Co-funded by the European Union

german cooperation
DEUTSCHE ZUSAMMENARBEIT

Norwegian Embassy
Islamabad

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

NAVTTC

Implemented by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Published by
National Vocational and Technical Training Commission
Government of Pakistan

Headquarter
Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan
www.navttc.org

Responsible
Director General Skills Standard and Curricula, National Vocational and Technical Training Commission
National Deputy Head, TVET Sector Support Programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Layout & design
SAP Communications

Photo Credits
TVET Sector Support Programme

This document has been produced with the technical assistance of the TVET Sector Support Programme, which is funded by the European Union, the Federal Republic of Germany and the Royal Norwegian Embassy and has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the National Vocational and Technical Training Commission (NAVTTC) as well as provincial Technical Education and Vocational Training Authorities (TEVTAs), Punjab Vocational Training Council (PVTC), Qualification Awarding Bodies (QABs)s and private sector organizations.

Document Version
July, 2019
Islamabad, Pakistan

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Introduction

Definition/ Description of the training programme for SURGICAL INSTRUMENT MANUFACTURING TECHNICIAN

Surgical Instrument Manufacturing Technician is a course developed to create a technician for the whole surgical industry. The technician has skills and knowledge about all parts of the surgical field within a safe work place environment. He has the ability to handle production from the raw material to the finished inspected packed surgical instruments. In addition he can assign duties, supervision and inspection of surgical instruments. The production process is also involved in the responsibilities of a Surgical Instrument Manufacturing Technician.

Purpose of the training programme

The purpose of training a Surgical Instrument Manufacturing Technician is to enhance the development of the surgical industry in PAKISTAN. The surgical industry is the second largest foreign exchange earning industry in the light engineering sector. After completion of the training, the candidate will be able to start a job or start his own business.

Overall objectives of training programme

Overall objectives of the Surgical Instrument Manufacturing Technician are:

- Giving knowledge and skills about safe workplace environment and attitude
- Giving knowledge and skills about surgical instrument manufacturing process/ operations i.e. (Forging, Machining, Grinding, Polishing, Inspection, Packing etc)
- Selecting and operating of tools and equipment used in surgical instrument manufacturing process
- Sequencing of the process involved in surgical instrument manufacturing process
- Handling the stock and finished surgical instruments
- Assigning the duties
- Working in a team
- Supervising the production
- Operating and knowledge about computer applications i.e. (Microsoft office etc)
- Giving knowledge about office management
- Quality inspection of the surgical instruments
- Packing skills and techniques of surgical instruments

Competencies to be gained after completion of course

At the end of the course, the trainee must have attained the following competencies:

- Communication skills
- Maintain safe work place environment and attitude
- Team work
- Computer application skill
- Manage finance
- Forging operation, its tools, equipment and machines
- Manual machining operations, its tools, equipment and machines
- Sheet metal surgical instruments developing operations, its tools, equipment and machines
- Handle surgical instruments manufacturing
- Grinding operations, its tools, equipment and machines
- Heat treatment methods, operations, its tools, equipment and machines

Potential job opportunities available immediately and later in the future

After completion the Surgical Instrument Manufacturing Technician training, trainees get employments in firms related to surgical industry. They can also start self-employment by means of small production unit at initial level. The opportunities available in industries after completion of surgical instrument manufacturing technician are:

- Production supervisor
- Foreman
- Forger
- Machinist
- Grinding machine operator
- Furnace operator
- Heat treatment plant operator
- Polishing man
- Ultrasonic machine operator
- Surgical instrument setter and assembler
- Packing worker
- Quality checker and controller

Trainee entry level

Trainee's entry level for Surgical Instrument Manufacturing Technician is minimum 8th grade or equivalent.

Entry requirements

The entry for National Vocational Certificate levels-II to Level-IV Surgical Instrument Manufacturing Technician is given below**:**

QUALIFICATION TITLE	ENTRY REQUIREMENTS
National Vocational Certificate Level-II in Surgical Instrument Manufacturing Technician (Instrument Maker)	The entry requirement for this qualification is minimum 8th Grade or equivalent.
National Vocational Certificate Level-III in Surgical Instrument Manufacturing Technician (Surgical Forger)	The entry requirement for this qualification is National Vocational Certificate Level-II or middle with hands on experience
National Vocational Certificate Level-IV in Surgical Instrument Manufacturing Technician (Supervisor)	The entry requirement for this qualification is National Vocational Certificates Level-III or GIII or middle with 1 year work experience

Minimum qualification of trainer

DAE in Mechanical with minimum three (3) years of experience in surgical field

OR

BSC Mechanical Engineering or BSC Mechanical Engineering Technology or equivalent in Mechanical with one (1) years of experience in surgical field

OR

Minimum one level higher than the qualification with minimum five years work experience in surgical field

Recommended trainer: trainee ratio

The recommended maximum trainer: trainee ratio for Surgical Instrument Manufacturing Technician is 1 trainer and 1 demonstrator for 25 trainees.

Medium of instruction i.e. language of instruction

Medium of instruction for Surgical Instrument Manufacturing Technician are Urdu and English.

Duration of the course (Total time, Theory & Practical time)

The level 3 curriculum comprises with 9 Modules. The recommended delivery time is 690 hours. Delivery of course could be full time, 5 days a week. Training providers are at liberty to develop other models of delivery, including part-time and evening delivery.

The structure of this module is as follow:

Module Code	Module Name	Theory Hours	Practical Hours	Total Hours
102200846	Apply Work Health and Safety Practices (WHS)			30
041700840	Identify and Implement Workplace Policy and Procedures			20
001100852	Communicate at Workplace			30
061100858	Perform Computer Application Skills			40
041300867	Manage Personal Finances			30
	Perform Forging	28	102	130
	Perform Manual Machining	28	102	130
	Develop Sheet Metal Surgical Instruments	28	102	130
	Apply Heat Treatment	30	120	150

Sequence of the modules

The level 3 is consists of 9 modules. Every module has its own important and measures. We arrange the sequence of module according to working sequence/ steps.

