

INSTITUTE OF ADVANCED STUDIES IN  
EDUCATION (DEEMED UNIVERSITY)  
GANDHI VIDYA MANDIR  
SARDARSHAHAR

*Detailed Syllabus  
of*

**CERTIFICATE IN FITTER MECHANIC  
(CFM )**

**COURSE TITLE** : CFM  
**DURATION** : 02 YEARS (YEARLY SYSTEM)  
**TOTAL DEGREE MARKS** : 800

**FIRST YEAR**

COURSE TITLE	PAPER CODE	MARKS		
		THEORY	INTERNAL	TOTAL
TRADE THEORY	CFM-110	70	30	100
WORKSHOP CALU.& SECINCE	CFM-120	70	30	100
ENGINEERING DRAWING	CFM-130	70	30	100
PRACTICAL	CFM-140	70	30	100

**SECOND YEAR**

COURSE TITLE	PAPER CODE	MARKS		
		THEORY	INTERNAL	TOTAL
TRADE THEORY	CFM -210	70	30	100
WORKSHOP CALU.& SECINCE	CFM -220	70	30	100
ENGINEERING DRAWING	CFM -230	70	30	100
PRACTICAL	CFM -240	70	30	100

## FIRST YEAR

<b>TRADE THEORY</b>	<b>Code CFM-110</b>
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Importance of safety and general precautions observed in the institute and in the section. Importance of trade in the development of industrial economy of the country. What is the related instruction subjects to be taught achievement to made. Recreation, medical facilities and other extra curricular activities of the institute. (All necessary guidance to be provided to the new comers to become familiar with the working of Industrial Training Institute System including stores procedures.

Safety accident prevention linear measurements its units dividers, calipers, hermaphrodite, centre punch, dot punch, their description and uses of different types of hammers description used and care of 'V' Blocks, marking off table.

Bench vice construction, types, uses care & maintenance, vice clamps, hacksaw frames and blades specification description, types and their uses, method of using hacksaws.

Files specifications, description, materials grades, cuts file elements uses, Measuring standards (English Metric Units) angular measurements subdivisions, try square, or dinary depth gauge protractor description, use and care.

Marking off and lay out tools dividers, scribing block, oddleg calipers, punches description, classification material care & maintenance.

Calipers types material constructional details uses care & maintenance of cold chisels, material Types cutting angles.

Marking media marking blue Prussian blue red lead, chalk and their special application description. Use care and maintenance of scribing block.

Surface plate and auxiliary marking equipment, V block angle plates, parallel block, description types and uses workshop surface plate their uses accuracy care and maintenance.

Type of files convexing taper, needle care and maintenance of file various types of keys allowable clearance & tapers; type uses of key pullers.

Physical properties of engineering metal : colour weight structure, conductivity magnetic, fusibility specific gravity Mechanical properties : ductility malle ability hardness, brittleness, toughness, tenacity, elasticity.

Drill processes : common type (bench type, pillar type, radial type) gang and multiple drilling machine.

Micrometer outside an in side principle constructional features, parts graduation reading use and care. Millcromter depth gauge, parts graduation, reading use and care.

Vernier calipers, principle, construction, graduations, reading, use and care. Vertiner bevel protractor, construction, graduations, reading use and care, Dial veriner caliper.

Drill holding device : material, construction and their uses. Drill processes : Comomon type (bench type, pillar type, gang and multiple drilling machine .

Safety precautions to be observed in smith shop forge: Necessary description uses, fuel used for heating bellows blowers description and uses.

Anvil and swage blocks Description and uses forging tools hammers band and sledge description and uses. Chisels, set hammers, flaters,hardier, fuller swag & uses.

Measuring and checking tools steels rule, brass rule calipers, 'T' Square description and uses. General idea about the main operations performed in a forging shop such as upsetting punching, difting welding.

Heat treatment-necessary various heat treatment methods such as normalizing an nealing, hardening and tempering. Power hammer construction features, method of operating and uses.

Safety precautions to be observed in a sheet metal workshop sheet and sizes. Commercial sizes and various types of metal sheets coated sheets and their uses as per ISI specifications.

Marking and measuring tools, wing compass, prick punch, tin man's square tools, snips, types, and uses. Tin man's hammers and mallets type-sheet metal tools stakes-bench types, parts their uses. Soldering iron types specifications, uses. Trammel, description parts, uses. Hand grooves specifications and uses.

Solders-composition of various types of solders and their heating media of soldering iron. Fluxes : types, selection and application-joints wiring various types of metal joints, their selection and application tolerance for various joints, their selection & application.

