

Ministry of Higher Education and Scientific research



**Department of Forestry**

**College of Agricultural Engineering Sciences**

**Salahaddin University-Erbil**

**Subject: Silviculture- Theory & Practice**

**Course Book: Second Stage**

**Lecturer's name (Theory): Dr. Sherzad Omar Hamad**

**(Lecturer)**

**Lecturer's name (Practice): M. Rushdy Rokan Aziz**

**(Assist Lecturer)**

**Academic Year: Fall Semester 2021-2022**

**Course Book**

<b>1. Course name</b>	<b>Silviculture- Theory and Practice</b>
<b>2. Lecturer in charge</b>	<b>Dr. Sherzad Omar Hamad</b> <b>M. Rushdy Rokan Aziz</b>
<b>3. Department/ College</b>	<b>Forestry / Agricultural Engineering Sciences</b>
<b>4. Contact</b>	<b>E-mail: <a href="mailto:sherzadomer@ymail.com">sherzadomer@ymail.com</a></b> <b>E-mail: <a href="mailto:sherzad.hamad@su.edu.krd">sherzad.hamad@su.edu.krd</a></b> <b>E-mail: Rushdy.Aziz @su.edu.krd</b> <b>E-mail : rushdyrokan@yahoo.com</b>
<b>5. Time (in hours) per week</b>	<b>Theoretical: 2</b> <b>Practical: 3</b>
<b>6. Office hours</b>	<b>Sunday to Wednesday or make appointment</b>
<b>7. Course code</b>	
<b>8. Teacher's academic profile</b> ➤ <b>( Dr. Sherzad Omar Hamad)</b>	<b>I completed my B.Sc. in Salahaddin University – Agriculture college – Plant Production Department in 2005. I got M.Sc. in Salahaddin University – Agriculture college – Forestry and Horticulture department in 2010 and my specialize is Silviculture. I completed my PhD. in Universiti Putra Malaysia in 2017. Currently, I am working as Lecturer in Forestry Department - Agriculture college, Salahaddin University.</b>

<p>➤ <b>M. Rushdy Rokan Aziz</b></p>	<p><b>He was awarded BSc. from Department of Plant Production– College of Agriculture - Salahaddin University – Erbil Iraq in 2007.</b>  <b>He was also awarded MSc. in Forest Science (Silviculture) from Department of Forestry – College of Agriculture – Salahaddin University- Erbil, Iraq in 2015.</b></p>
<p><b>9. Keywords</b></p>	
<p><b>10. Course overview:</b></p> <p>➤ <b>Theoretical Part:</b></p> <p>Silviculture is the most important branch of forestry (forest sciences) which looks at the establishment, composition, structure, and growth of a forest stand, which starts by seeds in general, and ends with economical production. In addition, the subject has significant role in increasing wood or timber production, vegetation cover and biodiversity especially in degraded soil by reforestation and afforestation due to this science deal with how to establish a forest stand and how to improve tree growth by applying Silviculture practices.</p> <p>➤ <b>Practical Part:</b></p> <p>Silviculture is one of the most important branch sciences of forestry. It was defined by <b>Shafiq Y. (1988)</b>: as the integrated science which looks at the principles of development and improvement of forests, beginner by topics of forest tree seeds, and ending by sustained economical production in the studied comprehensive plan. Based on this definition, study of forest tree seeds is the main subject of Silviculture and it is the basic unit to make a forest either naturally or artificially.</p>	
<p><b>11. Course objective:</b></p> <p>➤ <b>Theoretical Part:</b></p>	

1. Enable students to identify the forest and its types in the world and Iraq.
2. Introduce students to Silviculture concepts, objectives and its historical developments.
3. Students have to get information about Forest Seed Orchard in terms of concepts, definition, objectives, types and establishment of forest seed orchard.
4. Students have to understand of the Silviculture System.
5. Students have to understand of the forest regeneration.
6. Students must learn the intermediate treatments that apply in the forest in order to optimal growth of the tree.
7. Students have to know the types of tree harvesting which ensure tree regeneration.