The full structures of the sequence of module within levels are:

LEVEL-3

Sequence No.	Module Code	Module Name	Module Code	Module Name
1		Perform Forging	102200846	Apply Work Health and Safety Practices (WHS)
2		Perform Manual Machining	041700840	Identify and Implement Workplace Policy and Procedures
			001100852	Communicate at Workplace
3		Develop Sheet Metal Surgical Instruments	061100858	Perform Computer Application Skills
4		Apply Heat Treatment	041300867	Manage Personal Finances

Summary – overview of the course

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 1: 102200846 Apply Work Health and Safety Practices (WHS) **Aim:** This unit describes the skills to work with safety and participate in hazard assessment activities, follow emergency procedures and participate OHS practices in process.	**LU1:** Implement safe work practices at work place **LU2:** Participate in hazard assessment activities a work place **LU3:** Follow emergency procedures at workplace **LU4:** Participate in OHS consultative processes			**30**
Module 2: 041700840 Identify and Implement Workplace Policy and Procedures **Aim:** This unit describes the skills and knowledge required to develop and implement a workplace policy & procedures and to modify the policy to suit changed circumstances. It applies to individuals with managerial responsibilities who undertake work developing approaches to create, monitor and improve strategies and policies within workplaces and engage with a range of relevant stakeholders and specialists.	**LU1:** Identify workplace policy & procedures **LU2:** Implement workplace policy & procedures **LU3:** Communicate workplace policy& procedures **LU4:** Review the implementation of workplace policy & procedures			**20**

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 3: 001100852 Communicate at Workplace **Aim:** This unit describes the performance outcomes, skills and knowledge required to develop communication skills in the workplace. It covers gathering, conveying and receiving information, along with completing assigned written information under direct supervision.	**LU1:** Communicate within the organization **LU2:** Communicate outside the organization **LU3:** Communicate effectively in workgroup **LU4:** Communicate in writing			**30**
Module 4: 061100858 Perform Computer Application Skills **Aim:** This unit describes the skills and knowledge required to use spreadsheet applications, prepare in page documents, develops familiarity with Word, Excel, Access, PowerPoint, email, and computer graphics basics. It applies to individuals who perform a range of routine tasks in the workplace using a fundamental knowledge of spreadsheets, Microsoft office and computer graphics in under direct supervision or with limited responsibility.	**LU1:** Prepare In-page documents as per required information **LU2:** Prepare Spreadsheets as per required information **LU3:** Use MS Office as per required information **LU4:** Perform computer graphics in basic applications **LU5:** Create Email account for communications			**40**

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 5: 041300867 Manage Personal Finances **Aim:** This unit of competency describes the outcomes required to manage develop, implement and monitor a personal budget in order to plan regular savings and manage debt effectively.	**LU1:** Develop a personal budget **LU2:** Develop long term personal budget **LU3:** Identify ways to maximize future finances			**30**
Module 6: Perform Forging **Aim:** The aim of this module is to develop advanced skills, knowledge and understanding to perform forging	**LU1:** Perform sheet cutting **LU2:** Apply hammer stroke **LU3:** Trim extra material	28	102	**130**
Module 7: Perform Manual Machining **Aim:** The aim of this module is to develop advanced skills, knowledge and understanding to perform manual machining	**LU1:** Perform turning operations **LU2:** Perform milling operations	28	102	**130**

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
Module 8: Develop Sheet Metal Surgical Instruments **Aim:** The aim of this module is to develop advanced skills, knowledge and understanding of developing sheet metal surgical instruments	**LU1:** Perform blanking **LU2:** Perform punching **LU3:** Perform bending **LU4:** Apply deep draw process **LU5:** Perform spinning	28	102	**130**
Module 9: Apply Heat Treatment **Aim:** The aim of this module is to develop advanced skills, knowledge and understanding to apply heat treatment methods	**LU1:** Prepare workstation for heat treatment **LU2:** Perform annealing **LU3:** Apply heat treatment by conventional method **LU4:** Apply vacuum heat treatment **LU5:** Apply conveyor belt heat treatment	30	120	**150**

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

Module-1

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Modules

Module 1: Apply Work Health and Safety Practices (WHS) (102200846)

Objective of the module: This unit describes the skills to work with safety and participate in hazard assessment activities, follow emergency procedures and participate OHS practices in process.

Duration: 30 Hours **Theory:** Hours **Practical:** Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Implement safe work practices at work place	**The trainee will be able to:** Implement relevant rules and procedures of WHS at work place. Comply with duty of care requirements Use personal protective equipment according to safe work practices Contribute to WHS consultative activities Raise WHS issues with relevant personnel		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop

LU2: Participate in hazard assessment activities a work place	**The trainee will be able to:** Identify hazards or WHS issues in the workplace to relevant personnel Assess and control risks according to own level of responsibility, in line with workplace procedures Report hazards or WHS issues in the workplace to relevant personnel Document risk control actions as required		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop
LU3: Follow emergency procedures at workplace	**The trainee will be able to:** Report emergencies or incidents promptly to relevant personnel Deal with emergencies in line with own level of responsibility Implement evacuation procedures as required		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop

LU4: Participate in OHS consultative processes	**The trainee will be able to:** Contribute to workplace meetings, inspections or other consultative activities Raise OHS (Occupational Health and Safety) issues with designated persons in accordance with organizational procedures Take actions to eliminate workplace hazards or to reduce risks		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

Module-2

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Module 2: Identify and Implement Workplace Policy and Procedures (041700840)

Objective of the module: This unit describes the skills and knowledge required to develop and implement a workplace policy & procedures and to modify the policy to suit changed circumstances. It applies to individuals with managerial responsibilities who undertake work developing approaches to create, monitor and improve strategies and policies within workplaces and engage with a range of relevant stakeholders and specialists.

Duration: 20 Hours **Theory:** Hours **Practical:** Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Identify workplace policy & procedures	**The trainee will be able to:** Identify the workplace policy & procedures Apply appropriate strategies that can be used to measure whether your workplace health and safety obligations are being met. Assure the policies are realistic, resources and personnel to implement Implement the policy & procedures that reflects the organizations commitments Ensure the appropriate		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop

	methods of implementation, outcomes and performance indicators				
LU2: Implement workplace policy & procedures	**The trainee will be able to:** Apply and assign responsibility for recording systems to track continuous improvements in policy & procedures Implement strategies for continuous improvement in effective and efficient information		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop
LU3: Communicate workplace policy& procedures	**The trainee will be able to:** Communicate procedures to help implement workplace policy Inform those involved in implementing the policy about expected outcomes, activities to be undertaken and assigned responsibilities		**Total** **Hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical:** Workshop

LU4: Review the implementation of workplace policy & procedures	**The trainee will be able to:** Identify the trends that may require remedial actions Record the trends that may require remedial actions. Ensure policy and procedures as required are made for continuous improvement of performance		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

Module-3

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Module 3: Communicate at Workplace (001100852)

Objective of the module: This unit describes the performance outcomes, skills and knowledge required to develop communication skills in the workplace. It covers gathering, conveying and receiving information, along with completing assigned written information under direct supervision.

Duration: 30 Hours **Theory:** Hours **Practical:** Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Communicate within the organization	**The trainee will be able to:** Communicate within a department Communicate with other departments. Use various media to communicate effectively Communicate orally and written		**Total hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop
LU2: Communicate outside the organization	**The trainee will be able to:** Deal with vendors Deal with clients/customers Interact with other organisations Use various media to communicate effectively Work with people of different cultures /		**Total hrs** **Theory:** hrs **Practical:**	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop

	backgrounds		hrs		
LU3: Communicate effectively in workgroup	**The trainee will be able to:** Assess the issues to provide relevant suggestion to group members Resolve the issues/ problems /conflicts within the group Arrange group working sessions to increase the level of participation in the group processes Communicate messages to group members clearly to ensure interpretation is valid Communicate style /manner to reflect professional standards/ awareness of appropriate cultural practices Act upon constructive feedback		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop
LU4: Communicate in writing	**The trainee will be able to:** Identify relevant procedures for written information Use strategies to ensure correct communication in writing .i.e. • correct composition • clarity • comprehensiveness • accuracy • appropriateness Draft assigned written information for approval, ensuring it is written within designated timeframes Ensure written information meets required standards of style, format and detail Seek assistance / feedback to aid communication skills development		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

Module-4

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Module 4: Perform Computer Application Skills (061100858)

Objective of the module: This unit describes the skills and knowledge required to use spreadsheet applications, prepare in page documents, develops familiarity with Word, Excel, Access, PowerPoint, email, and computer graphics basics.