Rivets-Tin man's rivets, types, sizes, selection for various works. Riveting tools, dolly, snaps, description and uses. Method of riveting shearing machine description, parts and uses.

Safety-importance of safety and general precautions observed in a welding shop. Precautions in electric and gas welding. (before, during, after). Introduction to safety equipment and their uses.

Hand tools: Hammers, welding description, types and uses, Machines and accessories, welding transformer, welding generators, description principle, method of operating.

(MACHINAL TRADE ONLY)

- 1     **UNITS:-**  
           Introduction--Defination--classification of units--interrrelationship  
           between Metric and British System of units
- 2     **SIMPLIFICATION :-**  
           Introduction--fractions--decimal fractions--lowest common  
           multiple, LCM.
- 3     **SQUARE ROOT :-**  
           Square and square root--symbol of root--method of finding  
           out the squire root of a number-- factorization method--division method.
- 4     **RATIO AND PROPORTION :-**  
           Introduction--ratio--proportion-
- 5     **PERCENTANCE :-**  
           Introduction--percentance method
- 6     **ALGEBRA :-**  
           Introduction-careful consideration of subject items--addition and  
           subtraction--multiplication and division--algebraic formulac-  
           factorization—equations
- 7     **MENSURATION :-**  
           Introduction-rectangle--square--parallelogram—  
           rhombus--trapezium--trianglesh--circle
- 8     **TRIGONOMETRY :-**  
           definition--formula--measurement of angles--
- 9     **METALS :-**  
           Introduction--properties of metal--types of metals--ferrous metals—  
           cast iron-steel- ferrous metals
- 10    **HEAT TREATMENT :-**  
           Introduction--purposes of heat treatment--processes of  
           heat treatment
- 11    **FORCE:-** newton's law of motion--space diagram--vector diagram
- 12    **MOMENT AND LEVER :-** moment--unit--lever
- 13    **SIMPLE MACHINES :-**  
           efficiency of machine--effort and load--mechanical  
           advantage--velocity ratio--out and in put
- 14    **WORK ,POWER AND ENERGY :-**  
           work--unit of work--power--unit of power-  
           energy--uses of energy--
- 15    **FRICTION :-**  
           Introduction--advantage and disadvantage of friction--normal  
           reaction--limiting friction
- 16    **VELOCITY AND SPEED :-**  
           rest and motion--speed--velocity--acceleration--motion  
           under gravity

(MACHINAL TRADE ONLY)

- 1 INTRODUCTION, DRAWING INSTRUMENTS AND MATERIALS :-  
Introduction—Drawing—drawing board—set-square—  
instrument box—pencil—rubber—drawing sheet--
- 2 CONVENTIONS FOR LINES, MATERIALS AND BREAKS :-  
Introduction—convention for lines—grouping of lines—conventional breaks
- 3 FREE HAND LETTERING AND SKETCHING :-  
Introduction—lettering—type of lettering—free hand sketching--
- 4 GEOMETRICAL DRAWING :-  
Introduction—points—line—curved line—angle—circle—square—rectangle--
- 5 SCALE :-  
Introduction—plain scale—diagonal scales—comparative scales—  
vernier scales--
- 6 ISOMETRIC PROJECTION :-  
Introduction— isometric projection—axis—lines--
- 7 ORTHOGRAPHIC PROJECTION AND IDENTIFICATION OF  
SURFACES :-  
Introduction—projection—pictorial projection—orthographic  
projection—first angle projection—third angle projection--
- 8 BLUE PRINT READING :-  
Introduction—blue print—some important conventions—  
diameter—radius—
- 9 WELD AND WELDED JOINTS :-  
Introduction—lapjoint—buttjoint—edge joint—corner joint—tee joint--
- 10 HAND TOOLS :-  
Hammers—files—pipe wrench—plier—spanner—hackaws—  
drilling machines—screw driver—tester—chisel—try-square—vice—etc.

Familiarisation with the Institute, Importance of trade training, Machinery used in the trade, types of work done by the trainees in the trade, introduction to safety equipment and their uses.

Marking outlines gripping suitably in vice jaws, hacksawing to given dimensions sawing different types of metals of different sections.

Filing Channel Paralee Filling Flat and Square (Rough Finish)

Filing practices, surface filing marking off straight and parallel lines with odd leg calipers and steel rule, marking practice with dividers oddleg calipers and steel rule (circles, arcs, parallel lines)

Marking off straight lines and arcs using scribing block and dividers chipping flat surfaces along a marked line.

