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SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN



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CBT CURRICULUM

National Vocational Certificate Level 2

Version 1 - July, 2019



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Introduction	5
Definition/ Description of the training programme for Surgical Instrument Manufacturing Technician	5
Purpose of the training programme	5
Overall objectives of training programme	5
Competencies to be gained after completion of course	6
Potential job opportunities available immediately and later in the future	6
Trainee entry level	6
Entry requirements	6
Minimum qualification of trainer	4
Recommended trainer : trainee ratio	7
Medium of instruction i.e. language of instruction	8
Duration of the course (Total time, Theory & Practical time)	8
Sequence of the modules	6
Summary – overview of the curriculum	7
Modules	12
Module 1: Comply Personal Health and Safety Guidelines (102200844)	12
Module 2: Communicate the Workplace Policy and Procedure (041700839)	16
Module 3: Perform Basic Communication (Specific) (001100851)	19
Module 4: Perform Basic Computer Application (Specific) (061100856)	21
Module 5: Perform Grinding	24
Module 6: Assemble Surgical Instruments	28
Module 7: Perform Polishing	33
Module 8: Perform Packing	43
General assessment guidance for Surgical Instrument Manufacturing Technician	49
Complete list of tools and equipment	53
List of consumable supplies	58
Credit values	62

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
- Computer application skill
- Team work
- Grinding operations, its tools, equipment and machines
- Surgical instruments assembling methods, operations, its tools, equipment and machines
- Handle surgical instruments manufacturing
- Inspection of surgical instruments
- Polishing operations, techniques, its tools, equipment and machines
- Packing techniques, 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 Certificate 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 (5) 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 20 to 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 module (Total time, Theory & Practical time)

The level 2 curriculum comprises with 8 Modules. The recommended delivery time is 500 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
102200844	Comply Personal Health and Safety Guidelines			30
041700839	Communicate the Workplace Policy and Procedure			20
001100851	Perform Basic Communication (Specific)			30
061100856	Perform Basic Computer Application (Specific)			40
	Perform Grinding	14	56	70

	Assemble Surgical Instruments	12	48	60
	Perform Polishing	34	136	170
	Perform Packing	18	62	80

Sequence of the modules

The level 2 is consists of 8 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-2

Sequence No.	Module Code	Module Name	Module Code	Module Name
1		Perform Grinding	102200844	Comply Personal Health and Safety Guidelines
2		Assemble Surgical Instruments	041700839	Communicate the Workplace Policy and Procedure
3		Perform Polishing	001100851	Perform Basic Communication (Specific)
4		Perform Packing	061100856	Perform Basic Computer Application (Specific)

Summary – overview of the curriculum

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p>Module 1: 102200844 Comply with Perform Personal Health and Safety Guidelines</p> <p>Aim: This Competency Standard identifies the competencies required to protect/apply occupational Safety, health and Environment at workplace according to the industry's approved guidelines, procedures and interpret environmental rules/regulations. Trainee will be expected to identify and use Personal Protective Equipment (PPE) according to the work place requirements. The underpinning knowledge regarding Observe Occupational Safety and Health (OSH) will be sufficient to provide the basis for the job at workplace.</p>	<p>LU1: Identify Personal Hazards at Workplace LU2: Apply Personal Protective and Safety Equipment (PPE) LU3: Comply Occupational Safety and Health (OSH) LU4: Dispose of hazardous Waste/materials from the designated area</p>			<p>30</p>

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p>Module 2: 041700839 Communicate the Workplace Policy and Procedure</p> <p>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.</p>	<p>LU1: Identify workplace communication procedures LU2: Communicate at workplace LU3: Draft Written Information LU4: Review Documents</p>			<p>20</p>

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p>Module 3: 001100851 Perform Basic Communication (Specific)</p> <p>Aim: This unit describes the skills and knowledge required to assist in the development of communication competence by providing information regarding different forms of communication and their appropriate use. By the end of this program, learners will be able, to communicate more effectively and efficiently by: working in a team, follow supervisor’s instructions and develop generic communication work skills at workplace.</p>	<p>LU1: Communicate in a team to achieve intended outcomes LU2: Follow Supervisor’s instructions as per organizational SOPs LU3: Develop Generic communication skills at workplace</p>			<p>30</p>

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p>Module 4: 061100856 Perform Basic Computer Application (Specific)</p> <p>Aim: This unit describes the skills and knowledge required to use spreadsheet to prepare a page of document, 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.</p>	<p>LU1: Create Word Documents LU2: Use internet for Browsing</p>			<p>40</p>
<p>Module 5: Perform Grinding</p> <p>Aim: The aim of this module is to develop advanced skills, knowledge and understanding to perform grinding</p>	<p>LU1: Perform wheel grinding LU2: Perform filing LU3: Perform drilling</p>	<p>14</p>	<p>56</p>	<p>70</p>

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of modules
<p>Module 6: Assemble Surgical Instruments</p> <p>Aim: The aim of this module is to develop advanced skills, knowledge and understanding of assembling surgical instruments</p>	<p>LU1: Perform fastening LU2: Apply setting LU3: Inspect quality of instruments</p>	12	48	60
<p>Module 7: Perform Polishing</p> <p>Aim: The aim of this module is to develop advanced skills, knowledge and understanding to perform polishing operation</p>	<p>LU1: Prepare workstation for polishing LU2: Apply initial polishing LU3: Apply electrochemical polishing LU4: Apply sand blasting LU5: Perform ultrasonic cleaning LU6: Perform passivation LU7: Perform final polishing</p>	34	136	170
<p>Module 8: Perform Packing</p> <p>Aim: The aim of this module is to develop advanced skills, knowledge and understanding to perform packing operation</p>	<p>LU1: Inspect quality of instruments LU2: Perform laser marking LU3: Perform stamping LU4: Perform etching LU5: Perform final packing</p>	18	62	80