It applies to individuals who perform a range of routine tasks in the workplace using a fundamental knowledge of spreadsheets, Microsoft office and computer graphics in under direct supervision or with limited responsibility.

Duration: 40 Hours **Theory:** Hours **Practical:** Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare In-page documents as per required information	**The trainee will be able to:** Set keyboard preferences according to information requirements Layout Page according to information requirements Toggle between Languages Identify the usage of tool bar Insert Columns as per requirement Print the document		**Total hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop

LU2: Prepare Spreadsheets as per required information	**The trainee will be able to:** Create workbook according to information requirements Insert sheet according to information requirements Enter basic formulae / functions using cell referencing when required Correct formulas when error messages occur Use a range of common tools during spreadsheet development Edit columns and rows within the spreadsheet Filter data Save the spreadsheet to a folder on a storage device Format spreadsheet using formatting features as required Incorporate object and		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop

	chart in spreadsheet Print spreadsheet				
LU3: Use MS Office as per required information	**The trainee will be able to:** Use Microsoft Word for documentation Use Microsoft Excel for documentation Use Microsoft PowerPoint for presentation Perform OneNote Perform Outlook for emails Perform Publisher applications		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop
LU4: Perform computer graphics in basic applications	**The trainee will be able to:** Perform graphic fundamentals in basic applications Draw Points and lines to make images Draw Dots in space to		**Total** **hrs** **Theory:** hrs	**Consumable :**	

	make images Draw lightening blot Shapes to make images Enlarge circles and rectangles to block in forms		**Practical:** hrs		
LU5: Create Email account for communications	**The trainee will be able to:** Make email account for communications Compose text of an email message according to organizational guidelines as required Create an automatic signature for the user Attach files to email message where required Send email message Reply to / forward a received message using available features Save an attachment to		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	

	the relevant folder Save email message using available settings Adjust email accounts to restrict and quarantine possible email security problems • Print email message as per requirements				

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

Module-5

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Module 5: Manage Personal Finances (041300867)

Objective of the module: This unit of competency describes the outcomes required to manage develop, implement and monitor a personal budget in order to plan regular savings and manage debt effectively.

Duration: 30 Hours **Theory:** Hours **Practical:** Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Develop a personal budget	**The trainee will be able to:** Calculate current living expenses using available information to prepare a personal budget. Keep a record of all income and expenses for a short period of time to help estimate ongoing expenses. Subtract total expenses from total income to determine a surplus or deficit budget for the specified period. Find reasons for a deficit budget and ways to reduce expenditure identified.		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop

	Identify ways to increase income				
LU2: Develop long term personal budget	**The trainee will be able to:** Analyze income and expenditure and set long term personal financial goals. Develop a long-term budget based on the outcomes of short-term budgeting. Identify obstacles that might affect the business Formulate a regular savings plan based on budget		**Total** **hrs** **Theory:** hrs **Practical:** hrs	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop
LU3: Identify ways to maximize future finances	**The trainee will be able to:** Determine sources to maximize personal income, Get further education or training to maintain or improve future income Identify the need for debt		**Total** **hrs** **Theory:** hrs **Practical:**	**Consumable :**	**Theory:** Class room with multimedia facility **Practical :** Workshop

	to finance living and other expenses Determine the appropriate levels of debt and repayment Consolidate existing debt, where possible, to minimize interest costs and fees Seek professional money management services		hrs		

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

Module-6

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Module 6: Perform Forging

Objective of the module: This standard defines the knowledge, skills and understanding required to perform forging which is initial step for surgical manufacturing.

Duration: 130 Hours **Theory:** 28 Hours **Practical:** 102 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform Sheet Cutting	**The trainee will be able to:** Arrange suitable materials and measure thickness of sheet as per product specification / drawing Set shearing parameters as per required strip sizes Adjust the Jig size for sheet cutting on shearing press table Cut down the large size sheet into strips according to job specification using shearing press Measure strips to verify required specifications	Understanding safety precautions and Personal Protective Equipment for sheet cutting operations Understanding systems of measurements and conversions (imperial & metric Systems) Knowledge and use of Measuring Instruments and marking tools (e.g. Steel rule, vernier caliper, thickness gauge, scriber etc) Identify metal sheets by grades and gauges used for making surgical instruments through sheet cutting operations. Understanding the basics of technical drawings and symbols Basic understandings of jigs and fixture. Knowledge about shearing press, its parts, types and operations (stroke, alignments of jigs and fixtures) Setting parameters of	**Total** **36 hrs** **Theory:** 09 hrs **Practical:** 27 hrs	Measuring tools (steel rule, measuring tape, tri square, scriber, compass, vernier caliper, micrometer, feeler gauge, sheet gauge etc) Work holding devices and attachments(jigs and fixtures) Shearing press Hammers (assorted range) Spanners Clamping set Tool kit	**Theory:** Class room with multimedia facility **Practical :** Workshop

	Mount cutting die on power press to cut strips for pre-forge shape (raw shape)	shearing press Method of die setting, and its alignments, tools used in die setting (e.g. clamps, spacers, spanner etc), techniques to reduce/ control die setting time. Understanding of time management Understanding of contingency management Knowledge about basic maintenance of shearing press Knowledge of defects in sheet cutting parts / pieces and its corrective measures. Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)		**Consumables :** Metal sheets First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, Safety shoe, ear plug/ muffs, apron etc) Process travel card (PTC)	
LU2: Apply hammer stroke	**The trainee will be able to:** Mount both parts of forging dies on drop forged hammer Align forging dies as per standard procedure Heat up the pre-forged work pieces in furnace to achieve required	Understanding safety precautions and Personal Protective Equipment for drop forging operations Understanding parts, specifications, stroke techniques and operating of drop forging hammer Method of die setting/ mounting, and its alignments, tools used in die setting (e.g. Clamping set, spanner etc), techniques to reduce/ control die setting time	**Total** **60 hrs** **Theory:** 12 hrs **Practical:** 48 hrs	Work holding devices and attachments(jigs and fixtures) Drop forging hammer Gas heating furnace Hammers (assorted range) Forging die	**Theory:** Class room with multimedia facility **Practical :** Workshop

	temperature Place preheated pieces in forging die and apply hammer stroke as per requirements Remove the forged pieces out of die safely and place in storage container/trolley/bin Inspect the size and shape of forged pieces after cooling down to verify required specifications	Knowledge of setting furnace temperature and follow the thermo couple/ temperature controller display reading Knowledge of standard operating procedure for forging Understanding about handling techniques of forged work piece Understanding of time management Understanding of contingency management Knowledge about basic maintenance of drop forging hammer and furnace Knowledge of types of defects in forged parts / pieces and its corrective measures (misaligned forged parts) Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)		Spanners Clamping set Tongs (For holding forged work piece) Tool kit **Consumables :** Metal strip First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Process travel card (PTC)	
LU3: Trim extra material	**The trainee will be able to:** Mount trimming die on power press Set press parameters	Understanding safety precautions and Personal Protective Equipment for trimming operations Purpose of trimming operation and construction of trimming die	**Total** **34 hrs** **Theory:**	Work holding devices and attachments(jigs and fixtures) Power press Hammers	**Theory:** Class room with multimedia facility **Practical :** Workshop