Marking, filing filing square, use of tri square

Marking according to simple blue prints locating positions of holes scribbling lines on chalked surface with marking tools finding centre of round bar with the help of 'V' block and marking block. Joining st. line to an arc.

Chipping Chip slots & oil grooves (Straight)

Filing flat square and parallel to an accuracy of 0.5 mm. Chip curve along a line mark out key way at various angles & cut key ways.

File thin metal to an accuracy of 0.5 mm. chip chamfer grooves and slots.

Saw along a straight line, curved line, on different sections of metal. Straight saw on thick section. M.S. angle and pipes.

File steps and finish with smooth file accuracy  $\pm 0.25$  mm. File and saw on M.S. square and pipe ends.

File radius along a marked line (convex & Concave) & Match. Chip sheet metal (shearing) Chip step and file.

Punch letter and number (letter and number punch) use of different punches.

Prepare forge. Fire for heating metals. Forge a square rod from round stock. Judges the forging temperature of various metals.

Forge M.S. bar to square octagon and hexagon.

Forge flat chisel grind and heat treat chisels.

Forge punches screw drivers chisels, grind them to shape and heat treat to requirement, bending metals to angles, curves & twisting, Preparation of brackets.

Marking of straight lines, circles, profiles and various geometrical shapes and cutting the sheets with snips. Marking out of simple development marking out for flaps for soldering and sweating.

Make various joints, wiring hemming, soldering and brazing form locked, grooved and knocked up single hem straight and curved edges form double hemming. Punch holes using hollow and solid punches. Do lap and butt joints.

Bend sheet metal into various curvature form wired edges straight and curves. Fold sheet metal at an angle stakes. Bend sheet metal to various curvature. Make simple square container with wired edge and fix handle.

Make square tray with square soldered corner make funnel as per development and solder joints.

Make riveted lap and belt joint.

Striking and maintaining arc, straight line head.

Make square butt joint and 'T' fillet joint and arc. Do setting up of flames, fusion runs with and without filler rod, gas and arc.

Make butt weld and corner fillet welding Gas and Arc. Practice in hard soldering and silver soldering.

Do gas cutting

## SECOND YEAR

<b>TRADE THEORY</b>	<b>Code CFM-210</b>
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H.P. Welding equipment description, principle method of operating L.P. welding equipment, description, principle, method of operating types: Joints-Butt and fillet as per BIS specifications.

Oxygen cutting machine description, parts function and uses. Gases and gas cylinder-description. Kinds main difference and uses.

Safety precautions to be observed while working on a lathe. Lathe specifications, and constructional features Lathe main parts-descriptions, bed, head stock, carriage, tail stock, feeding and thread cutting mechanisms. Between centre work catch plate , dog, simple description of a facing and roughing tool and their applications.

Lathe cutting tools Brief study of the nomenclature of lathe cutting tools and necessity of correct grinding, solid and tipped, throw away type tools cutting speed and feed and comparison for H.S.S. carbide tools. Use of coolants and lubricants.

Chucks and chucking the independent four jaw chuck. Reversible features of jaws, the back plate, Method of clearing the thread of the chuck-mounting and dis mounting chucks chucking true, face plate drilling in method of holding drills in the tail stock, boring tools and enlargement of holes.

General turning operations parallel or straight, turning stepped turning grooving , shape of tools for the above operations. Appropriate method of holding the tool on tool post or tool rest. Knurling tools description , grade, uses, speed and feed coolant for knurling.

Taper-definition use and method of expressing tapers standard tapers-taper calculations.

Screw thread definition uses and application. Terminology of screw threads, square worm buttress (non standard-screw threads) Principle of cutting screw thread in centre lathe principle of chasing the screw thread-use of centre gauge. Setting tool for cutting internal and external thread cutting-use of screw pitch gauge, checking the screw thread.

Drill material , types, (taper shank, straight shank) parts and sizes. Drill angle cutting angle for different materials, cutting speed feed. R.P.M. for different materials.

Drill troubles: causes and remedy equality of lips correct clearance, dead centre, length of lips. Drill kinds: fractions , metric, letters and number, grinding of drill.

Grinding wheel: Abrasive, grit, grade structure, bond, specification, use, mounting and dressing bench grinder parts and use-radius gauge, fillet gauge, material, construction, parts, fraction and metric, different dimensions, convex and concave uses care and maintenance.

Radius gauge, feeler, hole gauge, and their uses.

Vernier height gauge: material construction parts, graduations(English & Metric) uses, care, and maintenance. Pig Iron: manufacturing process ( Blast furnace) types, properties and uses.

