

Course Title	Fluid Mechanics		
Purpose	To develop working knowledge & hands on experience in the area of Fluid Mechanics.		
Eligibility	B.E./ Diploma in Chemical Or Petrochemical Engineering / NTC / NAC in NCVT Chemical trade (AOCP/MMCP/IMCP) OMCP Group-A supervisory course/ B.Sc. with working experience in Chemical Industries (in case of sponsored candidates entry Qualification may be relaxed).		
Duration	01 week.		
Location	ATI Campus Mumbai.		
Learning Outcomes	On completion of this AVTS Course the trainee will be able to Operate & Maintain (a) Different types of Flow meters – Venturi-meter, Orifice-meter, Rota-meter and Pitot-tube, (b) Different types of Pumps – Centrifugal, Reciprocating, Gear, Vacuum, Diaphragm and Screw, (c) Energy & Frictional Losses in pipes finding Test Rig, (d) Annular Flow Study Test Rig.		
Teaching Methods	Lectures in Class Room. Practicals. Group Exercises. Demonstrations.		
Assessment Methods	❖ Formative Assessment consist of following things :		
	Sl.No.	Criteria for Assessment	Maximum Marks
	1 – A	Attendance & Punctuality	20
	2 – B	Sincerity	20
	3 – C	Ability to Grasp the Topic	10
	❖ Summative Assessment through Objective Type Questions consist of following things :		
	Sl.No.	Criteria for Assessment	Maximum Marks
	1	Acquired Practical Knowledge	30
2	Test consist of Theoretical Knowledge	20	
Course Schedule	Theory: 2 Hours / Day and Practical : 6 Hours / Day. Full Day-wise Course Schedule attached.		
AIDS	White board and markers, LCD Projection, Instruments – Flow meter Test Rig – Venturi-meter, Orifice-meter, Rotameter and Pitot-tube, Centifugal Pump Test Rig, Reciprocating Pump Test Rig, Gear Pump Test Rig, Vacuum pump, Diaphragm pump, Screw pump, Energy & Frictional Losses in pipes finding Test Rig, Annular Flow Study Test Rig, Hand Tools, Multi-meter and Raw materials.		
Instruction Materials	TD/AVTS/AV12/01/CM. TD/AVTS/AV12/01/PPT_01-10.		

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FLUID MECHANICS (1 week)

DAY	FORENOON SESSION (09:00 – 13:00)		AFTERNOON SESSION (13:30 – 17:30)
1ST DAY - MONDAY	Registration Introduction to fluid mechanics	13:00 – 13:30 LUNCH BREAK	Introduction to Pressure and Manometers, Standard Operating Procedures of using Manometer in measurement of fluid flow.
2ND DAY - TUESDAY	Introduction to various fluid flow meters: rotameter venturimeter, orifice meter, and pitot tube. Flow measurement using rotameter		Flow measurement by using Venturimeter and Orifice-meter and pitot tube.
3RD DAY - WEDNESDAY	Valves and its classifications, different types of pipe fittings and steam traps – operation and its study, trouble shooting and maintenance of different types of valves.		Study of energy losses in pipes, pipe fittings, in enlargement and Contraction, friction factor, equivalent length, energy & frictional losses in pipes, pipe-fittings and valves.
4TH DAY - THURSDAY	Study of annular flows of fluids, annular flow of fluids, experiment to determine the co-efficient of friction.		Introduction to various types of pumps used in fluid transportation – centrifugal, reciprocating and gear Pumps, Operation, study and maintenance of centrifugal, reciprocating and gear pumps.
5TH DAY – FRIDAY	Construction, working, study and maintenance of vacuum pumps, diaphragm pump and screw pumps.		Trouble shooting of different types of pumps. Assessment Test & Valediction.