	(daylight, stroke etc.) as per job requirements Trim the extra material from forged pieces on power press Check quality of trimmed forged work pieces Perform cold stamping if required and store in designated place Prepare report of completed work on prescribed format	Method of trimming die setting, and its alignments, tools used in die setting (e.g. clamps, spacers, spanner etc) Understands techniques to reduce/ control die setting time. Knowledge about power press, its parts, types and operations (stroke, daylight, alignments of jigs and fixtures). Setting parameters of power press Understanding quality requirements of trimmed jobs, defects and corrective measures Knowledge and requirements of cold stamping method Understanding of time management Understanding of contingency management Knowledge about basic maintenance of power press Knowledge of types of defects in trimmed work pieces and its corrective measures Understanding process travelling card (PTC) and its applications. (Storage of job, quality, quantity etc)	07 hrs **Practical:** 27 hrs	(assorted range) Trimming dies for different product Dial Indicator with Magnet Stand Spanners Clamping set Tool kit **Consumables :** Forged pieces First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Process travel card (PTC)	

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

Module-7

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Module 7: Perform Manual Machining

Objective of the module: This standard defines the knowledge, skills and understanding required for manual machining to perform surgical operations.

Duration: 130 Hours **Theory:** 28 Hours **Practical:** 102 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform turning operations	**The trainee will be able to:** Arrange material for turning operations according to job requirement Prepare work-piece by using required machining (sawing and filing etc.) and get it ready for clamping Arrange tools, measuring instruments and holding devices as per work instructions Clamp and align the work piece and tools on lathe machine Set lathe machine parameters (spindle speed (rpm), feed etc.)	Understand safety precautions and Personal Protective Equipment and workplace safety in turning operation. Identify materials used in commonly produced surgical instruments (mild steel, teflon, aluminium, stainless steel, brass, etc) Identify commonly produced surgical instruments that require lathe machine operations Understand work specifications, and instructions for lathe machine Understand using files (flat file, round file needle file etc), saws, its types and operating techniques. Knowledge of measurement systems Understand using measuring and marking tools (vernier callipers, micrometers, thread gauge, radius gauge, scriber, punch, dial indicator with magnetic stand etc)	**Total** **65 hrs** **Theory:** 13 hrs **Practical:** 52 hrs	Lathe machine (with standard accessories) Power hacksaw machine Hand hacksaw Measuring and marking tools (Vernier Callipers, Micrometers, scriber, punch etc) Work holding devices and attachments of lathe machine (face plate, mandrill, chuck, drill chuck, lathe centres etc)	**Theory:** Class room with multimedia facility **Practical :** Machine Shop/ Workshop

	according to the machining requirements Perform machining to achieve required dimensions and finish surface Use appropriate measuring tools & instruments to ensure the quality and measurements of work piece according to standards	Understanding lathe machine construction, sizes, types and operations (turning, facing, drilling, boring, threading etc) Understanding about cutting tools materials and geometry (turning, boring, knurling, threading tools etc) Knowledge about tool bit grinding as per tool geometry Knowledge about work holding devices and attachments (face plate, mandrill, chucks etc) Understand safe clamping practices of tool and work piece Understand job and tool clamping methods for lathe machines Understand importance and usage of cutting lubricants Understand setting feed, depth of cut and spindle speed (RPM) according to the work-piece and tool materials Understanding of time management Understanding of contingency management Knowledge about basic maintenance of lathe machine		Pedestal grinder with cutting angle support Hammers (assorted range) Radius gauge - concave & convex (assorted range) Threads gauge - inches / millimeters (assorted range) Bench vices Boring head Plug and snap gauges Dial indicator with magnet stand Tool kit **Consumables :** First aid box with complete accessories	

		Understand common defects in machined components and its corrective measures. Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)		Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Work piece material (mild steel, teflon, aluminium stainless steel, brass etc) Hacksaw blades Different grades of grinding wheel (for HSS tool bits and tungsten carbide tip tool Different types of files Tap set Drill set Range of lathe cutting tools (HSS tool bit, tungsten carbide tips tool	

				etc) Lubricant oil Coolant Cleaning brushes Cleaning clothes Process travel card (PTC)	
LU2: Perform milling operations	**The trainee will be able to:** Arrange materials for milling operations according to job requirement Prepare work-piece for required machining (sawing and filing etc.) and get it ready to clamp Arrange the cutters, measuring instruments and holding devices as per work instructions Clamp and align the work piece and tool on milling machine	Understand safety precautions and Personal Protective Equipment and workplace safety in milling operation. Identify materials used in commonly produced surgical instruments (mild steel, teflon, aluminium, stainless steel, brass, etc) Knowledge about commonly produced surgical instruments that require milling machine operations Understand work specifications, and instructions of milling machine Understand using files, saws, its types and operating techniques. Knowledge of measurement systems Understand using measuring and marking	**Total** **65 hrs** **Theory:** 13 hrs **Practical:** 52 hrs	Vertical and horizontal milling machines (with standard accessories) Power hacksaw Shaper machine Tool and cutter grinder Surface grinder Drill machine Hand hacksaw Measuring and marking tools (vernier callipers,	**Theory:** Class room with multimedia facility **Practical :** Workshop/ lab

	Set milling machine parameters (spindle speed(rpm), feed, depth of cut etc.) according to the machining requirements Perform milling to achieve required dimensions and surface finish Use appropriate measuring tools & instruments to ensure the quality and measurements of work piece according to standards	tools (vernier callipers, micrometers, height gauge, dial indicator with magnetic stand, tri square, scriber, depth micrometer etc) Understanding milling machine construction, sizes, types and operations (Face milling, side milling, slotting, serration etc) Understanding about Milling Cutters, material and geometry (End mill cutter, T-slot cutter, Concave and convex cutters, saw cutter etc) Knowledge about work holding devices, attachments and fixtures (clamping sets, machine vices, tool holders and collets set, Rotary table, dividing head spacer etc) Understand safe clamping practices of tool and work piece Understand job and tool clamping methods for milling machines Understand Importance and usage of cutting lubricants Understand setting feed, depth of cut and spindle speed (RPM) according to the work-piece and cutter materials Understanding of time management Understanding of contingency management Knowledge about basic maintenance of		micrometers, height gauge, dial indicator with magnetic stand, tri square, scriber, depth micrometer, etc) Work holding devices and attachments (clamping sets, machine vices, tool holders and collets set, spacer etc) Pedestal grinder with cutting angle support Hammers (assorted range) Bench vices Dividing head and rotary table Dial indicator with magnet stand Tool kit	

		milling machine Understand common defects in machined components and its corrective measures Understanding process travelling card (PTC) and its applications. (Storage of job, quality, quantity etc)		**Consumables :** First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Work piece material (mild steel, teflon, aluminium stainless steel, brass, etc) Hacksaw blades Files Range of milling cutters according to material (HSS cutter, carbide cutters etc) and its operations (end mill cutter, t-slot	

				cutter, concave and convex cutters, saw cutter etc) Lubricant oil Coolant Cleaning brushes Cleaning clothes Process travel card (PTC)	

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

Module-8

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Module 8: Develop Sheet Metal Surgical Instruments

Objective of the module: This standard defines the knowledge, skills and understanding required to develop sheet metal surgical instruments.