Cast iron: manufacturing process (cupola furnace) types, properties and uses. Wrought iron: manufacturing process (puddling and Bessemer process) properties and uses.

Steel: manufacturing process plain carbon steels types, properties and uses .

Non-ferrous metals( copper, aluminium, tin, lead, zinc.) properties and uses.

Screw threads: its terminology, parts, types, and their uses. Screw pitch gauge:material parts and uses, Taps British standard(B.S.P.) and metric/BIS(shank body, flute, cutting edge). Method of using and use of calculating tap hole sizes. Tap wrench material parts, types ( solid& adjustable types ) and their uses removal of broken tap, studs( tap stud extractor).

Dies: British standard, metric and BIS standard , material, parts, types, method of using dies, Die stock: material, parts and uses.

Counter sink, counter bore and spot facing tools and nomenclature, Reamer material , types(Hand and machine reamer) kinds, parts and their uses. Determining hole size ( or reaming), Reaming procedure.

Screw thred micrometer: construction graduation and use.

Dial test indicator, construction, parts material, graduation , method of use, Care and maintenance. Comparators-measuremet

<b>WORKSHOP CALCULATION &amp; SCIENCE</b>
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<b>Code CFM- 220</b>
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True job on four jaw chuck using knife tool face both the ends for holding between centres. Using roughing tool parallel turn+0.1 mm. Measure the diameter using outside caliper and steel rule.

Cut grooves, square, round 'v' groove, make a mandrel-turn diameter to sizes Knurl the job.

Bore holes-spot face, pilot drill, enlarge hole, using boring tools make a bush. Step bore-cut recess turn hole diameter to sizes.

Turn taper (internal and external). Turn taper pins. Turn standard tapers to suit with gauge.

Cut threads using taps & dies on lathe by hand, cut 'v' thread-external. Prepare a nut and match with the bolt.

Mark off and drill through holes-drill on M.S. flat, file radius and profile to suit gauge.

Step fit, angular fit, file and make angle, surfaces (Bevel gauge accuracy 1 degree) make simple open and sliding fits.

Enlarge hole and increase internal dia. File cylindrical surfaces. Make open fitting of curved profiles.

Make the circles by bridging a previously drilled hole. Test angular match up.

Inside square fit, make combined open and sliding fit, straight sides 'T' fit.

File fit combined open angular and sliding sides. File internal angles 30 minutes accuracy open angular fit.

Make sliding fit with angles other than 90 sliding fit with an angle.

Make simple bracket by bending and twisting nonferrous metal. Drill small holes(2mm) Drill holes on sheet metal, bend sheet for round bracket.

Form internal threads with taps to standard size (through holes and blind holes)-Drill through hole and tap drill blind hole and tap; prepare studs and bolt.

Form external threads with dies to standard size. Prepare nuts and match with bolts.

Counter sink, counter bore and ream split fit(three piece fitting).

Filing & scraping of bearing to close precision.

File and fit combined radius and angular surface ( accuracy+.5 mm) angular and radius fit.

Locate accurate holes. Make accurate hole for stud fit .

Make assembly for dovetail sliding fits using lower pins and screws(+0.04 mm)

Make sliding fits assembly with parallel and angular mating surface. (+0.04 mm)

Practice on testing of machine tools and general shop maintenance.

Simple repair work, simple

Assembly of machine parts from blue prints.

Test

Prepare triangle, hexagon on ends of a cylinder bar prepare female end and fit.

Make key and keyways on the shaft and fit. "V" grooves and slots on the cast iron block.

Make riveted joints( lap and butt joints)

Drill on cylindrical surface.

Scrap on flat surfaces scrap on curved surfaces and scrap surface parallels and test. Make& assemble sliding fits-plain surfaces.

Make simple dowel pins fitting dowel pins and tap screw assembly.

Assembly sliding for using keys and dowel pin and screw + 0.02 mm plain surfaces.

Testing of sliding fitting job, scrap on two flat surfaces-and curved surfaces.

File & fit angular mating surface plain within an accuracy of + 0.02 mm & angular+15 minutes angular fitting.

Drill through and blind holes at an angle-drill blind holes 'Y' fitting.

Dovetailed fitting radius fitting.

Precision drilling, reaming and tapping. Test – Job

File and fit combined fit with straight, angular surface+0.02 mm, hexagonal fitting.

Drill and ream small dia holes to accuracy-correct location for fitting. Make male and female fitting parts-drill and ream holes not less than 12.7 mm.

Sliding fitting-Diamond fitting ,Lapping flat surfaces using lapping plate.

Stepped keyed fitting test job. Lapping holes and cylindrical surfaces.