OBJECTIVES (ENGG-364)

1. **A greenhouse** is a framed or an inflated structure covered with a transparent or translucent material in which crops could be grown under the conditions of at least partially controlled environment and which is large enough to permit persons to work within it to carry out cultural operations.

2. The percentage of carbon dioxide in the atmosphere is **0.0345% (345 ppm).**

3. The phenomenon of increase in the ambient temperature, due to the formation of the blanket of carbon dioxide is known as **greenhouse effect.**

4. **A lean-to** design is used when a greenhouse is placed against the side of an existing building.

5. When only one span is used as described in shape then they are called as **single span type greenhouse.**

6. When small, isolated cultural area is required then **Quonset greenhouse** type of greenhouse is used.

7. **Uneven span type greenhouse** type of greenhouse is constructed on hilly terrain.

8. The greenhouses with span less than 6 m, **wooden** framed structures are used.

9. **Pipes** are used for construction of greenhouses, when the clear span is around 12m.

10. If the greenhouse span is greater than or equal to 15m, **truss** frames are used.

11. **Glass** as covering material has the advantage of greater interior light intensity.

12. The main disadvantage with plastic films is its **short** life.

13. The light intensity is measured by the international unit known as **Lux.**

14. Green house crops are subjected to light intensities varying from **129.6klux** on clear summer days to **3.2 Klux** on cloudy winter days.

15. Light is classified according to its wave length in **nanometers (nm).**

16. Glass screens are opaque to the most UV light and light below the range of **325nm**.

17. Visible and white light has wavelength of **400 to 700nm**.

18. The green house crops are grown at a day temperature, which are **3 to 6^0C** higher than the night temperature on cloudy days and **8^0C** higher on clear days.

19. The night temperature of green house crops is generally in the range of **7 to 21^0C**.

20. Air temperatures above **35^0C** are generally not suited for the crops in green house.

21. In regions where snow is expected, trees should be **30.5 m** away in order to keep drifts back from the greenhouses.

22. Greenhouse structures should be designed to resist a **130 km/h** wind velocity.

23. Covering material and Life span **1**. **Glass and acrylic sheet -20 years 2. Polycarbonate and fiberglass-reinforced polyester sheet -5-12 years 3. Polyethylene- 2-6 months 4. Polyethylene stabilized for UV rays -2-3 years**

24. **Wood and bamboo** are generally used for low cost polyhouses.

25. The commonly used woods are **pine and casuarina**, which are strong and less expensive.

26. Wood must be painted with **white** colour paint to improve light conditions within the greenhouse.

27. **Chromated copper arsenate and ammonical copper arsenate** are water based preservatives that are applied to the wood that may come into contact with the soil.

28. Single drawn or float glass has the uniform thickness of **3 to 4 mm**.

29. Hammered and tempered glass has a thickness of **4 mm**.

30. The most traditional method of irrigation is **hand watering** and in present days is uneconomical.

31. **Perimeter** watering system can be used for crop production in benches or beds.

32. **Boom** watering is used often for the production of seedlings grown in plug trays.

33. Drip irrigation**,** often referred to as **trickle irrigation,** consists of laying plastic tubes of small diameter on the surface or subsurface of the field or greenhouse beside or beneath the plants.

34. **Ventilation** is the process of allowing the fresh air to enter in to the enclosed area by driving out the air with undesirable properties.

35. In **forced or active** ventilation, mechanical devices such as fans are used to expel the air.

36. One kg of water can hold **4.23 kJ** of heat for each **1^oC** rise in temperature.

37. Rocks can store about **0.83 kJ** for each 1^oC rise in temperature.

38. To store equivalent amounts of heat, a rock bed would have to be **three** times as large as a water tank.

39. Each kilogram of water can supply **71.1 kJ** of heat, and each kilogram of rock can supply **14.2 kJ** of heat, as it cools by **17^{o}C**.

40. **Roundness** is a measure of the sharpness of the solid material.

41. **Sphericity** may be defined as the ratio of the diameter of a sphere of the same volume as that of the particle and the diameter of the smallest circumscribing sphere or generally the largest diameter of the particle.

43. **Porosity** is defined as the percentage of volume of inter-grain surface to the total volume of grain bulk.

44. Porosity of some crops are as follows

Grain	Porosity (%)
Corn	**40 -45**
Paddy	**48 -50**
Wheat	**50 -55**
Oats	**65 -70**

45. The coefficient of friction between granular materials is equal to the **tangent** of the angle of internal friction for the material.

46. **The angle of repose** is the angle between the base and the slope of the cone formed on a free vertical fall of the grain mass to a horizontal plane.

47. The angle of repose for a few important grains are as follows

Grain	Angle of repose (degrees)
Wheat	**23-28**
Corn	**30-40**
Millets	**20-25**
Rye	**23-28**
Oats	**31-44**
Barley	**28-40**

48. **Specific heat** of a substance is defined as the amount of heat required to raise the temperature of unit mass through 1^{o}C.

49. Specific heat may be defined as the amount of heat in Kilocalories that must be added to or removed from 1 kg of substance to change its temperature by 1^{o}C**.**

50. **The thermal conductivity** is defined as the amount of heat flow through unit thickness of material over an unit area per unit time for unit temperature difference.

51. The thermal conductivity of **single grain mass** varies from **0.3 to 0.6 kcal/m-hr^{o} c** where as the thermal conductivity of grains in **bulk** is about **0.10 to 0.15 kcal/m-hr^{o} c** which is due to the presence of air space in it. The thermal conductivity of **air is 0.02 kcal/m-hr^{o} c** only.

52. The air velocity at which an object remains in a suspended state in a verticle pipe under the action of the air current is called **terminal velocity** of the object.