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Course Title	Heat Transfer Operations (HTO)		
Purpose	To develop working knowledge & hands on experience in the area of Heat Transfer Operations.		
Eligibility	B.E./ Diploma in Chemical Or Petrochemical Engineering / NTC / NAC in NCVT Chemical trade (AOCP/MMCP/IMCP) OMCP Group-A supervisory course/ B.Sc. with working experience in Chemical Industries (in case of sponsored candidates entry Qualification may be relaxed).		
Duration	01 week.		
Location	ATI Campus, Sion (East) , Mumbai.		
Learning Outcomes	On completion of this AVTS Course the trainee will be able to Operate & Maintain different types of Heat Transfer Equipments such as (a) Heat exchangers of 5 different types (b) Non - IBR Boilers (c) Cooling Towers (d) Evaporators – Single and Multiple types evaporators in Chemical Industries /Plants.		
Teaching Methods	Lectures in Class Room. Practicals Group Exercises. Demonstrations.		
Assessment Methods	❖ Formative Assessment consist of following things :		
	Sl. No.	Criteria for Assessment	Maximum Marks
	1 – A	Attendance & Punctuality	20
	2 – B	Sincerity	20
	3 – C	Ability to Grasp the Topic	10
	❖ Summative Assessment through Objective Type Questions consist of following things :		
	Sl. No.	Criteria for Assessment	Maximum Marks
	1	Acquired Practical Knowledge	30
2	Test consist of Theoretical Knowledge	20	
Course Schedule	Theory: 2 Hours / Day and Practical: 6 Hours / Day. Full Day-wise Course Schedule attached.		
AIDS	White board and marker pens, LCD Projection. Instruments – Double Pipe Heat Exchanger, Glass tube Heat Exchanger, Spiral Tube Heat Exchanger, Multi-pass (1- 2 shell and tube type)Heat Exchanger, Plate type Heat Exchanger, , Vertical Tube Evaporator, Triple Effect Evaporator, Forced draft cooling tower Thermometer, Hydrometer, Multi-meter and Raw materials.		
Instruction Materials	TD/AVTS/AV12/02/CM. TD/AVTS/AV12/02/PPT_01-10.		

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HEAT TRANSFER OPERATIONS (1 week)

DAY	FORENOON SESSION (09:00 – 13:00)		AFTERNOON SESSION (13:30 – 17:30)
1ST DAY - MONDAY	Registration Introduction to heat transfer operations. Introduction to all Equipments used in Heat transfer Operations - Heat Exchangers, Co-current and Counter current, Cross-flow Heat Exchangers.	13:00 – 13:30 LUNCH BREAK	Concept of Log Mean Temperature Difference (LMTD) and Heat Transfer Co-efficient (U and h). Finding out of Overall Heat Transfer Co-efficient for Glass-Tube Heat Exchanger.
2ND DAY - TUESDAY	Finding out of Overall Heat Transfer Co-efficient for multi pass heat exchanger. (1-2 shell and tube type)		Finding out of Overall Heat Transfer Co-efficient for Double-pipe Heat Exchanger
3RD DAY - WEDNESDAY	Fouling of Heat Transfer surfaces – Maintenance & Trouble–shooting of Heat Exchange equipments. Finding out of Overall Heat Transfer Co-efficient for Spiral Tube Heat Exchanger.		Finding out of Overall Heat Transfer Co-efficient for Plate Type Heat Exchanger. Study and operation of Forced Draft Cooling Tower
4TH DAY - THURSDAY	Evaporators and types of evaporators, capacity, steam economy. To find the rate of evaporation & capacity, steam economy for a standard vertical tube evaporator.		To find the rate of evaporation & capacity, steam economy for a forward feed triple effect evaporator.
5TH DAY – FRIDAY	Types & properties of steams, classification of boilers, boiler mountings and accessories. Operation, maintenance and trouble shootings of Non-IBR Electrode Steam Boiler.		Computerized Simulation study of 1-1 Shell and Tube Heat Exchanger. Assessment Test & Valediction.

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Course Title	Operation & Maintenance of Pumps & Valves.		
Purpose	To develop working knowledge & hands on experience in the area of Operation & Maintenance of Pumps & Valves.		
Eligibility	B.E./ Diploma in Chemical Or Petrochemical Engineering / NTC / NAC in NCVT Chemical trade (AOC/PMCP/IMCP) OMCP Group-A supervisory course/ B.Sc. with working experience in Chemical Industries (in case of sponsored candidates entry Qualification may be relaxed).		
Duration	01 week.		
Location	ATI Campus Mumbai.		
Learning Outcomes	On completion of this AVTS Course the trainee will be able to Operate & Maintain (a) Different types of Pumps – Centrifugal, Multi-stage Centrifugal, Gear, Reciprocating, Screw, Vane, Metering, Diaphragm and Vacuum, (b) Different types of Valves – Gate valves, Globe valves, Butterfly valves, Ball valves, Needle valves, Non-return valves – Foot valves, Check valves – Lift & Swing types, Safety valves, Control valves.		
Teaching Methods	Lectures in Class Room. Practicals. Group Exercises. Demonstrations.		
Assessment Methods	❖ Formative Assessment consist of following things :		
	Sl. No.	Criteria for Assessment	Maximum Marks
	1 – A	Attendance & Punctuality	20
	2 – B	Sincerity	20
	3 – C	Ability to Grasp the Topic	10
	❖ Summative Assessment through Objective Type Questions consist of following things :		
	Sl. No.	Criteria for Assessment	Maximum Marks
1	Acquired Practical Knowledge	30	
2	Test consist of Theoretical Knowledge	20	
Course Schedule	Theory: 2 Hours / Day and Practical: 6 Hours / Day. Full Day-wise Course Schedule attached.		
AIDS	White board and markers, LCD Projection, Instruments – Centrifugal Pump Test Rig, Multi-stage Centrifugal Pump, Reciprocating Pump Test Rig, Gear Pump Test Rig, Oil Ring Vacuum pump, Water Ring Vacuum pump Diaphragm pump, Screw pump, Vane pump, Metering Pump, Different Valves – Gate valves, Globe valves, Butterfly valves, Ball valves, Needle valves, Non-return valves – Foot valves, Check valves – Lift & Swing types, Safety valves, Control valves., Hand Tools, Multi-meter and Raw materials.		
Instruction Materials	TD/AVTS/AV12/03/CM. TD/AVTS/AV12/03/PPT_01-10.		

