



S.No.	Topic	No. of Lectures
15.	Recirculation of water; Reuse systems, water exchange, design of re-use systems, Inlet and outlet structures.	3
16.	Water treatment plants in fish farms.	1
	<b>Total</b>	<b>30</b>

### IX. List of Practicals

S.No.	Topic	No. of Practicals
1.	Study of aeration systems of fish ponds.	1
2.	Study of feeding systems of fish ponds.	1
3.	Design of dykes in fish farming structures.	1
4.	Design of feeder canals in fish farming structures.	2
5.	Design of drainage canals in fish farming structures.	1
6.	Design of drain ditch in fish farming structures.	1
7.	Design of internal pond drains in fish farming structures.	1
8.	Design of borrow pits in fish farming structures.	1
9.	Design of internal harvesting pits in fish farming structures.	1
10.	Study of waste water management through aquaculture.	1
11.	Design of recirculatory ponds for waste water treatment in fish farms.	1
12.	Different types of containers for live fish.	1
13.	Design of re-use systems in fish farms.	1
14.	Different types of inlet and outlet structures in fish farms.	1
	<b>Total</b>	<b>15</b>

### X. Suggested Reading

- FAO. 1983. *Inland Aquaculture Engineering*. ISBN 92-5-102168-6.

**I. Course Title : Thermal Environmental Engineering for Agricultural Processing**

**II. Course Code : PFE 518**

**III. Credit Hours : 3+0**

#### IV. Aim of the course

To acquaint and equip the students with the concept of thermodynamic properties of air and its application in food processing.

#### V. Theory

##### Unit I

Requirements of temperature and moisture in food preservation, processing, storage, animal and plant production systems, human comfort etc.

##### Unit II

Thermodynamic properties of moist air, psychrometric chart, psychrometric processes and applications. Mass transfer and evaporation of water from free surfaces, theory of psychrometer, direct contact transfer processes between moist air and water-air washer, cooling tower, heating and cooling of moist air by extended surface coils, dehumidification using moisture absorbing materials. Solar irradiations on structures, calculation of heating and cooling loads in buildings/ storage structures.

**Unit III**

Design of air conditioning systems, air distribution and duct design, air flow pattern and control, equipment, components and controls. Instruments for measurement and control of temperature and moisture.

**Unit IV**

Thermal insulation materials for environmental control systems, applications of environmental control in green house, dairy industry, potato storage etc.

**VI. Learning outcome**

Student's capability to design environmental control systems related to different unit operation in food processing industry.

**VII. Schedule of Lectures**

S.No.	Topic	No. of Lectures
1.	Requirements of temperature and moisture in food preservation, processing, storage, animal and plant production systems, human comfort etc. Various thermal indices.	5
2.	To study the different temperature, moisture and relative humidity measuring instruments.	3
3.	Thermodynamic properties of moist air.	3
4.	Psychrometric chart, psychrometric processes and applications. Mass transfer and evaporation of water from free surfaces, theory of psychrometer.	5
5.	Direct contact transfer processes between moist air and water-air washer, cooling tower, heating and cooling of moist air by extended surface coils, dehumidification using moisture absorbing materials.	4
6.	Solar irradiations on structures, calculation of heating and cooling loads in buildings/ storage structures.	5
7.	Introduction to air conditioning systems and design considerations.	4
8.	air distribution and duct design, air flow pattern and control, equipment, components and controls. Instruments for measurement and control of temperature and moisture.	4
9.	Thermal insulation materials for environmental control systems. Comparative performance of these materials.	4
10.	Applications of environmental control in farm buildings, farmstead, green house, dairy industry, poultry shed, potato storage etc.	5
	<b>Total</b>	<b>42</b>

**VIII. Suggested Reading**

- *Perry's Chemical Engineers' Handbook*, Section 12. (2007).
- Threlkald JL. *Thermal Environmental Engineering*, Pearson.