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN



Module-1
CBT CURRICULUM
National Vocational Certificate Level 2

Version 1 - July, 2019

Modules

Module 1: Comply with Perform Personal Health and Safety Guidelines (102200844)

Objective of the module: This Competency Standard identifies the competencies required to protect/apply occupational Safety, health and Environment at workplace according to the industry's approved guidelines, procedures and interpret environmental rules/regulations. Trainee will be expected to identify and use Personal Protective Equipment (PPE) according to the work place requirements. The underpinning knowledge regarding Observe Occupational Safety and Health (OSH) will be sufficient to provide the basis for the job at workplace.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Identify Personal Hazards at Workplace	<p>The trainee will be able to:</p> <ul style="list-style-type: none"> Identify risk to personal health Identify hygiene and safety at work place Identify processes Identify tools, equipment and consumable materials that have the potential to cause harm Report, identified risk to Health, hygiene and safety to concerned 		<p>Total</p> <p>hrs</p> <p>Theory:</p> <p>hrs</p> <p>Practical:</p> <p>hrs</p>		<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

				Consumable :	
LU2: Apply Personal Protective and Safety Equipment (PPE)	<p>The trainee will be able to:</p> <p>List the Personal Protective equipment</p> <p>Select personal protective equipment in terms of type and quantity according to work orders.</p> <p>Wear personal protective equipment according to job requirements.</p> <p>Clean personal protective equipment</p> <p>Stored Personal Protective equipments in proper place after use.</p>		<p>Total hrs</p> <p>Theory: hrs</p> <p>Practical: hrs</p>	Consumable :	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>
LU3: Comply Occupational Safety and Health (OSH)	<p>The trainee will be able to:</p> <p>Maintain cleanliness and</p>		<p>Total hrs</p>		Theory: Class room with multimedia facility

	<p>hygiene as per organizational policy</p> <p>Comply with Health, hygiene and safety precautions before starting work</p> <p>Comply organizational Health, hygiene and safety guidelines during work</p> <p>Deal with resolvable problems according to prescribed procedures</p> <p>Report un resolvable problems to concerned</p> <p>Place the tools equipment etc at their prescribed place after completion of work</p>		<p>Theory:</p> <p>hrs</p> <p>Practical:</p> <p>hrs</p>	<p>Consumable :</p>	<p>Practical : Workshop</p>
<p>LU4: Dispose of hazardous Waste/materials from the designated area</p>	<p>The trainee will be able to:</p> <p>Identify hazardous waste materials which needs to be disposed off</p> <p>Segregate hazardous or non-hazardous waste carefully from the designated area as per</p>		<p>Total</p> <p>hrs</p> <p>Theory:</p> <p>hrs</p> <p>Practical:</p>	<p>Consumable :</p>	

	<p>approved procedure</p> <p>Use proper disposal hazardous containers for dispose-off hazardous waste as per procedure</p> <p>Take necessary precautions like putting masks and gloves while disposing hazardous waste/ materials as per standard operating procedure</p>		hrs		
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SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN



Module-2
CBT CURRICULUM
National Vocational Certificate Level 2

Version 1 - July, 2019

Module 2: Communicate the Workplace Policy and Procedure (041700839)

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Identify workplace communication procedures	<p>The trainee will be able to:</p> <p>Identify organizational communication requirements and workplace procedures with assistance from relevant authority</p> <p>Identify appropriate lines of communication with supervisors and colleagues.</p> <p>Seek advice on the communication method/equipment most appropriate for the task</p>		<p>Total hrs</p> <p>Theory: hrs</p> <p>Practical: hrs</p>	Consumable :	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>
LU2: Communicate at workplace	<p>The trainee will be able to:</p> <p>Use effective questioning, and active</p>		<p>Total hrs</p>		Theory: Class room with multimedia facility

	<p>listening and speaking skills to gather and convey information</p> <p>Use appropriate non-verbal behavior at all times</p> <p>Encourage, acknowledge and act upon constructive feedback</p>		<p>Theory:</p> <p>hrs</p> <p>Practical:</p> <p>hrs</p>	<p>Consumable :</p>	<p>Practical : Workshop</p>
<p>LU3: Draft Written Information</p>	<p>The trainee will be able to:</p> <p>Identify and comply with required range of written materials in accordance with organizational policy and procedures</p> <p>Draft and present assigned written information for approval, ensuring it is written clearly, concisely and within designated timeframes.</p> <p>Ensure written information meets required standards of style, format and detail.</p> <p>Seek assistance and/or</p>		<p>Total</p> <p>hrs</p> <p>Theory:</p> <p>hrs</p> <p>Practical:</p> <p>hrs</p>	<p>Consumable :</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

	feedback to aid communication skills development				
LU4: Review Documents	<p>The trainee will be able to:</p> <p>Check draft for suitability of tone for audience, purpose, format and communication style</p> <p>Check draft for readability, grammar, spelling, sentence and paragraph construction and correct any inaccuracies or gaps in content.</p> <p>Check draft for sequencing and structure</p> <p>Check draft to ensure it meets organizational requirements</p> <p>Ensure draft is proofread, where appropriate, by supervisor or colleague</p>		<p>Total</p> <p>hrs</p> <p>Theory:</p> <p>hrs</p> <p>Practical:</p> <p>hrs</p>	Consumable :	

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN



Module-3
CBT CURRICULUM
National Vocational Certificate Level 2

Version 1 - July, 2019

Module 3: Perform Basic Communication (Specific) (001100851)

Objective of the module: This unit describes the skills and knowledge required to assist in the development of communication competence by providing information regarding different forms of communication and their appropriate use.