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Operation and Maintenance of Pumps and Valves (1 week)

DAY	FORENOON SESSION (09:00 – 13:00)		AFTERNOON SESSION (13:30 – 17:30)
1ST DAY - MONDAY	<p style="text-align: center;">Registration</p> Introduction to pumps , classification of pumps	13:00 – 13:30 LUNCH BREAK	Operation, maintenance and trouble shootings of Volute type Centrifugal pump.
2ND DAY - TUESDAY	Dismantling and assembling, of multi-stage Centrifugal pump. Operation and maintenance and trouble shootings of multi-stage centrifugal pump.		Operation, maintenance and trouble shootings of Reciprocating pump.
3RD DAY - WEDNESDAY	Operation, maintenance and trouble shootings of Spur gear (External) pump.		Operation, maintenance and trouble shootings of single screw pump and metering pump (Plunger Type).
4TH DAY - THURSDAY	Operation and maintenance and trouble shootings of air operated Double diaphragm pump.		Valves – Classification & Identification of valves, dismantling, assembling and maintenance of gate valve, butterfly valve, ball valve, plug valve, globe valve, needle valve, Check valves (Non-return valves) – swing, lift, ball types, foot valve. Safety valves, pressure reducing valve, etc.
5TH DAY – FRIDAY	Different Types of Control Valves, Study and operation of Pneumatic Control Valve. Control valve Characteristics.		Operation, maintenance and trouble shootings of oil ring / water ring vacuum pumps, Assessment Test. Valediction.

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Course Title	Mass Transfer Operations (MTO)		
Purpose	To develop working knowledge & hands on experience in the area of Mass Transfer Operations.		
Eligibility	B.E./ Diploma in Chemical Or Petrochemical Engineering / NTC / NAC in NCVT Chemical trade (AOC/PMCP/IMCP) OMCP Group-A supervisory course/ B.Sc. with working experience in Chemical Industries (in case of sponsored candidates entry Qualification may be relaxed).		
Duration	01 week.		
Location	ATI Campus Mumbai.		
Learning Outcomes	On completion of this AVTS Course the trainee will be able to Operate & Maintain (a) Distillation – Bubble Cap Continuous Distillation Unit, (b) Different types of Extraction Columns – Mixer Settler & Spray Extraction, (c) Packed Column Absorption Tower (d) Different types of Driers –Tray and Rotary (e) Humidification & Dehumidification Unit.		
Teaching Methods	Lectures in Class Room. Practicals Group Exercises. Demonstrations.		
Assessment Methods	❖ Formative Assessment consist of following things :		
	Sl. No.	Criteria for Assessment	Maximum Marks
	1 – A	Attendance & Punctuality	20
	2 – B	Sincerity	20
	3 – C	Ability to Grasp the Topic	10
	❖ Summative Assessment through Objective Type Questions consist of following things :		
	Sl. No.	Criteria for Assessment	Maximum Marks
	1	Acquired Practical Knowledge	30
2	Test consist of Theoretical Knowledge	20	
Course Schedule	Theory: 2 Hours / Day and Practical : 6 Hours / Day. Full Day-wise Course Schedule attached.		
AIDS	White board and marker pens , LCD Projection Instruments – Bubble Cap Continuous Distillation Column, Mixer Settler Extraction Column, Spray Extraction Column, Packed Column Absorption Tower, Tray Drier, Rotary Drier, Humidification & Dehumidification Unit, Hand Tools, Thermometer ,Hydrometer ,Multi-meter and Raw materials (Methanol/Acetone)		
Instruction Materials	TD/AVTS/AV12/04/CM. TD/AVTS/AV12/04/PPT_01-10.		