Duration: 130 Hours **Theory:** 28 Hours **Practical:** 102 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform blanking	**The trainee will be able to:** Arrange materials and tools required for blanking operation as per work instructions Set parameters to perform shearing on shearing press as per required strip sizes Mount blanking die on power press Adjust machine daylight and stroke according to sheet thickness Perform blanking on sheets Offload and store sheet	Understanding personal protective equipment and workplace safety for sheet metal blanking operation Knowledge and use of measuring instruments and (e.g. steel rule, vernier caliper, micrometer, thickness gauge, etc) Identify sheet metal materials and their grades and gauges (e.g. stainless steel etc) Identification of surgical instruments made of sheet metal (hollow wear instruments etc) Understand work specifications and instructions of blanking operation. Knowledge about shearing and power press for blanking, its parts, types and operations (Stroke, day light, alignments of jigs and fixtures) Setting parameters of shearing and power press	**Total** **28 hrs** **Theory:** 07 hrs **Practical:** 21 hrs	Measuring (e.g. steel rule, vernier caliper, micrometer, thickness gauge, etc) Clamping set Hand hammers (assorted range) Power press Shearing press Blanking dies Tool kit **Consumables :** First aid box with	**Theory:** Class room with multimedia facility **Practical :** Workshop

	scrap and blanks safely at designated places	Understand methods and techniques of mounting and setting of blanking dies. Knowledge of blanking dies, punches and their components Understand quality of component produced using sheet metal Handling and transportation of punched jobs Understanding of time management Understanding of contingency management Knowledge about basic maintenance of shearing and power press Understanding process travelling card (PTC) and its applications. (Storage of job, quality, quantity etc) Understand the defects of blanking and its corrective measures		complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Metal sheets (stainless steel) Process travel card (PTC)	
LU2: Perform punching	**The trainee will be able to:** Arrange materials and tools required for punching operation as per work instructions Mount and set punching	Understand personal protective equipment and workplace safety for sheet metal punching Understand methods and techniques of mounting and setting of punching dies. Knowledge about power/ punching press for punching, its parts, types and	**Total** **20 hrs** **Theory:**	Hand hammers (assorted range) Power/ punching press Punching dies	**Theory:** Class room with multimedia facility **Practical :** Workshop

	die on press as per work specifications and procedures Adjust machine daylight and stroke according to sheet thickness Perform punching on blanks Offload and store work pieces safely at designated place	operations (Stroke, day light, alignments) Setting parameters of power press Knowledge of dies, punches and their components Understand work specifications, and instructions. Understand quality of component produced using sheet metal Handling and transportation of punched jobs Understanding of time management Understanding of contingency management Knowledge about basic maintenance of power and punching press Understanding process travelling card (PTC) and its applications. (Storage of job, quality, quantity etc) Understand the defects of punching and its corrective measures	04 hrs **Practical:** 16 hrs	Clamping set Tool kit **Consumables :** First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoe, apron, ear plug/muff etc) Blanked work pieces for punching Process travel card (PTC)	
LU3: Perform bending	**The trainee will be able to:** Arrange material and tools required for	Understand personal protective equipment and workplace safety for sheet metal bending Understand methods and techniques of	**Total** **20 hrs**	Hand hammers (assorted range) Power/ hydraulic press	**Theory:** Class room with multimedia facility

	bending operation as per work instructions Adjust and set bending die on press as per work specifications and procedures. Adjust power / hydraulic press daylight and stroke according to sheet thickness Start the required operations as per drawing and job specifications Offload and store work pieces safely at designated place	mounting and setting of bending dies. Knowledge about power/ hydraulic press for bending, its parts, types and operations (stroke, day light, alignments) Setting parameters of power press Knowledge of bending dies, punches and their components Understand work specifications, and instructions for bending operation. Understand quality of component produced using bended work pieces Handling and transportation of bended jobs Understanding of time management Understanding of contingency management Knowledge about basic maintenance of power and hydraulic press Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc) Understand the defects of bended work pieces manufacturing and its corrective measures	**Theory:** 04 hrs **Practical:** 16 hrs	Bending dies Tool kit **Consumables :** First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Blanked/ punched work piece Process travel card (PTC)	**Practical:** Workshop
LU4: Apply deep draw process	**The trainee will be able to:**	Understand personal protective equipment and workplace safety for deep draw	**Total**	Dial indicator with magnet stand	

	Arrange material and tools required for deep draw operation as per work instructions Mount and set deep draw dies on hydraulic press as per work specifications and procedures. Punch marks using manual punches on the product wherever applicable Operate deep draw process on hydraulic press Offload and store work pieces safely at designated place	process. Understand methods and techniques of mounting and setting of deep draw dies. Knowledge about hydraulic press for deep drawing, its parts, types and operations (Stroke, day light, alignments) Setting parameters of hydraulic press Knowledge of deep draw dies, punches and their components Understand work specifications, and instructions for deep draw process. Understand quality of component produced using deep drawing Handling and transportation of deep drawing jobs Understanding of time management Understanding of contingency management Knowledge about basic maintenance of hydraulic press Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc) Understand the defects of deep drawing work pieces manufacturing and its	**40 hrs** **Theory:** 08 hrs **Practical:** 32 hrs	Hammers (assorted range) Hydraulic press Deep draw dies Tool kit **Consumable :** First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Blanked/ punched work piece Process travel card (PTC)	**Theory:** Class room with multimedia facility **Practical :** Workshop

		corrective measures (Tearing, wrinkling etc)			
LU5: Perform spinning	**The trainee will be able to:** Arrange materials and tools required for spinning operation as per work instructions Clamp the work piece and tool on spinning lathe machine as per process requirement Apply force gradually to the spinning object to achieve required shape and size Use appropriate tools and gauges to ensure the quality of the product Offload and store work pieces safely at designated place Prepare report of completed work	Understand personal protective equipment and workplace safety for spinning operation Knowledge and use of Measuring Instruments (e.g. Steel Rule, Vernier Caliper, Thickness Gauge, go and not go gauges etc) Understand methods and techniques of clamp, setting of work piece and tool. Knowledge about spinning lathe machine for spinning, its parts, types and operations (Spindle speed RPM, Feed rate) Setting parameters of spinning lathe Understand work specifications, and instructions. Understand quality of component produced using spinning operation Handling and transportation of completed spinning jobs Understanding of time management Understanding of contingency management Knowledge about basic maintenance of spinning machine Understanding process travelling card	**Total** **22 hrs** **Theory:** 05 hrs **Practical:** 17 hrs	Spinning Lathe machine (with standard accessories) Dial indicator with magnet stand Measuring instruments (e.g. Steel Rule, Vernier Caliper, Thickness Gauge, go and not go gauges etc) Different range of spinning lathe tools Hammers (assorted range) Radius gauge - concave & convex (assorted range) Tool kit **Consumables :**	**Theory:** Class room with multimedia facility **Practical :** Workshop