By the end of this program, learners will be able, to communicate more effectively and efficiently by: working in a team, follow supervisor’s instructions and develop generic communication work skills at workplace.

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

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Communicate in a team to achieve intended outcomes	The trainee will be able to: Treat team members with respect Maintain positive relationships to achieve common organizational goals Get work related information from team Identify interrelated work activities to avoid confusion Adopt communication skills, which are designed in a team.		Total hrs Theory: hrs Practical: hrs		Theory: Class room with multimedia facility Practical : Workshop

	<p>Identify problems in communication with a team</p> <p>Resolve Communication barrier through discussion and mutual agreement</p>			Consumable :	
<p>LU2: Follow Supervisor's instructions as per organizational SOPs</p>	<p>The trainee will be able to:</p> <p>Receive the instructions from Supervisor</p> <p>Carry out the instructions of the supervisor</p> <p>Report to the supervisor as per organizational SOPs</p>		<p>Total hrs</p> <p>Theory: hrs</p> <p>Practical: hrs</p>	Consumable :	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>
<p>LU3: Develop Generic communication skills at workplace</p>	<p>The trainee will be able to:</p> <p>Develop basic reading skills</p> <p>Develop Basic writing Skills</p> <p>Develop basic listening skills</p>		<p>Total hrs</p> <p>Theory: hrs</p> <p>Practical: hrs</p>	Consumable :	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN



Module-4
CBT CURRICULUM
National Vocational Certificate Level 2

Version 1 - July, 2019

Module 4: Perform Basic Computer Application (Specific) (061100856)

Objective of the module: This unit describes the skills and knowledge required to use spreadsheet to prepare a page of document, 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: Create Word Documents	<p>The trainee will be able to:</p> <ul style="list-style-type: none"> Open word processing application Create a word document Customize page layout with relevant name setting Set up page in a word document Edit word document as required Use simple formatting tools when creating the 		<p>Total hrs</p> <p>Theory: hrs</p> <p>Practical: hrs</p>		<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

	<p>document</p> <p>Save word document to directory</p> <p>Insert table in a word document</p> <p>Insert appropriate images into document as necessary</p> <p>Insert header/footer in a word document</p> <p>Insert section break in a word document</p> <p>Set style in word document</p> <p>Select basic Print settings</p> <p>Print the document</p>			<p>Consumable :</p>	
<p>LU2: Use internet for Browsing</p>	<p>The trainee will be able to:</p> <p>Use search engines to open website</p> <p>Search data on different topics</p> <p>Refine search to</p>		<p>Total hrs</p> <p>Theory:</p> <p>hrs</p> <p>Practical:</p>	<p>Consumable :</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

	increase relevance of information or content Navigate a website to access the information or content required		hrs		
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Module-5
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National Vocational Certificate Level 2

Version 1 - July, 2019

Module 5: Perform Grinding

Objective of the module: This standard defines the knowledge, skills and understanding required to perform grinding of surgical instruments.

Duration: 70 Hours **Theory:** 14 Hours **Practical:** 56 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform wheel grinding	<p>The trainee will be able to:</p> <p>Mount grinding wheel on bench grinding machine as per job requirement</p> <p>Perform dressing of grinding wheel using appropriate dresser if required</p> <p>Grind the instrument to remove excess material as per product requirement</p> <p>Control size of instrument during and after grinding using appropriate gauges</p>	<p>Understand health and safety requirements of grinding work (Safety guard)</p> <p>Understand inspection, mounting and usage of different types of grinding wheels</p> <p>Understand grinding wheel dressing requirements</p> <p>Understand operation/ perform of grinding</p> <p>Understand gauges used for size and shape measurement in grinding process</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Knowledge about basic maintenance of grinding machine</p> <p>Understand the defects of work pieces grinded and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job,</p>	<p>Total 25 hrs</p> <p>Theory: 05 hrs</p> <p>Practical: 20 hrs</p>	<p>Bench/ pedestal grinding machine with dust collector</p> <p>Measuring instruments and gauge</p> <p>Container for coolant</p> <p>Tool kit</p> <p>Consumables :</p> <p>First aid box with complete accessories</p> <p>Personal protective equipment (Helmets, Safety Goggles, Safety</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

		quality, quantity etc)		Shoe, Apron, Ear Plug/Muff etc) Grinding wheel Wheel dresser Coolant Work piece Process travel card (PTC)	
LU2: Perform filing	<p>The trainee will be able to:</p> <p>Select appropriate file (size and shape) according to job finish requirement</p> <p>Clamp the instrument using appropriate vice</p> <p>File the instrument according to required shape</p> <p>Control shape and size of instrument during and after filing using appropriate gauges</p>	<p>Understanding safety precaution and Personal Protective Equipment for filing work</p> <p>Understand inspection of filing</p> <p>Understand operation/ perform of filing</p> <p>Understand gauges used for size and shape measurement in filing process</p> <p>Knowledge about types of vices</p> <p>Knowledge about types of files (shapes and sizes)</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Knowledge about basic maintenance of files</p>	<p>Total 20 hrs</p> <p>Theory: 04 hrs</p> <p>Practical: 16 hrs</p>	<p>Bench Vices</p> <p>Measuring instruments and gauges (vernier caliper, steel rule, specific gauges etc)</p> <p>Tool kit</p> <p>Consumables :</p> <p>First aid box with complete accessories</p> <p>Personal protective equipment (helmets, safety goggles, safety</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

