

<b>Lecture Schedule</b>		
<b>Department of Fisheries Engineering (Code-FEN)</b>		
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**(1) - FEN-421, Aquaculture Engineering**

<b>(1) - FEN-421, Aquaculture Engineering</b>		
	<b>Theory</b>	
<b>S.No.</b>	<b>Topic</b>	<b>Class</b>
1	Fish Farm- Definition, objectives, types of farms; fresh water, brackish water and marine farms.	3
2	Selection of site for aqua farm- site selection criteria, pre-investment survey viz., accessibility, physical features of the ground, detailed survey viz., site condition, topography, soil characteristics.	3
3	Land Surveying- definition, principles of surveying, classification of surveying, instruments used for chaining, chaining on uneven or sloping ground and error due the incorrect chain length.	3
4	Chain surveying- definitions, instruments used for setting out right angles, basic problems in chaining, cross staff survey.	2
5	Compass surveying - definitions, bearing, meridians, whole circle bearing system, reduced bearing system, theory of magnetic compass, prismatic compass.	2
6	Leveling - definitions, methods of leveling, leveling instruments, terms and abbreviations, types of spirit leveling.	2
7	Plane table surveying- instruments required, working operation, methods.	2
8	Contour surveying- definition, contour interval, characteristics of contour, contouring methods and uses of contour.	2
9	Calculation of area of regular and irregular plane surfaces,	2
10	Trapezoidal and Simpson's rule,	1
11	volume of regular and irregular shape as applied to stacks and heaps, calculation of volume of pond.	2
12	Earth work calculations- excavation, embankment, longitudinal slope and cross slope, calculation of volume of earth work as applied to roads and channels.	3
13	Soil and its properties- classification of soil; soil sampling methods; three phase system of soil, definitions of soil properties and permeability of soil.	3
14	Ponds - classification of ponds; excavated ponds, embankment ponds, barrage and diversion ponds; rosary system and parallel system.	2
15	Planning of fish ponds, layout planning, materials planning, manual planning, comparison of square and rectangular ponds, large and small ponds;	2
16	Types of ponds; nursing ponds, rearing ponds and stocking ponds.	2
17	Design of ponds, pond geometry; shape, size, bottom slope of pond etc.,	2
18	construction ponds viz., marking, excavation etc., Dykes, types of dykes viz., peripheral dykes, secondary dyke, design of dykes, construction of dykes.	2
19	Water distribution system- canal, types of canals; feeder canal, diversion canal etc., Pipe line system,	2
20	Water control structures- types of inlet and out let and their construction.	2
21	Water budget equation,	1
22	Pond drainage system; seepage and the methods used for seepage control,	1
23	evaporation; factors affecting evaporation, erosion of soil in dykes and its control.	1
24	Site selection, planning and construction of coastal aqua farms.	1
25	Brackish water fish farms- tide fed, pump fed farms, site selection - topography, tidal amplitude, soil and water sources etc.,	2
26	Hatcheries- site selection, infrastructural facilities; water supply system, main hatchery complex viz., Layout plan and design of hatcheries-	2
27	brood stock ponds, artemia hatching tanks, sheds etc,	1
28	Raceway culture system- site selection, layout plan, types of raceway culture	2

	system viz.,parallel system, series system etc.,	
29	Aerators- principles, classification of aerators and placement aerators.	1
30	Pumps- purpose of pumping, types, selection of pump, total head, horse power calculation.	1
31	Filters- types and constructions.	1
<b>Total</b>		<b>58</b>
<b>Practical</b>		
1	Evaluation of potential site for aquaculture.	2
2	Land survey – chain surveying, compass surveying, leveling, plane table surveying and contouring; soil analysis for farm construction.	6
3	Design and layout plan of fresh water and brackish water farms and hatcheries.	2
4	Design of farm structure: ponds, dykes and channels.	3
5	Earth work calculations and water requirement calculation.	2
6	Visit to different types of farms.	2
<b>Total</b>		<b>17</b>