		(PTC) and its applications. (storage of job, quality, quantity etc) Understand the defects of spin work pieces manufacturing and its corrective measures (Layering, tearing, etc)		First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Blanked/ punched work piece Process travel card (PTC)	

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN

Module-9

CBT CURRICULUM

National Vocational Certificate Level 3

Version 1 - July, 2019

Module 9: Apply Heat Treatment

Objective of the module: This standard defines the knowledge, skills and understanding required to apply heat treatment to surgical instruments.

Duration: 150 Hours **Theory:** 30 Hours **Practical:** 120 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Prepare workstation for heat treatment	**The trainee will be able to:** Identify heat treatment processes required for the instrument using work instructions / specification sheets Arrange material, tools and gauges for the identified heat treatment processes Check quality of work pieces before heat treatment	Understanding safety precaution and Personal Protective Equipment for heat treatment processes Understand heat treatment, its purpose methods and their application Basic knowledge about materials and their heat treatment requirements Understand furnace operation (vacuum furnace, conveyor belt furnace, conventional heating furnace, annealing furnace) Basic information about commonly used quenching media (air, water, quenching oil, nitrogen gas, ammonia gas etc) Understand usage of Rockwell hardness tester (scale C) Understand basic concepts of hardness and brittleness	**Total** **25 hrs** **Theory:** 05 hrs **Practical:** 20 hrs	Annealing furnace Conventional heating furnace Vacuum furnace Conveyor belt heat treatment furnace Rockwell hardness tester Standard chart of materials (regarding heat treatment) Quenching tank Tool kit **Consumables:**	**Theory:** Class room with multimedia facility **Practical :** Workshop

				First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Work piece Furnace oil/ natural gas (For heating furnace) Quenching media (water, quenching oil, ammonia Gas, nitrogen gas etc) Process travel card (PTC)	
LU2: Perform annealing	**The trainee will be able to:** Set furnace parameters (temperature and time) as per material requirements	Understanding safety precaution and Personal Protective Equipment for annealing processes Understand annealing, its purpose, method and application Understanding about standard operating	**Total** **25 hrs** **Theory:**	Annealing Furnace Basket (to carry work piece in annealing furnace)	**Theory:** Class room with multimedia facility **Practical :** Workshop

	Place work pieces inside the annealing furnace to achieve set temperature Switch off the furnace and let work pieces cool down to room temperature inside the furnace (12 to 15 hours) Remove work pieces from furnace, test hardness of work pieces using Rockwell Hardness Tester as per hardness requirements and prepare test report	procedures of annealing furnace Basic knowledge about materials and their annealing requirements Understand usage of Rockwell hardness tester (scale C) Understanding of handling methods of annealed work piece Understanding of time management Understanding of contingency management Knowledge about basic maintenance of annealing furnace Understand the defects of annealed work piece (oxidation, bending, improper annealed etc) and its corrective measures Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)	05 hrs **Practical:** 20 hrs	Rockwell hardness tester Standard chart of materials (regarding annealing) Tool kit **Consumables:** First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Work piece Furnace oil/ natural gas (For heating furnace) Process travel card (PTC)	

LU3: Apply heat treatment by conventional method	**The trainee will be able to:** Set furnace parameters (temperature, time) as per material requirements Maintain flame quality by adjusting air: fuel ratio to avoid carbon deposits on instruments Hold work pieces with wires and place in the furnace for specified time Remove work pieces safely from furnace and quench in quenching medium (air, water & oil) for specified time Remove oil from quenched work pieces using appropriate method (draining by hanging and cleaning with cotton etc.) Perform acid pickling to remove the scales from surface of work pieces	Understanding safety precaution and Personal Protective Equipment for conventional heat treatment method processes Understand conventional heat treatment, its purpose, method and their application Understanding about standard operating procedures of conventional heat treatment furnace Understanding flame types and their effects on conventional heat treatment (Reducing, Neutral and oxidizing flame) Basic knowledge about materials and their conventional heat treatment requirements Basic information about commonly used quenching media in conventional heat treatment Understand usage of Rockwell hardness tester (scale C) Understanding of handling methods of conventional heat treatment work piece Understanding of time management Understanding of contingency management Knowledge about basic maintenance of	**Total** **30 hrs** **Theory:** 06 hrs **Practical:** 24 hrs	Conventional heating furnace Rockwell hardness tester Hangers/ baskets (to carry work pieces in furnace) Standard chart of materials Quenching tank Tool kit **Consumables :** First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Work piece	**Theory:** Class room with multimedia facility **Practical :** Workshop

	Test hardness of work pieces using Rockwell Hardness Tester as per hardness requirements and prepare test report	conventional heat treatment furnace Understand the defects of conventional heat treatment work piece (oxidation, improper hardened etc) and its corrective measures Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)		Furnace oil/ natural gas (For heating furnace) Quenching media (water, quenching oil etc) Stainless steel wire (to hold the work pieces) Process travel card (PTC)	
LU4: Apply Vacuum heat treatment	**The trainee will be able to:** Prepare vacuum furnace (temperature, time) as per material requirements Perform vacuum heat treatment (vacuum, heating & cooling) on work pieces as per requirement Remove work pieces safely from the furnace after completing the processes	Understanding safety precaution and Personal Protective Equipment for Vacuum heat treatment processes Understand Vacuum heat treatment, its purpose, method and their application Understanding about standard operating procedures of vacuum heat treatment furnace Basic knowledge about materials and their Vacuum heat treatment requirements Basic information about commonly used cooling media in Vacuum heat treatment (Nitrogen etc) Understand usage of Rockwell hardness	**Total** **40 hrs** **Theory:** 08 hrs **Practical:** 32 hrs	Vacuum furnace Rockwell hardness tester Hangers/ baskets (to carry work pieces in furnace) Standard chart of materials Tool kit **Consumables:** First aid box with complete	**Theory:** Class room with multimedia facility **Practical :** Workshop