		<p>and vices</p> <p>Understand the defects of filed work pieces and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)</p>		<p>gloves, safety shoes, ear plugs/ muffs, apron etc)</p> <p>Files (different sizes and shapes)</p> <p>File Brush</p> <p>Work piece</p> <p>Process travel card (PTC)</p>	
<p>LU3: Perform drilling</p>	<p>The trainee will be able to:</p> <p>Prepare pedestal drill machine using drill bits and fixtures according to job requirement</p> <p>Sharpen the drill bit using tool grinder if required</p> <p>Clamp the work piece on drill machine using fixtures</p> <p>Drill holes in work piece as per required sizes</p> <p>Perform countersink on drilled holes where</p>	<p>Understanding safety precaution and Personal Protective Equipment for drilling work</p> <p>Understand inspection of drill machines, drill bits, taps and reamer</p> <p>Understand operation of drill machines, drill bits, taps and reamer</p> <p>Understand gauges used for size and shape measurement in drilling process</p> <p>Knowledge about types of fixtures and vices</p> <p>Understand drill bit sharpening</p> <p>Understand cutting lubricants used in drilling and tapping</p> <p>Basic understanding of commonly used</p>	<p>Total</p> <p>25 hrs</p> <p>Theory:</p> <p>05 hrs</p> <p>Practical:</p> <p>20 hrs</p>	<p>Pedestal drilling machine with accessories (chucks, sleeves etc.)</p> <p>Fixtures and vices</p> <p>Measuring instruments and gauges</p> <p>Tool and cutter grinder machine</p> <p>Tool kit</p> <p>Consumables :</p> <p>First aid box with</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

	<p>required</p> <p>Perform reaming in drilled holes where required</p> <p>Perform tapping in drilled holes where required</p> <p>Control quality of instrument during and after drilling using appropriate gauges</p> <p>Prepare report of completed work.</p>	<p>drilling processes</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Knowledge about basic maintenance of drill machine</p> <p>Understand the defects of drilled work pieces and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)</p>		<p>complete accessories</p> <p>Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc)</p> <p>Drill set</p> <p>Tap set</p> <p>Reamers</p> <p>Work piece</p> <p>Process travel card (PTC)</p>	
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SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN



Module-6
CBT CURRICULUM
National Vocational Certificate Level 2

Version 1 - July, 2019

Module 6: Assemble Surgical Instruments

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

Duration: 60 Hours **Theory:** 12 Hours **Practical:** 48 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Perform fastening	<p>The trainee will be able to:</p> <p>Drill holes in work pieces at specified areas</p> <p>Use pin grinder at narrow areas if required</p> <p>Assemble the instrument components by riveting where applicable</p> <p>Tap drilled holes and assemble the surgical instrument components using screws where applicable</p> <p>Check functionality and quality of surgical instruments and prepare a report</p>	<p>Understanding safety precaution and Personal Protective Equipment for fastening processes</p> <p>Understand usage of hammers / mallets</p> <p>Understand usage of files</p> <p>Understand operating of pin grinder</p> <p>Understand operation of tapping</p> <p>Understand operating drill machine</p> <p>Understand sharpness requirements of drill bits</p> <p>Understand types of fasteners (Rivets, screws) and fastening techniques</p> <p>Understand instrument functionality requirements</p> <p>Understand operating riveting press</p> <p>Understand usage of measuring instruments and gauges (vernier caliper,</p>	<p>Total</p> <p>30 hrs</p> <p>Theory:</p> <p>06 hrs</p> <p>Practical:</p> <p>24 hrs</p>	<p>Riveting press</p> <p>Orbital riveting punch “peen” (to develop the shape on the rivets)</p> <p>Pin grinder</p> <p>Wheel grinding machine</p> <p>Hammers</p> <p>Mallets</p> <p>Measuring instruments and gauges (vernier caliper, micrometer etc)</p> <p>Drill machine</p> <p>Screw drivers set</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

		<p>Micrometer etc)</p> <p>Understand technical drawings and work instructions</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Understand the defects of fastening process (Improper fitting and functionality etc) and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (Storage of job, quality, quantity etc)</p> <p>Understanding of handling methods of fastened work piece</p>	<p>Combination pliers</p> <p>Allen key set</p> <p>Anvil/ work station (Brass block etc)</p> <p>Tool kit</p> <p>Consumables :</p> <p>First aid box with complete accessories</p> <p>Personal protective equipment (Safety Goggles, safety gloves, Safety Shoe, Face mask, Apron, etc)</p> <p>Rivets</p> <p>Files</p> <p>Drill set</p> <p>Tap set</p> <p>Pin grinder tools (cutters and</p>	
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				stones etc) Different size of screws Work piece Process travel card (PTC)	
LU2: Apply setting	<p>The trainee will be able to:</p> <p>Adjust alignment of surgical instruments using mallet hammer</p> <p>Grind / file the surgical instruments where required</p> <p>Check functionality of surgical instruments and prepare a report</p>	<p>Understanding safety precaution and Personal Protective Equipment for apply setting processes</p> <p>Understand usage of hammers / mallets</p> <p>Understand usage of files</p> <p>Understand operating of pin grinder and wheel grinder</p> <p>Understand instrument functionality requirements</p> <p>Understand usage of measuring instruments and gauges (vernier caliper, micrometer etc)</p> <p>Understand technical drawings and work instructions</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Understand the defects of setting process</p>	<p>Total 15 hrs</p> <p>Theory: 03 hrs</p> <p>Practical: 12 hrs</p>	<p>Pin grinder</p> <p>Wheel grinding machine</p> <p>Hammers</p> <p>Mallets</p> <p>Measuring instruments and gauges (vernier caliper, micrometer etc)</p> <p>Screw drivers set</p> <p>Combination plier</p> <p>Allen key set</p> <p>Anvil/ work station (Brass block etc)</p> <p>Tool kit</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