**(2) - FEN-321, Refrigeration and Equipment Engineering**

<b>Theory</b>		
<b>S.No.</b>	<b>Topic</b>	<b>Class</b>
1	Fundamentals: Force, work, power, energy, volume, pressure, temperature. Heat, specific heat, sensible heat, latent heat, comparison between heat and work-A path function.	2
2	Thermodynamics: Laws of Thermodynamics, Laws of perfect gases, Thermodynamic processes, Application of First and Second law of Thermodynamics in refrigeration, Thermodynamics cycle, entropy, enthalpy.	2
3	Refrigeration: History of refrigeration, Definition, principle, classification, Types of refrigeration systems i.e., Air refrigeration, vapour absorption refrigeration system. Vapour compression refrigeration system.	2
4	Refrigeration plant: Layout of refrigeration plant, Construction. Insulating materials used for the cold storage construction, Frozen product storage capacity of cold storage, usage of Ante-room.	1
5	Refrigeration systems: Vapour compression refrigeration system advantages and Disadvantages as compared to other refrigeration systems, Types of Vapour compression refrigeration cycles i.e., Theoretical Vapour compression refrigeration cycle, Actual refrigeration cycle.	2
6	Compressors: Definition, Types of compressor, construction, working principle advantages and disadvantages.	1
7	Evaporator: Definition, Types of Evaporator, construction, working principle advantages and disadvantages.	1
8	Condenser: Definition, Types of Condenser, Cooling Towers, construction, working principle, advantages and disadvantages.	1
9	Expansion valve: Definition, Types of Expansion valve, construction, working principle advantages and disadvantages.	1
10	Refrigerant: Primary refrigerant, secondary refrigerant, properties, ideal refrigerant, leakage detection.	1
11	Study of auxiliary equipment: Receiver, oil charging, refrigerant charging, gas purging, oil draining, types of defrosting.	1
12	Ice-plant: Ice plant planning Brine tank construction, preparation of brine ,Types of ice, Storing of ice, Equipments used in ice plants.	1
13	Freezers: Definition, Design and construction of freezers i.e. Plate freezer, Blast freezer, Tunnel freezer, spray or immersion freezers, refrigerated fish rooms and fish hold. Alternative refrigeration technique arrangements used onboard the fishing vessel i.e., Refrigerated sea water (RSW), Chilled sea water (CSW). Refrigerated transport.	2
14	Cooling load: Unit of refrigeration, coefficient of performance (C.O.P), Refrigeration effect, study and use of Psychometric chart. Cooling load estimation, introduction, components of cooling load, heat gain through walls, roofs, products, occupants, lighting equipments.	2
15	Theory of machines: Transmission of power, friction wheels, shaft , gears, belt and Chain drive. Study of equipments used in fish processing with particular reference to canning, sausage, freeze drying and irradiation.	2
16	Maintenance: Definition, Types of maintenance, general maintenance of freezing plant, cold storage and ice plant.	1

<b>Total</b>		<b>23</b>
<b>Practical</b>		
1	Handling and operation of Evaporators, Compressors, Condensers	
2	Handling and operation of Refrigerant controls, Motor and electric controls, Liquid receivers.	
3	Handling and operation of Refrigerants.	
4	Calculations of Refrigerating effect and cooling estimate.	
5	Calculations of Heat load calculations - Wall heat gain load and Air change load.	
6	Tools & accessories for servicing and installation works.	
7	Operation, maintenance & safety precautions of various equipments and machineries used in : Processing plants.	
8	Operation, maintenance & safety precautions of various equipments and machineries used in : Canning plants.	
9	Operation, maintenance & safety precautions of various equipments and machineries used in : Ice plants, Cold storages.	
10	Fault finding procedures of various processing equipment : Electrical, Mechanical.	
11	Visits to fishing harbour to study maintenance of boat, its hull and machinery.	
12	Visits to various canning plants	
13	Operation and maintenance of : Mechanical & Hydraulic deck equipment.	
14	Operation and maintenance of : Electronic fish finding equipments	
15	Operation and maintenance of : Navigational equipments.	
16	Visits to various : Fish processing units, Cold storages and Ice factories.	
<b>Total</b>		

### (3) - FEN-221, Fishing Craft Technology 2(1+1)

**Objective:**

- To teach various types of fishing craft ,boat building materials fabrication, operation and safety of fishing crafts
- To teach the different types of engines, important parts, accessories of fishing crafts.
- To teach the engine installation on fishing boat, Care, Operation & Maintenance of engines.