➤ **Practical Part:**

1. Student must be know how the seed be formed after process of pollination and fertilization in the flower.
2. Student must identify signs of fruit maturity.
3. Student must know how to collect seeds and fruits, seed extract, store, and show the machines, tools and equipment and how to use for this purpose.
4. Students learn how to deal with seeds to determine the vitality of seeds by many important laboratory tests such as sampling, the rate of purity, thousand seed weight, determine the vitality of seeds....
5. Student must identify the reasons for the inability of seeds to germinate (Dormancy) and conduct pre-treatments for the purpose of breaking dormancy that found in some species and treatment according to type of seeds for the purpose of speed up and increase the germination rate and uniformity during the production of seedlings in nurseries.

**12. Student's obligation**

Students will be asked to prepare research papers on selective topics. There will be classroom discussions and the lecture will give enough background to evaluate problems

sets, and different issues discussed throughout the course. To get the best of the course, it is suggested that students attend classes as much as possible, read the required lectures, teacher's notes regularly as all of them are foundations for the course. Try as much as possible to participate in classroom discussions, preparing the assignments given in the course. Using quiz, exams, a laboratory practical and seed collection, seed extraction, germination test, vitality test.

In conclusion, The student must attend the classes and prepare themselves for the test, assignment reports, and quizzes.

### **13. Forms of teaching**

Different forms of teaching will be used to reach the objectives of the course: 'power point presentations for the head titles, definitions and summary of the lecture; the students can get a copy of a lecture; the white board also be used to clear the figures and meaning of words; to more clear the lectures some animations and videos will be shown. In practical part, the student will be brought to the forest to identify different tree species and collect different type of the seeds, the students also will be brought to the seed lab to know the process of seed testing and familiar with instrument and equipment that use for that purpose.

**14. Assessment scheme**

Grading: This subject includes theoretical and practical parts

	First exam	Second exam	Quiz, activity and report	Annual average	Final exam	Total
Theoretical part	5	5	5	15	50	
Practical part	12.5	12.5	10	35	0	
				<b>50</b>	<b>50</b>	<b>100</b>

**15. Student learning outcome:****In Theoretical part:**

The students will get the scientific information about Silviculture aspects which include regeneration methods to do reforestation and afforestation. The student also can enhance their knowledge about climatic factors that play important role in development of the forest. The above information help the students to be able to establish and rehabilitate the forest stand for sustainable timber production.

**In Practical Part:**

Differentiate between Forest seeds and other relatives of seeds.

- Be able to classify the different order or families of forest seeds such as present it in cone or pods, capsule, flesh fruit, winged seeds or fruit....
- How to collect the seeds by using different methods.
- Be able to deal with the collecting seeds like extraction the seeds and how to store the seeds under storage condition.

- Be able to Analysis the seeds by using different seeds testing such as purity, moisture content ,weight of 1000 seeds, germination , viability test .

## 16. Course Reading List and References:

- Graham, R. T. (2008). Silviculture and Ecology of Western US forests.

Johnson, P. S., Shifley, S. R., & Rogers, R. (2009). The Ecology and Silviculture of Oaks. CABI.

Smith, D. M., Larson, B. C., Kelty, M. J., & Ashton, P. M. S. (1997). The Practice of Silviculture: applied forest ecology (No. Ed. 9). John Wiley and Sons, Inc..

Elwes, H. J. (1922). The Silviculture of Indian trees.

-Singh, V. and Lavania, S.K. (2003). Forest Tree seeds and Nursery Management. Bishen Singh. Indian.

- Willan, R.L. (1985) A guide to forest seed handling. Reprinted 1987.

Schmidt, L. (2007) Tropical Forest Seed. Springer-Verlag Berlin Heidelberg New York.

- BISHT, N.S. and AHLAWAT, S.P (1999 ) SEED TECHNOLOGY. Itanagar - 791 111 (India).

- Bonner, F. T. , Vozzo, J. A., Elam, W. W., and Land, S. B. (1994) Tree Seed Technology Training Course. United States Department of Agriculture Forest Service .