		<p>(Improper fitting and functionality etc) and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (Storage of job, quality, quantity etc)</p>		<p>Consumables :</p> <p>First aid box with complete accessories</p> <p>Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc)</p> <p>Files</p> <p>Pin grinder tools (cutters and stones etc)</p> <p>Work piece</p> <p>Process travel card (PTC)</p>	
<p>LU3: Inspect quality of instruments</p>	<p>The trainee will be able to:</p> <p>Gather technical sheets, drawings, samples etc.</p> <p>Arrange required</p>	<p>Understanding safety precaution and Personal Protective Equipment for quality inspection processes (Proper light system, free of moisture, ventilation system etc)</p> <p>Understand technical drawings and work</p>	<p>Total</p> <p>15 hrs</p> <p>Theory:</p>	<p>Measuring instruments and gauges</p> <p>Magnifying glass</p> <p>Tool kit</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

	<p>measuring tools and gauges for quality inspection</p> <p>Check setting of surgical instruments as per specification sheet or sample</p> <p>Measure sizes and shapes of surgical instruments using gauges</p> <p>Prepare quality inspection report</p>	<p>instructions</p> <p>Understand instrument functionality as per customer requirements</p> <p>Understand usage of measuring instruments and gauges (vernier caliper, micrometer etc)</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Understand the defects of instruments (Improper fitting and functionality, cracks, pin holes etc) and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (Storage of job, quality, quantity etc)</p> <p>Understanding of handling methods of work piece</p>	<p>03 hrs</p> <p>Practical:</p> <p>12 hrs</p>	<p>Consumables :</p> <p>First aid box with complete accessories</p> <p>Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc)</p> <p>Cotton/ cleaning clothes</p> <p>Paraffin oil</p> <p>Drawing sheet</p> <p>Work piece</p> <p>Dull stick</p> <p>Polish sticks</p> <p>Process travel card (PTC)</p>	
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SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN



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Module-7
CBT CURRICULUM
National Vocational Certificate Level 2

Version 1 - July, 2019

Module 7: Perform Polishing

Objective of the module: This standard defines the knowledge, skills and understanding required to perform polishing of surgical instruments.

Duration: 170 Hours **Theory:** 34 Hours **Practical:** 136 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<p>LU1: Prepare workstation for polishing</p>	<p>The trainee will be able to:</p> <p>Identify polishing and cleaning processes required for the instrument using work instructions / specification sheets</p> <p>Arrange materials, tools and gauges for the identified polishing and cleaning processes</p> <p>Check quality of work pieces before polishing</p>	<p>Understanding safety precaution and Personal Protective Equipment for polishing and cleaning processes</p> <p>Understanding polishing, its types and requirements.</p> <p>Basic knowledge of polishing wheel (leather, cotton, dull brush etc), polishing belts and their specifications and uses</p> <p>Identify polishing materials (lustres etc) and their applications</p> <p>Knowledge of vibratory polish machine, ring grinding and blade grinding machine</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)</p>	<p>Total 35 hrs</p> <p>Theory: 07 hrs</p> <p>Practical: 28 hrs</p>	<p>Polishing lathe with attachments</p> <p>Vibratory polish machine</p> <p>Ring grinding machine</p> <p>Blade grinding machine</p> <p>Magnifying glass with light</p> <p>Tool kit</p> <p>Consumables :</p> <p>First aid box with complete accessories</p> <p>Personal protective</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical: Workshop</p>

				<p>equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc)</p> <p>Belts</p> <p>Wheels</p> <p>Polishing lusters</p> <p>Lubricant(for lusters)</p> <p>Cotton/ cleaning clothes</p> <p>Work piece/ job</p> <p>Polishing media of different grains for vibratory polish</p> <p>Grinding wheel</p> <p>Process travel card (PTC)</p>	
<p>LU2: Apply initial polishing</p>	<p>The trainee will be able to:</p> <p>Load leather wheel and</p>	<p>Understanding safety precautions and Personal Protective Equipment for polishing and initial polishing processes</p>	<p>Total</p> <p>25 hrs</p>	<p>Polishing lathe with attachments</p> <p>Vibratory polish</p>	<p>Theory: Class room with multimedia facility</p>

	<p>polishing belt on polishing lathe</p> <p>Polish surgical instrument as per required surface finish</p> <p>Control the quality of polishing using measuring instruments and gauges</p> <p>Handle and store polished instruments to avoid any surface damage</p>	<p>Understand usage of measuring instruments and gauges (vernier calliper, production gauges etc)</p> <p>Understanding of belt/wheel adjustment technique</p> <p>Understand polishing techniques and methods</p> <p>Identify polishing material used in various polishing stages</p> <p>Understanding operating skill of vibratory polish machine, ring grinder and blade grinding machine.</p> <p>Awareness of safety measures for storage and product handling</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Knowledge about basic maintenance of Polishing lathe</p> <p>Understand the defects of initial polishing and its corrective measures</p> <p>Understanding process travelling card</p>	<p>Theory:</p> <p>05 hrs</p> <p>Practical:</p> <p>20 hrs</p>	<p>machine</p> <p>Ring grinding machine</p> <p>Blade grinding machine</p> <p>measuring instruments and gauges (Vernier calliper, production gauges etc)</p> <p>Tool kit</p> <p>Consumables:</p> <p>First aid box with complete accessories</p> <p>Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc)</p> <p>Emery Belts</p> <p>Polishing Wheels</p>	<p>Practical : Workshop</p>
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		(PTC) and its applications. (storage of job, quality, quantity etc)		Polishing lusters Lubricant(for lusters) Cotton/ cleaning clothes Polishing media of different grains for vibratory polish Grinding wheel Work piece/ job Process travel card (PTC)	
LU3: Apply electrochemical polishing	The trainee will be able to: Prepare chemical solution in bath for electrochemical polishing Dip instruments into container of the electrochemical bath Perform electrochemical polishing using required	Understanding safety precaution and Personal Protective Equipment for electrochemical polishing and storage Basic understanding of electrochemical polishing process parameters (Current, time, temperature etc) Understand holding requirements of electrochemical polishing process Knowledge of chemicals, its composition	Total 20 hrs Theory: 04 hrs Practical: 16 hrs	Electrochemical polishing plant Hangers Magnifying glass with light Tool kit Consumables: First aid box with complete	Theory: Class room with multimedia facility Practical : Workshop