	Test hardness of work pieces using Rockwell hardness tester (scale C) as per hardness requirements and prepare test report	tester (scale C) Understanding of handling methods of Vacuum heat treatment work piece Understanding of time management Understanding of contingency management Knowledge about basic maintenance of vacuum heat treatment furnace Understand the defects of Vacuum heat treatment work piece (improper hardened etc) and its corrective measures Understanding process travelling card (PTC) and its applications (storage of job, quality, quantity etc)		accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Work piece Cooling media (nitrogen etc) Process travel card (PTC) Stainless steel hangers (to hold the work pieces)	
LU5: Apply Conveyor Belt Heat Treatment	**The trainee will be able to:** Prepare vacuum furnace (temperature, time, speed) as per material requirements Place the work pieces on conveyor belt of the furnace and start the	Understanding safety precaution and Personal Protective Equipment for conveyor belt heat treatment processes Understand conveyor belt heat treatment, its purpose, method and their application Understanding about standard operating procedures of conveyor belt heat treatment furnace Basic knowledge about materials and their	**Total** **30 hrs** **Theory:** 06 hrs **Practical:**	Conveyor belt heat treatment furnace Rockwell hardness tester Hangers/ baskets (to carry work pieces in furnace) Standard chart of	**Theory:** Class room with multimedia facility **Practical :** Heat treatment shop

	process Remove work pieces from furnace, test hardness of work pieces using Rockwell Hardness Tester as per hardness requirements and prepare test report	conveyor belt heat treatment requirements Basic information about commonly used quenching / cooling media in conveyor belt heat treatment (ammonia gas) Understand usage of Rockwell Hardness Tester (scale C) Understanding of handling methods of conveyor belt heat treatment work piece Understanding of time management Understanding of contingency management Knowledge about basic maintenance of conveyor belt heat treatment machine Understand the defects of conveyor belt heat treatment (improper hardened, bending etc) and its corrective measures Understanding process travelling card (PTC) and its applications. (Storage of job, quality, quantity etc)	24 hrs	materials Tool kit **Consumables:** First aid box with complete accessories Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc) Work piece Cooling media (ammonia gas etc) Process travel card (PTC) Stainless steel basket (to hold the work pieces)	

General assessment guidance for Surgical Instrument Manufacturing Technician

Good practice in Pakistan makes use of sessional and final assessments, the basis of which is described below. Good practice by vocational training providers in Pakistan is to use a combination of these sessional and final assessments to produce the final qualification result.

Sessional assessment is an ongoing process. Its purpose is to provide feedback on what students are learning:

- to the student: to identify achievement and areas for further work
- to the teacher: to evaluate the effectiveness of teaching to date and to focus future plans.

Assessors need to devise sessional assessments for both theoretical and practical work. Guidance is provided in the assessment strategy

Final assessment is the assessment, usually done on completion of a course or module, which says whether or not the student has "passed". It is – or should be – undertaken with reference to all the objectives or outcomes of the course, and is formal process. Considerations of security – ensuring that the student who gets the credit is the person who did the work – assumes considerable importance in final assessment.

Methods of assessment

For lessons with a high quantity of theory, written or oral tests related to learning outcomes and/ or learning content can be conducted. For workplace lessons, assessment can focus on the quality of planning the related process, the quality of executing the process, the quality of the product and/or evaluation of the process.

Methods include direct assessment, which is the most desirable form of assessment. For this method, evidence is obtained by direct observation of the student's performance.

Examples for direct assessment of a Surgical Instrument Manufacturing Technician include:

- Work performances, for example preparing the work place according to the need of surgical operation process with respect to health, safety and environment.
- Demonstrations, for example demonstrating machining operations, parts and its functions.
- Direct questioning, where the assessor would ask the student why he has manufactured such surgical item in this way, or how the student will find out about the current and future requirements for the surgical instrument manufacturing technician
- Paper-based tests, such as multiple choices, fill in the blanks and short answer questions on surgical instrument manufacturing processes, preparing the work station or developing productive working relationships with associates.

Indirect assessment is the method used where the performance could not be observed and evidence is gained indirectly.

Examples for indirect assessment of a Surgical Instrument Manufacturing Technician include:

- Work products, such as completed surgical instruments.
- Workplace documents, such as process travel card, sessional test and assignments, attendance register etc.

Indirect assessment should only be a second choice. (in some cases, it may not even be guaranteed that the work products were produced by the person being assessed.)

Principles of assessment

All assessments should be valid, reliable, fair and flexible:

Fairness means that there should be no advantages or disadvantages for any assessed person. For example, it should not happen that one student gets prior information about the type of work performance that will be assessed, while another candidate does not get any prior information.

Validity means that the assessment assesses what it claims to assess. For example, if complex heat treatment skills are to be assessed, the assessment should involve performance criteria that are directly related to that heat treatment activity. An interview about the effect of the heat treatment processes on different surgical jobs may not meet the performance criteria.

Reliability means that the assessment is consistent and reproducible. For example, if the work performance of polishing the surgical instruments has been assessed, another assessor (e.g. the future employer) should be able to see the same work performance and witness the same level of achievement.

Flexibility means that the assessor has to be flexible concerning the assessment approach. For example, if there is a power failure during the assessment, the assessor should modify the arrangements to accommodate the student’s needs.

Assessment strategy for Surgical Instrument Manufacturing Technician

The curriculum of level 3 consists of nine modules.

Module No.	Module Name
01	Apply Work Health and Safety Practices (WHS)
02	Identify and Implement Workplace Policy and Procedures
03	Communicate at Workplace
04	Perform Computer Application Skills
05	Manage Personal Finances
06	Perform Forging
07	Perform Manual Machining
08	Develop Sheet Metal Surgical Instruments
09	Apply Heat Treatment

Sessional assessment

The sessional assessment for all modules shall be in two parts: theoretical assessment and practical assessment. The sessional marks shall contribute to the final qualification.

Theoretical assessment for all learning modules must consist of a written paper assessment lasting at least one hour per module. This can be a combination of multiple choice, fill in the blanks and short answer questions.

For practical assessment, all procedures and methods for the modules must be assessed on a sessional basis. Guidance is provided below under Planning for assessment.

Final assessment

Final assessment shall be in two parts: theoretical assessment and practical assessment. The final assessment marks shall contribute to the final qualification.

The final theoretical assessment shall consist of one hour paper for each module. This can be a combination of multiple choice, fill in the blanks and short answer questions.

The final practical assessment, all procedures and methods for the modules must be assessed. The time schedule for assessment depends upon the nature of assessment guide.

The assessment team

The number of national assessors must meet the needs of the students and the training provider. For example, where one assessor is conducting the assessment, there must be a maximum of five students per assessor in a day. In this example, a group of 25 students shall therefore require assessments to be carried out over a five-day period.

Planning for assessment

Sessional assessment: assessors need to plan in advance how they will conduct sessional assessments for each module. The tables on the following pages are for assessors to use to insert how many hours of theoretical and practical assessment will be conducted and what the scheduled dates are.

Final assessment: Training providers need to decide ways to combine modules into a cohesive two-day final assessment programme for each group of five students. Training providers must agree the operations performed for practical assessments in advance.