<b>Theory</b>		
S.No.	Topic	Class
1	Introduction: History & development of fishing crafts. Traditional fishing crafts of India.	1
2	FAQ Classification of fishing vessels. Classification of crafts based on fabrication dimension, nature of fishing, depth of operation.	1
3	History & development of mechanization of fishing crafts. Basic geometric concepts and important terminologies of fishing vessel.	1
4	Form coefficients, properties of irregular shapes Calculation of longitudinal and transverse sectional area of fishing craft by using Trapezoidal rule and Simpson's rules.	1
5	State of equilibrium; Volume of displacement; centre of gravity (CG); centre of buoyancy(CB);verticalcentreofgravity(VCB);longitudinalcentreofgravity(LCB).Stability of fishing vessels- longitudinal and transverse.	1
6	Various equilibrium of ships-stable, unstable and neutral; Light weight, Dead weight, Tonnage system; Gross Registered Tonnage (GRT), Net Registered Tonnage (NRT).	1
7	Boat building materials: Choice of construction materials: Wood, properties, advantages and disadvantages.	1
8	Deck fitting. Maintenance of fishing vessels.	1
9	Fouling and boring organisms; seasoning and preservation of wood.	1
10	Constructional details of boat: Offset tables.	1
11	Mould lofting; Backbone assembly of wooden boat.	1
12	Constructional details of Steel, FRP, Ferro Cement and Aluminum boats. Introduction of Outboard and inboard engines.	2
<b>Total</b>		<b>13</b>
<b>Practical</b>		
1	Studies on traditional fishing crafts.	1
2	Introduction to drawing and drawing instruments.	2
3	Lettering, Geometrical construction, Curves.	2
4	Projections; Projection of points, planes and Projection of solids;	2
5	Lines plan drawing; Drawing of backbone assembly; U & V bottom hull of wooden boat.	2
6	General view of boat; Drawing of sheer plan, body plan and half breadth plan.	1
7	Types of marine engines and their installation of engines.	2
8	Visit to boat building yard and dry dock.	4
<b>Total</b>		<b>16</b>
<b>Reference:</b>		
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- Fisherman's workbook, (1990), Prado, J., Fishing News Books, Blackwell Scientific publications Ltd., Osney Mead, Oxford, 192 p
- Fishing operations, (1996). FAO Training guidelines for responsible fisheries No. 1, FAO, Rome, 26 p.
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**(4) - FEN-323, Navigation and Seamanship**