	<p>temperature, time and current</p> <p>Rinse instruments with clean water to remove traces of chemicals</p> <p>Wash the instruments in dilute solution of sulphuric acid according to material sensitivity</p> <p>Wash the instrument in clean water to remove traces of sulphuric acid</p> <p>Wash the instruments in hot water</p> <p>Dry instruments with wooden husk completely</p> <p>Inspect the instrument according to specifications</p> <p>Handle and store polished instruments to avoid any surface</p>	<p>and their reactions e.g. such as mixtures of sulphuric acid, Glycerine and phosphoric acid.</p> <p>Understanding of visual inspection of electrochemical polishing</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Knowledge about basic maintenance of electrochemical polishing</p> <p>Understand the defects of electrochemical polished work pieces and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)</p>		<p>accessories</p> <p>Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc)</p> <p>Sulphuric acid</p> <p>Phosphoric acid</p> <p>Glycerine</p> <p>Wooden husk</p> <p>Copper wire</p> <p>Process travel card (PTC)</p>	
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	damage				
LU4: Apply sand blasting	<p>The trainee will be able to:</p> <p>Prepare sand blasting machine for operation as per requirements</p> <p>Place/hold instruments inside sand blasting machine and perform operation as per required surface finish</p> <p>Inspect the instrument according to specifications</p> <p>Handle and store polished instruments to avoid any surface damage</p>	<p>Understanding safety precaution and Personal Protective Equipment for sand blasting process</p> <p>Understand handling and storage requirements of sand blasted product</p> <p>Identify sand blasting materials</p> <p>Understand finishing application of sand blasting materials</p> <p>Understanding of visual inspection of sand blasting</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Knowledge about basic maintenance of sand blasting machine</p> <p>Understand the defects of sand blasted work pieces and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)</p>	<p>Total 20 hrs</p> <p>Theory: 04 hrs</p> <p>Practical: 16 hrs</p>	<p>Sand blasting machine with complete accessories</p> <p>Magnifying glass with light</p> <p>Tool kit</p> <p>Consumables:</p> <p>First aid box with complete accessories</p> <p>Sand (Silicon Carbide)</p> <p>Rubber Gloves</p> <p>Long shoe</p> <p>Dust Mask</p> <p>Process travel card (PTC)</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

<p>LU5: A Perform Ultrasonic Cleaning</p>	<p>The trainee will be able to:</p> <p>Fill cleaning chemical solution in the ultrasonic cleaning machine bath up to required level</p> <p>Set temperature of ultrasonic cleaning machine as per product requirements</p> <p>Arrange instruments in a hanger or tray</p> <p>Perform chemical fuming on instruments for specified time duration</p> <p>Dip instruments in chemical for specified time duration</p> <p>Shower instruments with chemical while holding above the machine bath</p> <p>Control the quality of</p>	<p>Understanding safety precautions and Personal Protective Equipment for ultrasonic cleaning</p> <p>Understand handling and storage requirements after cleaning</p> <p>Basic understanding of ultrasonic cleaning process parameters</p> <p>Knowledge of chemicals used in ultrasonic cleaning (e.g. Trichloroethylene) commonly known as Triclone</p> <p>Understanding of visual inspection of ultrasonic cleaned instruments</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Knowledge about basic maintenance of ultrasonic machine</p> <p>Understand the defects of ultrasonic cleaned work pieces and its corrective measures</p> <p>Understanding process travelling card</p>	<p>Total</p> <p>20 hrs</p> <p>Theory:</p> <p>04 hrs</p> <p>Practical:</p> <p>16 hrs</p>	<p>Ultrasonic cleaning machine with complete accessories</p> <p>(Trichloroethylene transfer pump)</p> <p>Hanging jigs (stands, container hanger) for ultrasonic cleaning machine</p> <p>Tool kit</p> <p>Consumables:</p> <p>First aid box with complete accessories</p> <p>Personal protective equipment (helmets, safety goggles, safety gloves, safety shoes, ear plugs/ muffs, apron etc)</p> <p>Trichloroethylene</p> <p>Face Mask</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>
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	instruments as per requirements Handle and store instruments to avoid any surface damage	(PTC) and its applications. (storage of job, quality, quantity etc)		Process travel card (PTC)	
LU6: Perform passivation	The trainee will be able to: Boil water in required quantity as per work instructions Dip instruments in boiling water for specified time to check rusting tendency of surfaces Inspect instruments for rusting Fill bath with passivation chemical at required level Dip the instruments in passivation chemical for specified time	Understanding safety precaution and Personal Protective Equipment for passivation. Basic understanding of passivation process and chemicals e.g. Nitric Acid and citric acid Understand handling and storage requirements after passivation Understanding of visual inspection of passivation Understanding of time management Understanding of contingency management Knowledge about basic maintenance of passivation plant Understand the defects of passivation work pieces and its corrective measures Understanding process travelling card (PTC) and its applications. (Storage of job,	Total 20 hrs Theory: 04 hrs Practical: 16 hrs	Passivation tubs Heating equipment for passivation Hanger Passivation tray Tool kit Consumables: First aid box with complete accessories Personal protective equipment LPG Passivation chemical solution (combination of Nitric and Citric	Theory: Class room with multimedia facility Practical : Workshop