- Friday, J. B.(2000) Seed Technology for Forestry in Hawaii. University of Hawaii at Manoa.

[www2.ctahr.hawaii.edu/oc](http://www2.ctahr.hawaii.edu/oc) .

### Arabic References:

ولي، صدرالدين بهاء الدين ( 1990 ) الانبات وسبات البذور. كلية التربية. جامعة الموصل.  
السيد، عبدالوهاب بدرالدين (1993). بذور الأشجار الخشبية و انتاج شتلاتها. كلية الزراعة. جامعة الاسكندرية  
عبدالله , ياووز شفيق و الكناني ، عادل ( 1985 ) مشاتل الغابات. كلية الزراعة و الغابات. جامعة الموصل.  
عبدالله , ياووز شفيق (1984). بذور اشجار الغابات . كلية الزراعة و الغابات. جامعة الموصل.

- Magazines and review (internet):

<https://en.wikipedia.org/wiki/Seed>

<http://www.britannica.com/plant/gymnosperm>

[http://www2.estrellamountain.edu/faculty/farabee/Biobk/BioBookDiversity\\_6.html](http://www2.estrellamountain.edu/faculty/farabee/Biobk/BioBookDiversity_6.html)

<http://www.fao.org/docrep/006/ad232e/ad232e07.htm>

[/www.seedtest.org/en/international-rules-\\_content---1--1083.html](http://www.seedtest.org/en/international-rules-_content---1--1083.html)

<http://www.agriculture.gov.ie/animalhealthwelfare/laboratoryservices/seedtestinglaboratory/>

<b>17. The Topics: Theoretical Topics</b>		<b>Lecturer's name</b>
First week	<ul style="list-style-type: none"> <li>- What is a forest?</li> <li>- Percentage of forest covers in each continents</li> <li>- Why is Forest Important?</li> <li>- Parts of a forest</li> <li>- Forest structure</li> </ul>	<p><b>Dr. Sherzad Omar Hamad</b> (2 hrs)</p>
Second week	<ul style="list-style-type: none"> <li>- What does Silviculture mean?</li> <li>-Definitions of Silviculture.</li> <li>- Objectives of Silviculture.</li> <li>- The subjects of Silviculture.</li> <li>- Historical development of the silviculture.</li> </ul>	
Third week	<ul style="list-style-type: none"> <li>- Types of forest in the world.</li> <li>- Some classification of the forest.</li> </ul>	
Fourth week	<ul style="list-style-type: none"> <li>- Natural forest in Iraq.</li> <li>- Distribution of Natural Forest among Governorates in Kurdistan Region and Iraq.</li> <li>- Divisions of Natural forest in Iraq according to tree types.</li> <li>- Stages of tree development.</li> </ul>	
Fifth week	The First Examination.	
Sixth week	<ul style="list-style-type: none"> <li>- Forest Seed Orchard</li> <li>- Concept of Seed Orchard</li> <li>- Definition of Forest Seed Orchard</li> <li>- Objectives of Seed Orchard</li> <li>- Definitions of Some Terms That Relate With Seed Orchard</li> <li>- Types of Seed Orchard.</li> </ul>	



Seventh week	<ul style="list-style-type: none"> <li>- Selection of Seed Orchard Site</li> <li>- Site preparation and establishment of Orchards</li> <li>- Silvicultural practices in a seed orchard</li> </ul>	
Eighth week	<ul style="list-style-type: none"> <li>○ Silviculture System</li> <li>○ Components of Silviculture System                             <ul style="list-style-type: none"> <li>1- Forest Regeneration                                     <ul style="list-style-type: none"> <li>• Regeneration Triangle</li> </ul> </li> <li>- Forest Regeneration Types</li> </ul> </li> </ul>	
Ninth week	<ul style="list-style-type: none"> <li>○ Components of Silviculture System (contin.)</li> <li>2- Tending (Intermediate treatments)</li> </ul>	
Tenth week	The Second Examination.	
Eleventh week	<ul style="list-style-type: none"> <li>○ Components of Silviculture System (contin.)</li> <li>3- Regeneration Harvest</li> </ul>	
Twelfth week	<ul style="list-style-type: none"> <li>- Classification of trees according to height and dominancy.</li> <li>- Site factors which impacts on growth of forest trees.</li> </ul>	
Thirteenth week	<ul style="list-style-type: none"> <li>- Effect of high and low temperature.</li> <li>- Effect of moisture.</li> <li>- Effect of light .</li> <li>- Effect of winds.</li> </ul>	
Fourteenth week	<ul style="list-style-type: none"> <li>- Tree Planting</li> <li>- Conditions of planting process.</li> </ul>	