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MASS TRANSFER OPERATIONS (1 week)

DAY	FORENOON SESSION (09:00 – 13:00)	AFTERNOON SESSION (13:30 – 17:30)
1ST DAY - MONDAY	<p>Registration Introduction to mass transfer operations. Distillation – methods of distillation, types of distillation column, reflux ratio.</p>	Separation of binary miscible liquid mixture (Acetone–Water mixture) by simple distillation method.
2ND DAY - TUESDAY	Separation of miscible liquid mixture (Methanol – Water mixture) by bubble cap tray continuous distillation column & effect on purity of distillate due to variation in reflux ratio.	<p>Concept of solvent extraction (Liquid-Liquid)</p> <p>To determine the % extraction of acetone from organic solution of acetone & methyl-iso-butyl-ketone (MIBK) using water as solvent in spray extraction column.</p>
3RD DAY - WEDNESDAY	To determine the % extraction of acetone from organic solution of acetone & methyl-iso-butyl-ketone (MIBK) using water as solvent in mixer settler extraction column.	Absorption, equipments used for absorption Study of flooding & loading in a packed absorption column for finding flooding velocity under various operating condition.
4TH DAY - THURSDAY	<p>Different types of dryers.</p> <p>Operation of tray drier & finding rate of drying curve showing drying rates.</p>	Operation and study of direct counter-current rotary drier.
5TH DAY – FRIDAY	<p>Operation and study of agitated batch crystallizer.</p> <p>Operation and study of refrigeration system.</p>	<p>Operation and study of humidification / dehumidification & air handling unit.</p> <p style="text-align: center;">Assessment Test & Valediction.</p>

**13:00 – 13:30
LUNCH BREAK**

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Course Title	Mechanical Operations of Chemical Plant (MOCP)		
Purpose	To develop working knowledge & hands on experience in the area of Mechanical Operations of Chemical Plant.		
Eligibility	B.E./ Diploma in Chemical Or Petrochemical Engineering / NTC / NAC in NCVT Chemical trade (AOCP/MMCP/IMCP) OMCP Group-A supervisory course/ B.Sc. with working experience in Chemical Industries (in case of sponsored candidates entry Qualification may be relaxed).		
Duration	01 week		
Location	ATI Campus, Sion (East) Mumbai		
Learning Outcomes	On completion of this AVTS Course the trainee will be able to Operate & Maintain (a) Different types of Crushers & Grinders – Blake Jaw Crusher, Ball Mill & Hammer Mill, (b) Ro-Tap Sieve Shaker, (c) Plate & Frame Filter Press, (d) Rotary Drum Vacuum Filter, (e) Different types of Conveyors – Belt and Screw, (f) Bucket Elevator, (g) Top & Bottom Centrifuges, (h) Ribbon Blender and Sigma Mixer		
Teaching Methods	Lectures in Class Room. Practicals. Group Exercises. Demonstrations.		
Assessment Methods	❖ Formative Assessment consist of following things :		
	Sl. No.	Criteria for Assessment	Maximum Marks
	1 – A	Attendance & Punctuality	20
	2 – B	Sincerity	20
	3 – C	Ability to Grasp the Topic	10
	❖ Summative Assessment through Objective Type Questions consist of following things :		
	Sl. No.	Criteria for Assessment	Maximum Marks
1	Acquired Practical Knowledge	30	
2	Test consist of Theoretical Knowledge	20	
Course Schedule	Theory: 2 Hours / Day and Practical: 6 Hours / Day. Full Day-wise Course Schedule attached.		
AIDS	White board and markers, LCD Projection, Instruments – Blake Jaw Crusher, Ball Mill, Hammer Mill, Ro-Tap Sieve Shaker, Plate & Frame Filter Press, Rotary Drum Vacuum Filter, Belt Conveyor, Screw Conveyor, Bucket Elevator, Top / Bottom Centrifuges, Ribbon Blender, Sigma Mixer Hand Tools, Multi-meter and Raw materials.		
Instruction Materials	TD/AVTS/AV12/05/CM. TD/AVTS/AV12/05/PPT_01-10.		

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MECHANICAL OPERATIONS OF CHEMICAL PLANT (1 week)

DAY	FORENOON SESSION (09:00 – 13:00)	AFTERNOON SESSION (13:30 – 17:30)
1ST DAY - MONDAY	Registration Introduction to mechanical operations.	Size reduction: crushing & grinding. Study of laws of crushing by blake jaw crusher.
2ND DAY - TUESDAY	Operation and study of hammer mill.	Operation and study of ball mill. Operation and study of cyclone separator. To carry out of Ro-tap sieve shaker and plot distribution curve.
3RD DAY - WEDNESDAY	Types of filtration and their specific applications. Operation and study of plate and frame washing / non-washing filter press.	Operation & study of rotary drum vacuum filter unit.
4TH DAY - THURSDAY	Centrifuges: batch, semi-continuous, continuous Operation and study of top / bottom centrifuge.	Operation and study of ribbon blender. Operation and study of sigma mixer.
5TH DAY – FRIDAY	Operation and study of belt conveyor & screw conveyor.	Operation and study of bucket elevator. Assessment Test and Valediction.

**13:00 – 13:30
LUNCH BREAK**