	<p>Rinse the instruments in water and dry in hanging position above the passivation bath</p> <p>Check the quality of instruments as per requirements</p>	<p>quality, quantity etc)</p>		<p>acid etc)</p> <p>Process travel card (PTC)</p>	
<p>LU7: Perform final polishing</p>	<p>The trainee will be able to:</p> <p>Load leather wheel and polishing belt on polishing lathe</p> <p>Polish instruments as per required surface finish by using specified emery grain belts (i.e.200,300 & 400)</p> <p>Use dull brush, buffing or water sand finishing for required final finishing,</p> <p>Control the quality of polishing as per requirements</p>	<p>Understanding safety precaution and Personal Protective Equipment for final polishing</p> <p>Basic knowledge of leather wheel and Buff polishing</p> <p>Understand handling and storage requirements after final polishing</p> <p>Knowledge and understanding of visual inspection after final polishing</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Knowledge about basic maintenance of polishing lathe</p> <p>Understand the defects of final polished</p>	<p>Total</p> <p>30 hrs</p> <p>Theory:</p> <p>06 hrs</p> <p>Practical:</p> <p>24 hrs</p>	<p>Polishing lathe with attachments</p> <p>Measuring instruments and gauges (vernier calliper, production gauges etc)</p> <p>Tool kit</p> <p>Consumables:</p> <p>First aid box with complete accessories</p> <p>Personal protective equipment (helmets, safety goggles, safety gloves, safety</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

	<p>Handle and store polished instruments to avoid any surface damage</p> <p>Prepare report of completed work</p>	<p>work piece and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)</p>	<p>shoes, ear plugs/ muffs, apron etc)</p> <p>Emery belts</p> <p>Polishing wheels</p> <p>Polishing lusters</p> <p>Lubricant(for lusters)</p> <p>Cotton/ cleaning clothes</p> <p>Work piece/ job</p> <p>Process travel card (PTC)</p> <p>Buff</p>	
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SURGICAL INSTRUMENTS MANUFACTURING TECHNICIAN



Module-8
CBT CURRICULUM
National Vocational Certificate Level 2

Version 1 - July, 2019

Module 8: Perform Packing

Objective of the module: This standard defines the knowledge, skills and understanding required to perform packing of surgical instruments.

Duration: 80 Hours **Theory:** 18 Hours **Practical:** 62 hrs

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1: Inspect quality of instruments	<p>The trainee will be able to:</p> <p>Prepare inspection workstation including measuring and inspection tools</p> <p>Select appropriate inspection sample size as per customer requirements</p> <p>Measure and record sizes of instruments</p> <p>Check functionality of the instruments</p> <p>Inspect surface finish as per finished product requirements</p> <p>Mark all non-conformances on inspected product and</p>	<p>Understanding safety precautions and Personal Protective Equipment at work</p> <p>Understand measuring tools and gauges e.g. steel rule, micrometre, vernier caliper, thread gauge, fillet gauge etc</p> <p>Understand product drawing/master sample</p> <p>Understand instrument functionality</p> <p>Understand surface finish requirements</p> <p>Understand stocking requirements</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)</p>	<p>Total</p> <p>20 hrs</p> <p>Theory:</p> <p>04 hrs</p> <p>Practical:</p> <p>16 hrs</p>	<p>Steel rule</p> <p>Micrometer</p> <p>Vernier caliper</p> <p>Fillet gauge</p> <p>Thread gauge</p> <p>Depth gauge</p> <p>Magnifying glass with light</p> <p>Weighing scale</p> <p>Tool kit</p> <p>Consumables:</p> <p>First aid box with complete accessories</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

	<p>send to relevant department for necessary measures</p> <p>Handle instruments with care to avoid any surface damage</p> <p>Store inspected products on instrument tray and update tag (bin card, tray card, process travel card etc.) for next process</p> <p>Prepare inspection report in prescribed format</p>			<p>PPEs</p> <p>Paraffin oil</p> <p>Cloth</p> <p>Polythene bag</p> <p>Surgical sheet (scissors cutting inspection)</p> <p>Permanent marker</p> <p>Process travel card (PTC)</p>	
<p>LU2: Perform Laser Marking</p>	<p>The trainee will be able to:</p> <p>Load marking design in machine software and make necessary adjustments</p> <p>Prepare laser marking machine (adjust laser head height, bed position, frequency, colour, current etc.)</p> <p>Mount jigs/fixtures on machine bed in appropriate position</p>	<p>Understanding safety precaution and Personal Protective Equipment for laser marking</p> <p>Understand laser marking machine operations e.g. bed setting, laser setting and positioning etc</p> <p>Knowledge about basic troubleshooting of Laser Marking machine</p> <p>Understand basic adjustment/editing tools of Laser marking design software e.g. EzCAD</p> <p>Understanding of time management</p>	<p>Total</p> <p>15 hrs</p> <p>Theory:</p> <p>04 hrs</p> <p>Practical:</p> <p>11 hrs</p>	<p>Laser marking machine</p> <p>Fixtures</p> <p>Vernier caliper</p> <p>Steel rule</p> <p>Computer system along with all accessories</p> <p>Container</p> <p>Tool kit</p> <p>Consumables:</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