	<ul style="list-style-type: none"><li>- The quality and age of seedling which used in planting process.</li><li>- The most important points before planting process.</li></ul>	
Fifteenth week	<ul style="list-style-type: none"><li>- Planting methods in general.</li><li>- Planting in mountain and slope areas.</li><li>- Planting forms.</li><li>- Pure forest.</li><li>- Advantage and disadvantages of pure forest.</li><li>- Mixed forest.</li><li>- Advantage and disadvantage of mixed forest.</li><li>- The rules of mixed forest establishment.</li><li>- Forms of mixing.</li></ul>	

<p><b>Practical Topics (If there is any)</b></p> <p><u>Week: 1</u></p> <ul style="list-style-type: none"> <li>- Definition of Silviculture.</li> <li>- Seeds of Forest tree is an important subject of Silviculture.</li> <li>- Formation of seeds in Angiosperm, Definition and composition of flowers and the processes that occur in them to the composition of the seed and fruit , Formation and composition of the pollen grain, Formation and composition of embryo sac.</li> </ul> <p><u>Week: 2</u></p> <ul style="list-style-type: none"> <li>- Formation of seeds in Gymnosperms, Pine life cycle, male cone, female cone.</li> <li>- Structure of seed.</li> </ul> <p><u>Week: 3</u></p> <ul style="list-style-type: none"> <li>- Seed collection.</li> <li>1. Choose groups of trees to collect seeds from them.</li> <li>2. Stages of fruit ripening.</li> <li>3. Signs of maturity of the fruits and seeds.</li> <li>4. Methods of seed and fruits collection of the trees.</li> <li>5. Machines and tools for collecting seeds..</li> </ul> <p><u>Week: 4</u></p> <p>Scientific trip to the park for the purpose of fruit and seed collection.</p> <p><u>Week: 5</u></p>	<p><b>Rushdy R. Aziz</b> <b>ex: (3 hrs)</b></p>

The First Examination.

Week: 6

- 1 Seed extraction.
- 2 - Seed extraction from cones.
- 3 - Seed extraction from fleshy fruits.
- 4 - Seed extraction from the winged fruit.
- 5 - Seed extraction from the pods and capsules.

Week: 7

- Seed storage. Some essential points that must be followed when storing seeds, natural longevity of seed, factors affecting seed longevity, storage containers, storage conditions.

Week: 8

Seed testing, sampling of seed for testing, Methods of mixing, simple seed testing, seed analysis, Seed Weight.

Week: 9

Moisture content, seed viability tests, germination test, cut test, chemical test, x-ray test.

Week: 10

The second examination.

Week: 11

Scientific trip to the Seed Laboratory in the Agriculture Research Center.

Week: 12

- Seed dormancy
- Types of seed dormancy

Pre-treatments to break seed dormancy

<b>Examination paper 1 (pending confirmation)</b>	
<b>Examination paper 2 (pending confirmation)</b>	
<b>Examinations:</b>  <b>In regard to this subject the type of exam will be as follow:</b>  <b>1- Definitions:</b>  <b>2- Multiple Choose:</b>  <b>3- Use true or false for each sentence and correct false statement:</b>  <b>4- Fill the following blanks with the correct word:</b>  <b>5- Numerous these followings:</b>  <b>6- Explain briefly:</b>  <b>7- give the reasons of these followings:</b>	
<b>20. Extra notes:</b>	
<b>21. Peer review</b>	