53. Air velocity requirement for of some of the agricultural materials

• **Grain,**	**Terminal velocity, m/s**
• **Wheat**	**9-11.5**
• **Rye**	**8.5-10**
• **Oats**	**8-9**
• **Corn**	**34.9**
• **Soybean**	**44.3**
. **Barley**	**8.5-10.5**
• **Small oats**	**19.3**

54. **Drying** refers to removal of moisture from grain and other products to a predetermined level.

55. **Drying** is the Universal method of conditioning grain by removing moisture to an moisture level that is equilibrium with normal atmospheric air in order to preserve its quality and nutritive value for seeds.

56. **Drying** is a thermo-physical and physico-chemical operation by which the excess moisture from a product is removed.

57. **Dehydration** refers to removal of moisture to very low levels usually to bone dry condition.

58. The atmospheric air contains mainly **oxygen 20.95%, Nitrogen 78.09%, Carbondioxide 0.03% and argon 0.93%.**

59. In bound moisture, the water- vapour pressure of grain is **lower** than the vapour pressure of free water surface.

60. The unbound moisture content is **more** than the bound moisture content.

61. When a solid is exposed to a continual supply of air at constant temperature and humidity, having a fixed partial pressure of the vapour, p, the solid will either lose moisture by evaporation

or gain moisture from the air until the vapour pressure of the moisture of solid equals p. The solid and the gas are then in equilibrium, and the moisture content of the solid in equilibrium with the surrounding conditions is known as **equilibrium moisture content E.M.C .**

62. The moisture content attained by a grain with respect to a set of atmospheric temperature and relative humidity is called **the Equilibrium Moisture Content.**

63. **Thin layer drying** refers to the grain drying process in which all grains are fully exposed to the drying air under constant drying conditions, i.e, at constant air temperature, and humidity.

64. In thin layer drying, thickness of grain bed **20cm.**

65. In **deep bed** drying all the grains in the dryer are not fully exposed to the same condition of drying air.

66. Amount of moisture /water contained in the food grain (product) is called **moisture content.**

67. **The Motomco moisture meter (U.S.A) and Burrows moisture recorder (U.S.A)** are some of the capacitance type of moisture meters. They take about 1 minute for the measurement of moisture. These are also known as **Safe crop testers** as they do not damage the grain sample.

68. Dry basis moisture content is **more** than wet basis moisture content.

69. **Sun drying** is a traditional method of drying of grains and crops and followed by farmers.

70. In sun drying the wave length of heat radiation may vary from **zero to infinity**, but the majority of heat radiation lies between **0.1 to 100 µm.**

71. **Mechanical drying** is the process of utilizing mechanical means for drying of grains by ventilating natural or heated air through the grain mass to accomplish removal of moisture from it.

72. In **Contact** drying, heat is supplied to wet products by conduction.

73. In **Convective** drying the sensible heat of heated air is transferred to the wet products by convection.

74. The wave length of the electromagnetic radiation lies between **0.76 to 400 µm**. The radiation within this wavelength is also called as **infra-red radiation.**

75. In deep bed dryers air flow rate of **2.94 - 3.92 m^3/min per tonne** is recommended. The **lower range of 2.94 - 3.43 m^3/min per tonne** can be used safely in **cooler** and **drier places** while the **higher range of 3.43 - 3.92 m^3/min per tonne** may be used in **hot and humid climates**. Rates above **3.92 m^3/min per tonne** may result in **uneven drying and is expensive** in operation.

76. In deep bed dryers, if the moisture content of grains is **upto 18 percent (w.b),** the depth of grain mass is limited to **3.0 m**. For grains whose moisture content is **above 18%,** the maximum depth recommended is **2.5m**. For paddy with **2.5 m depth requires 20 days during favorable weather and 40 days during bad weather.**

77. In deep bed dryers ,the net perforated area of the floor should be **15 percent** of the total floor area. Air velocity **300 m/min** is preferred.

78. Flat bed dryers are usually **1- 2 tonne** capacity.

79. In **Re-circulating dryer** during single pass, the grains are exposed to the heated air for **15-30 min and 1-3 percent** of moisture content is removed. Drying temperature of **60-80°C** is used in the dryer.

80. **Baffle dryer** uses low air flow rate of **50-95 m^3/min-tonne** and high drying temperature of **65^{O}C.**

81. LSU stands for **LOUISIANA STATE UNIVERSITY DRYER**

82. The bottom section LSU dryer is known as **drying chamber and** the top section which acts as the **holding bin.**

83. In LSU dryer, the drying chamber contains inverted trough or 'V' shaped channels are called **inlet ports.**

84. The capacity of the **LSU** dryer varies from **2 to 12 tonnes** of grain. The recommended air temperature is **60^{0}C.** The recommended **air flow rate is 70 m^3/min/tonne** of holding capacity of dryer. The grain temperature during drying **should not exceed 40^{0}C.**

85. In a **tray** dryer, many shallow trays are kept one above the other with a gap in between, in the drying chamber.

86. A **belt conveyor** is an endless belt operating between two pulleys with its load supported on idlers.

87. In **belt conveyor** for transportation of grains, the belt speed **not increases 3.5 m/s.** Generally, for grain conveying belt speed of **2.5 to 2.8 m/s** is recommended.

88. Screw conveyor is also known as **auger conveyor.**

89. **Screw conveyors** are used to handle finely divided powders, damp, sticky, heavy, viscous materials, hot substance that may be chemically active and granular materials of all types.

90. **Ribbon screws** are used for wet or sticky substances.

91. **Special cut flight and ribbon screws** are used for mixing, blending and churning.

92. Capacity of **bucket elevators** may vary from **2 to 1000 t/hr**. The vertical lift of the elevator may range between **few metres to more than 50 m.** Speed of the belt **-2.5 to 4 m/s**