistema de producción (temporal de riego), el agrónomo debe tener conocimientos profundos de este tema que le ayuden en la toma juiciosa de decisiones en las diferentes actividades de la agricultura.

CURSO: EL AGUA EN EL SISTEMA SUELO PLANTA ATMOSFERA I

PROGRAMA DE POSTGRADO: HIDROCIENCIAS

| HORAS | TEMAS Y SUBTEMAS | OBJETIVOS DE LOS TEMAS |
|---|---|---|
| 1 HORA | 1. Introducción.<br>La historia de la irrigación en el mundo y México | Destacar la importancia del manejo del agua para lograr la mejor productividad de los cultivos |
| 6 HORAS | 2. El sistema agua<br>El agua en la naturaleza<br>Propiedades físicas y químicas del agua<br>Propiedades coligativas<br>Interacciones ión-agua<br>El concepto de actividad y fuerza iónica<br>El concepto del potencial del agua y sus componentes.<br>Potencial químico del agua | Enseñar las propiedades derivadas de su estructura molecular y estudiar las propiedades relacionadas con el riego<br>Caracterización del agua de riego en función de sus propiedades químicas e indicadores para medir la calidad del agua para riego |
| 9 HORAS | 3. El sistema suelo<br>La fase sólida del suelo<br>Propiedades físicas y químicas del suelo<br>Relaciones agua-suelo<br>Métodos de medición del contenido de humedad del suelo<br>Medición del potencial del agua en el suelo<br>Movimiento del agua en el suelo | Estudiar la interacción del agua con el suelo, clasificación con fines de riego, el origen de las cargas de las arcillas y las cargas dependientes del pH, propiedades del suelo que se infiere de la textura, superficie específica, capacidad de retención de agua del suelo, conductividad hidráulica, ley de Darcy, infiltración, movimiento del agua en el suelo, movimiento del agua hacia la raíz |
| 6 HORAS | 4. El sistma planta<br>Anatomía del sistema conductor de las plantas<br>Absorción de agua u nutrientes por la planta<br>Transporte del agua y solutos en la planta<br>Métodos de medición del estatus del agua en la planta<br>Relaciones agua-planta | Estudiar la absorción del agua por las plantas, movimiento del agua dentro de la planta, trayectos del movimiento del agua y nutrientes en la planta, la ley de Fick,<br>el concepto de potencial electroquímico y potencial de membrana, movimiento activo, movimiento pasivo,<br>el potencial del agua en células y tejidos, el continuo suelo planta atmósfera, indicadores del estatus hídrico del agua en las plantas, curvas de retención del agua por los tejidos, el diagrama de Hofler, transpiración, el cambio de fase de líquido a vapor en las |

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| | | cavidades estomáticas, a nivel estomático |
| 10 HORAS | 5. Relaciones agua-suelo-planta<br>Evaporación y transpiración<br>Requerimiento y calendario de riego con fines de planeación | Estudiar los factores que afectan el proceso de evapotranspiración, mediciones directas e indirectas de la evapotranspiración, el concepto de disponibilidad de agua del suelo, el concepto de coeficiente de desarrollo del cultivo, métodos para estimar el coeficiente de desarrollo de los cultivos, el concepto de evapotranspiración de referencia métodos climatológicos para estimar la evapotranspiración de los cultivos y elaborar el calendario teórico de riegos, |
| TOTAL 32 HORAS | | |

CURSO: EL AGUA EN EL SISTEMA SUELO PLANTA ATMOSFERA I

PROGRAMA DE POSTGRADO: HIDROCIENCIAS

| LISTA DE PRÁCTICAS | OBJETIVO | Horas (estimadas) |
|---|---|---|
| | **Relación de Prácticas** | |
| S | 1. Muestreo de suelos y preparación de muestras | 2 HORAS |
| | 2. Determinación de la textura. | 2 HORAS |
| | 3. Determinación de densidad aparente. | 2 HORAS |
| | 4. Determinación de materia orgánica | 4 HORAS |
| | 5. Curvas características de retención de humedad del suelo | 4 HORAS |
| | 6. Determinación de capacidad de campo | 6 HORAS |
| | 7. Porcentaje de marchitamiento permanente | 4 HORAS |
| | 8. Determinación de la curva de retención de humedad | 4 HORAS |
| | 9. Conductividad eléctrica. | 4 HORAS |
| | 10. Curva del esfuerzo de la humedad del suelo | 4 HORAS |
| | 11. Determinación de humedad. | 4 HORAS |
| | 12. Instalación y operación de bloques de resistencia eléctrica para determinaciones de humedad. | 4 HORAS |
| | 13. Instalación y operación de tensiómetros. | 4 HORAS |
| | NÚM. TOTAL DE HORAS: | 48 |

## RECURSOS DIDÁCTICOS

El curso se imparte en forma teórica, de manera presencial en un aula, mediante la exposición de los temas de manera oral con la ayuda de una computadora y un proyector también se utiliza pizarrón apoyado con libros artículos y manuales sobre el tema en cuestión.
En cada tema se presentan ejemplos de problemas y su correspondiente solución se invita a los alumnos a que participen activamente en el planteamiento y solución de los problemas
El afianzamiento de los conocimientos por los alumnos es mediante tareas extra-clase utilizando parcialmente programas de computo.

## NORMAS Y PROCEDIMIENTOS DE EVALUACIÓN

Normas de evaluación

Al final de cuatrimestre se calcula la calificación de cada alumno con la escala entre 0 a 10.0. La calificación mínima aprobatoria es de 8.0.
La calificación final se obtiene considerando las calificaciones:
de dos exámenes parciales 20 %
Tareas con un valor del 20 %
Un examen final con un valor del 26 %
Reporte de prácticas 34 %

Procedimiento de evaluación
Se evalúa con la calificación que obtienen en las tareas extra-clase, los exámenes parciales, el examen final y el reporte de prácticas con el valor que se indica en la sección anterior

BIBLIOGRAFÍA IMPRESA O ELECTRÓNICA (AUTOR, AÑO, TÍTULO, EDITORIAL, FECHA, EDICIÓN)

**Bibliografía recomendable para los temas del curso**

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TEMA 2: EL SISTEMA AGUA

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4. Cassell, D.K. and A. Klute.1986. Water potential: Tensiometry. Tn A. Klute (ed.) Methods of soil analysis. Part 1. 2nd ed. Agronomy 9. p.p. 563-596.
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Wronski, E.B., J.W. Holmes and N.C. Turner. 1985. Phase and amplitude relations between transpiration, water potential and stem shrinkage. Plant Cell Environ, 8. p.p. 613-622.

TEMA 3: EL SISTEMA SUELO

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TEMA 4: EL SISTEMA PLANTA

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TEMA 5: EL SISTEMA AGUA-SUELO

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TEMA 6: EL SISTEMA AGUA-PLANTA

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TEMA 7: EL SISTEMA AGUA-SUELO-PLANTA

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