<b>(4) - FEN-323, Navigation and Seamanship</b>		
	<b>Theory</b>	
<b>S.No.</b>	<b>Topic</b>	<b>Class</b>
1	Principles of navigation –terms and definitions, finding positions and method of position fixing magnetic Compass-parts and functions, cardinal, inter cardinal, three letter and lay points pelorus and azimuth mirror, method of observation.	2
2	Sextant -parts and functions, finding adjustable and non adjustable errors and principles and use.	1
3	Hand lead line –construction and markings and method of taking soundings.	1
4	Types of speed logs –patent log, impeller log, Types of marine charts, Mercator and gnomonic projections great circles and rumba lines, chart collections and chart readings, chart observation and fixing positions.	2
5	The IALA-buoy age systems, cardinal and lateral marks, meaning of shapes, colours and lights top marks and explanation of approaching. International code of signals, flag signals mars code and storm signals general system, brief system and extended system ,storm signals stations Indian coasts,	1
6	Fog signals, types and methods .Distress signals, methods, types and communication international regulations for preventing collision at sea and recognition of lights and shapes at sea.	1
7	Observation of radar and parts and functions of radar, aneroid barometer, parts and functions of echo sounder, and sonar, observation of GPS	1
8	Principles of seamanship- Causes fire at sea, fire prevention on board the vessel and method of fire fighting at sea and recommended fire fighting appliances, Life saving appliances –life jackets, life buoys and method of operations and contents, SART and EPIRB.	1
9	Observations of storms, formation of storms and method of locating the eye of the storms and method of escaping from the center of the storms as per buys ballet law.	1
10	Preparing vessel to face heavy weather.	1
11	Temporary repairs for leaks constructions of steering system and rigging emergency jury rudder .	1
12	Types of anchors and their applications. selection of suitable anchorage , procedure for anchoring anchor watch and procedure to combating dragging of anchor.	1
13	Method of standing moor and running moor, open moor berthing procedures, axial thrust , transverse thrust mooring and securing the vessel to the jetty rigging fenders and gangways , and method of leaving vessels from the birth.	2
<b>Total</b>		<b>16</b>
<b>Practical</b>		
1	Anchoring, coming along side the berth and leaving.	1
2	Practicing the different types of knots and wire splices.	2
3	Use of magnetic compass, GPS, Echo-sounder.	1
4	CHART WORK-Finding positions by latitudes and longitudes by position lines by cross bearing.	1
5	Horizontal sextant, angles, vertical sextant angle and by running fix,	1
6	Finding position by speed, distance and time findings set and drift of current and findings course made good speed made good and steering	1
7	Course and finding position by counter acting the current observation of RADAR	2
<b>Total</b>		<b>9</b>

**(5) - FEN-311, Fishing Gear Technology**

<b>(5) - FEN-311, Fishing Gear Technology</b>		
	<b>Theory</b>	
<b>S.No.</b>	<b>Topic</b>	<b>Class</b>
1	Development fishing gears and Fishing Technology:	1
2	Evolution of Fishing gears;	1
3	Mechanization of Fishing;	1
4	Basic classification of fishing gears- Principle, Subsidiary and Auxiliary gears.	2
5	Classification of fishing gears and methods:	1
6	FAO classification of fishing gear and methods of the world;	1
7	International Standard Statistical Classification of Fishing gear (ISSCFG).	1
8	Fishing gear materials: Natural materials and Synthetic netting materials and their classification.	1
9	Types and important synthetic materials used in fishing gears.	1
10	Raw-materials for synthetic material;	1
11	Preparation of nylon (PA 6.66) material;	1
12	Different types of fibres- continuous fibre; monofilament, staple and split fibres and production of single yarns.	2
13	Identification of synthetic fishing gear materials:	1
14	Visual observation, water test, solubility test, burning test and melting point test.	1
15	Construction of twisted netting materials:	1
16	Yarn, single yarns, folded yarns, netting twine, cable netting twine and cable netting twine of higher order;	1
17	Construction of ropes and their higher order;	1
18	construction of braided netting twines.	1
19	Yarn numbering system - direct system: Tex system Denier system and calculation of resultant tex value.	1
20	Indirect system: British count, metric count, runnage system and their conversion.	1
21	Methods of Preparation of knotted and knotless webbing;,,	1
22	advantage and disadvantages of knotted and knotless webbings.	1
23	Shape of mesh: diamond; square hexagonal and their measurement.	1
24	Properties of netting material: physical properties- Density, twist and amount of twist,	1
25	Breaking strength-tenacity, & tensile strength, breaking length, abrasion resistance,	1
26	elasticity, extensibility, water absorption &, shrinkage, sinking velocity, weather resistance,	2
27	melting point and visibility. Chemical and Biological properties.	1
28	Floats – buoys – its materials, types their properties;	1
29	Classification of floats: based on shape and materials; calculation of buoyancy.	1
30	Sinkers – types, materials, properties- negative buoyancy.	1
31	Factors to be considered while designing /selection of fishing gears;	1
32	Biological, Environmental, oceano-graphical, Vessel characteristics and mesh size regulation.	2
33	Choice of netting materials for trawl, gillnet and purse seine.	1
34	Classification of trawl gears. 2 seem trawl; 4 seam trawl and wing trawl.	1
35	Design and construction of wing trawl.	1
36	Rigging of trawl gear:	1
37	Arrangements of bridles, sweep lines and attachment of ground gears:	1
38	tickler chain, bobbins and rock hoppers and attachment of otter board	1
<b>Total</b>		<b>42</b>