Complete list of tools and equipment

Sr. #	Name of Item/ Equipment/ Tools	Quantity
1	Steel rule (Different sizes)	26
2	Measuring tape (Different sizes)	26
3	Tri square (Different sizes)	26
4	Scriber	26
5	Compass	26
6	Manual venier caliper	12
7	Digital vernier caliper	6
8	Manual micrometer	12
9	Digital micrometer	6
10	Thickness gauge	6
11	Feeler gauges	6
12	Sheet gauges	6
13	Thread gauge	6
14	Depth gauge	6
15	Work holding devices and attachments(jigs and fixtures)	6
16	Hammers (assorted range)	26
17	Spanners (Different sizes)	6
18	Clamping set	5
19	Tool kit	2
20	Number and alphabet punch	2
21	Drop forging hammer	5
22	Gas heating furnace	5

23	Height gauge	6
24	Forging die	5
25	Tongs (For holding forged work piece)	12
26	Power press	5
27	Trimming dies for different product	5
28	Dial Indicator with magnet stand	6
29	Lathe machine (with standard accessories)	5
30	Hand hacksaw	26
31	Lathe machine work holding devices and attachments (face plate, mandrill, chuck, drill chuck, lathe centers)	5 each
32	Pedestal grinder with cutting angle support	5
33	Radius gauge - concave & convex (assorted range)	6
34	Threads gauge -inches / millimeters (assorted range)	6
35	Boring head	5
36	Plug and snap gauges	6
37	Vertical milling machine with standard accessories	5
38	Horizontal milling machines with standard accessories	5
39	Power hacksaw	5
40	Shaper machine	5
41	Tool and cutter grinder	5
42	Surface grinder	5
43	Milling machine work holding devices and attachments (clamping sets, machine vices, tool holders and collets set, spacer etc)	5 each
44	Dividing head and rotary table	5 each
45	Shearing press	5
46	Blanking dies	5

47	Punching press	5
48	Punching dies	5
49	Hydraulic press	5
50	Bending dies	5
51	Deep draw dies	5
52	Spinning lathe machine (with standard accessories)	5
53	Different range of spinning lathe tools	26
54	Bench/ pedestal grinding machine with dust collector	5
55	Container for coolant	5
56	Bench vices (different sizes)	12
57	Pedestal drilling machine with accessories (chucks, sleeves etc.)	5
58	Fixtures and vices	5
59	Annealing furnace	5
60	Conventional heating furnace	5
61	Vacuum furnace	5
62	Conveyor belt heat treatment furnace	5
63	Rockwell hardness tester	5
64	Standard chart of materials	26
65	Quenching tank	5
66	Basket (to carry work piece in annealing furnace)	5
67	Hangers (to carry work pieces in furnace)	5
68	Riveting press	5
69	Orbital riveting punch “peen” (to develop the shape on the rivets)	5
70	Pin grinder	5
71	Wheel grinding machine	5
72	Mallets	26

73	Screw drivers set	6
74	Combination pliers	6
75	Allen key set	6
76	Anvil/ work station (brass block etc)	6
77	Polishing lathe with attachments	5
78	Magnifying glass with light	6
79	Production gauges	6
80	Electrochemical polishing plant	5
81	Sand blasting machine with complete accessories	5
82	Ultrasonic cleaning machine with complete accessories	5
83	Trichloroethylene transfer pump	5
84	Hanging jigs (stands, container hanger) for Ultrasonic cleaning machine	5
85	Passivation tubs	5
86	Heating equipment for passivation	5
87	Passivation tray	5
88	Laser marking machine	5
89	Fixtures for laser marking	5
90	Computer system along with all accessories	5
91	Punching hammer	5
92	Stamping die	5
93	Etching machine with accessories	5
94	Label printer	5
95	Bar code printer	5
96	Bar code reader	5
97	Strapping machine	5
98	Quality Management System Standard and Manual	26
99	Scanner	5
100	Laser Printer	5
101	Microscope	5
102	Master sample of surgical instruments	26
103	Vibratory polish machine	2
104	Ring grinding machine	2
105	Blade grinding machine	2

List of Consumables supplies

Sr. #	Name of Consumables Supplies
1	Metal sheets
2	First aid box with complete accessories
3	Safety helmet
4	Safety goggles
5	Safety gloves
6	Safety shoe
7	Ear plugs/ muffs
8	Apron
9	Face mask
10	Process travel card (PTC)
11	Metal strip
12	Forged pieces
13	Work piece material (mild steel, teflon, aluminium stainless steel, brass etc)
14	Different grades of grinding wheel (for HSS tool bits and tungsten carbide tip tool)
15	Drill set
16	Range of lathe cutting tools (HSS tool bit, Tungsten carbide tips tool etc)
17	Coolant
18	Cleaning brushes

19	Hacksaw blades
20	Range of milling cutters according to material (HSS cutter, carbide cutters etc) and its operations (end mill cutter, t-slot cutter, concave and convex cutters, saw cutter etc)
21	Lubricant oil
22	Blanked work pieces
23	Punched work piece
24	Grinding wheel
25	Wheel dresser
26	Files (different sizes and shapes)
27	Tap set
28	Reamers
29	Furnace oil/ natural gas (for heating furnace)
30	Quenching media (water, quenching oil, ammonia gas, nitrogen gas etc)
31	Stainless steel hangers (to hold the work pieces)
32	Stainless steel basket (to hold the work pieces)
33	Rivets
34	Pin grinder tools (cutters and stones etc)
35	Different size of screws
36	Paraffin oil
37	Drawing sheet
38	Dull stick
39	Polish sticks

40	Belts
41	Polishing wheels
42	Polishing lusters
43	Lubricant (for lusters)
44	Cotton
45	Emery belts
46	Buff
47	Sulphuric acid
48	Phosphoric acid
49	Glycerine
50	Wooden husk
51	Copper wire
52	Sand (silicon carbide)
53	Rubber gloves
54	Long shoe
55	Trichloroethylene
56	LPG
57	Passivation chemical solution (combination of nitric and citric acid etc)
58	Polythene bag
59	Surgical sheet (scissors cutting inspection)

60	Permanent marker
61	Cleaning clothes (flees)
62	Stencil
63	Etching chemical and cleaner
64	Scotch tape/ double tape
65	Silicon caps (tip protectors for tip)
66	Bubble sheet
67	Packing boxes
68	Labels
69	Packing tape
70	Straps
71	Log of Quality Management System Standard and Manual
72	Paper for printer
73	Quality charts and graphs
74	Polishing media of different grains for vibratory polish
75	Grinding wheel

Credit values

The credit value of the National Certificate Level 4 in Surgical Instrument Manufacturing Technician is defined by estimating the amount of time/ instruction hours required to complete each competency unit and competency standard. The NVQF uses a standard credit value of 1 credit = 10 hours of learning (Following Higher Education Commission (HEC) guidelines.

The credit values are as follows:

Competency Standard		Estimate of hours	Credit
A:	Apply Work Health and Safety Practices (WHS)	30	3
B:	Identify and Implement Workplace Policy and Procedures	20	2
C:	Communicate at Workplace	30	3
D:	Perform Computer Application Skills	40	4
E:	Manage Personal Finances	30	3
F:	Perform Forging	130	13
G:	Perform Manual Machining	130	13
H:	Develop Sheet Metal Surgical Instruments	130	13
I:	Apply Heat Treatment	150	15

National Vocational and Technical Training Commission (NAVTTC)

Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan
+92 51 9044 322
+92 51 9044 322
info@navttc.org
www.navttc.org