<b>Practical</b>		
1	Study of net making tools; Knots and hitches used in net making.	2
2	Methods of net making: Hand braiding- Chain mesh method and loop methods of net making.	2
3	Shaping of webbing: baiting, creasing and reducing mesh size step by step.	2
4	Tailoring method: T and N direction of webbing; T-cuts, N-cuts, B-cuts and their combination.	2
5	Joining of net pieces.	1
6	Net mounting – hanging coefficient, hung depth and their calculation. Selvedging.	2
7	Methods of net mounting: reeving, stapling and norselling.	2
8	Mending and net shooter techniques.	2
<b>Total</b>		<b>15</b>

**(6) - FEN-322, Fishing Technology 2(1+1)****Objective:**

- To teach various types and structure of various commercial fishing gears. Rigging of fishing gears: Bridles, sweep lines, otter boards, floats and ground gears arrangements.
- To impart training in constructional details of single boat purse seine; two boat purse seine and method of operation.
- To teach the deck equipments – types of winches, net haulers, line haulers, triple drum, gurdy, power blocks, fish pumps.
- To teach the fishing equipment: Fish finder, GPS navigator, sonar, net sonde, gear monitoring equipment.

<b>Theory</b>		
<b>S.No.</b>	<b>Topic</b>	<b>Class</b>
1	Structure of various commercial fishing gears. Rigging of fishing gears: Bridles, sweep lines, otter boards, floats and ground gears arrangements.	1
2	Otter door: Different types of otter doors. Behavior of otter doors in water: Angle of attack, angle of heel and angle of tilt. Fishing accessories – thimbles, shackles, C-links, rings, G-links, Kelly's eye, stopper, bottle screw, Deck layout of different fishing vessels.	2
3	Trawling: Beam trawling; otter trawling; side trawling; twin trawling out rig trawling bull trawling and mid water trawling.	1
4	Constructional details of single boat purse seine; two boat purse seine and method of operation.	1
5	Types of gill net – constructional details of simple gill net, trammel gill net, stick held gillnet, frame gillnet and vertical line gillnet,	1
6	Operation of gillnet: set gillnetting; drift gillnetting; bottom , mid water and pelagic gillnetting.	1
7	Line fishing: Types of hooks; structure and size of hooks. Constructional details of long line, tuna long line, vertical long line, pole & line and trolling line.	1
8	Operation of long line: set and drift long lining: bottom, mid water and pelagic long lining; jigging.	1
9	Operation of beach seine, boat seine and traps. Selectivity in fishing gear and by catch reducing devices.	1
10	Deck equipments – types of winches, net haulers, line haulers, triple drum, gurdy, power blocks, fish pumps.	1
11	Fishing equipment: Fish finder, GPS navigator, sonar, net sonde, gear monitoring equipment.	2
<b>Total</b>		<b>13</b>
<b>Practical</b>		
1	Survey of fishing gears; Trawl.	1
2	Survey of fishing gears; Gill nets.	1
3	Survey of fishing gears; long line	1
3	Survey of fishing gears; Rigging of trawl, purse seine,	1
4	Survey of fishing gears; gillnet and hook & line.	1
5	Commercial fishing techniques: Bottom trawling;	1
6	Commercial fishing techniques: purse seining;	1
7	Commercial fishing techniques: gillnetting and line fishing.	1
8	Commercial fishing techniques: Cast net fishing and trap fishing.	1
<b>Total</b>		<b>9</b>
<b>Reference:</b>		
<ul style="list-style-type: none"> <li>• An account of the inland fishing gear and methods of India. (1971). George VC., Indian</li> </ul>		

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