	<p>Mark designs on instruments using laser marking machine</p> <p>Control quality of laser marking for size, position and colour</p> <p>Handle and store instruments with care to avoid any surface damage</p>	<p>Understanding of contingency management</p> <p>Basic knowledge of machine maintenance</p> <p>Understand the defects of laser marking and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)</p>		<p>First aid box with complete accessories</p> <p>PPE</p> <p>Cleaning clothes (flees)</p> <p>Process travel card (PTC)</p>	
<p>LU3: Perform stamping</p>	<p>The trainee will be able to:</p> <p>Prepare workstation according to work instructions</p> <p>Arrange and set stamping tools (manual punch, hammer, stamping die/punch) as per process requirement</p> <p>Perform punching on the instrument in designated area</p> <p>Control quality of punching</p> <p>Handle and store instruments with care to</p>	<p>Understanding safety precaution and Personal Protective Equipment for stamping.</p> <p>Understanding stamping machine operations</p> <p>Understanding about stamping tool and its adjustments</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Understanding basic maintenance of stamping machine</p> <p>Understand the defects of stamped work pieces and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (Storage of job,</p>	<p>Total</p> <p>10 hrs</p> <p>Theory:</p> <p>02 hrs</p> <p>Practical:</p> <p>08 hrs</p>	<p>Punching press</p> <p>Punching hammer</p> <p>Stamping die</p> <p>Fixture</p> <p>Tool kit</p> <p>Consumables:</p> <p>First aid box with complete accessories</p> <p>PPE</p> <p>Surgical instruments/ work</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical : Workshop</p>

	avoid any surface damage	quality, quantity etc)		pieces Process travel card (PTC)	
LU4: Perform etching	<p>The trainee will be able to:</p> <p>Clean the instrument surface to ensure dryness</p> <p>Adjust stencil on etching machine and pour etching chemical on stencil</p> <p>Adjust etching current according to product thickness</p> <p>Perform etching by placing the instrument on etching stencil for set time, while ensuring connection with earth rod</p> <p>Control quality of etching for position and sharpness</p> <p>Clean the etching surface with cleaner chemical and dry with cotton</p>	<p>Understanding safety precaution and Personal Protective Equipment for etching.</p> <p>Understand etching machine and its operations</p> <p>Knowledge of etching and cleaning chemicals and their application</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Understanding basic maintenance of etching machine</p> <p>Understand the defects of etched Stamps and its corrective measures</p> <p>Understanding process travelling card (PTC) and its applications. (storage of job, quality, quantity etc)</p>	<p>Total 15 hrs</p> <p>Theory: 04 hrs</p> <p>Practical: 11 hrs</p>	<p>Etching machine with accessories</p> <p>Tool kit</p> <p>Consumables:</p> <p>First aid box with complete accessories</p> <p>PPE</p> <p>Stencil</p> <p>Etching chemical and cleaner</p> <p>Cottons/ cleaning cloths</p> <p>Scotch tape/ double tape</p> <p>Surgical Instruments/ work pieces</p> <p>Process travel card (PTC)</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical: workshop</p>

	Handle and store instruments with care to avoid any surface damage				
LU5: Perform final packing	<p>The trainee will be able to:</p> <p>Clean the instruments with cotton</p> <p>Apply lubricant on instrument joints</p> <p>Arrange packing material as per packing instructions</p> <p>Pack the instruments as per packing instructions</p> <p>Apply labels on packages as per customer instructions and shipment requirements</p> <p>Store the packages in designated storage area as per stacking instructions</p>	<p>Understanding safety precaution and Personal Protective Equipment for final packing.</p> <p>Knowledge of packing materials and packing techniques</p> <p>Understanding of product handling and care requirements</p> <p>Knowledge of packaging, cleaning and labelling e.g. bar code printer/reader</p> <p>Understanding of time management</p> <p>Understanding of contingency management</p> <p>Understanding process travelling card (PTC) and its applications. (Storage of job, quality, quantity etc)</p>	<p>Total</p> <p>20 hrs</p> <p>Theory:</p> <p>04 hrs</p> <p>Practical:</p> <p>16 hrs</p>	<p>Label printer</p> <p>Bar code printer</p> <p>Bar code reader</p> <p>Computer system along with all accessories</p> <p>Strapping machine</p> <p>Weighing scale</p> <p>Tool kit</p> <p>Consumables:</p> <p>First aid box with complete accessories</p> <p>PPE (Cotton gloves)</p> <p>Cotton</p> <p>Silicon caps (Tip</p>	<p>Theory: Class room with multimedia facility</p> <p>Practical: Lab</p>

				protectors for tip) Bubble sheet Packing boxes Labels Packing tape Polythene bag Straps Process travel card	
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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 2 consists of eight modules.

Module No.	Module Name
01	Comply Personal Health and Safety Guidelines
02	Communicate the Workplace Policy and Procedure
03	Perform Basic Communication (Specific)
04	Perform Basic Computer Application (Specific)
05	Perform Grinding
06	Assemble Surgical Instruments
07	Perform Polishing
08	Perform Packing

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 vernier 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: Comply Personal Health and Safety Guidelines	30	3
B: Communicate the Workplace Policy and Procedure	20	2
C: Perform Basic Communication (Specific)	30	3
D: Perform Basic Computer Application (Specific)	40	4
E: Perform Grinding	70	7
F: Assemble Surgical Instruments	06	6
G: Perform Polishing	170	17
H: Perform Packing	80	8

National Vocational and Technical Training Commission (NAVTTTC)

 Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan

 +92 51 9044 322

 +92 51 9044 322

 info@navttc.org

 www.navttc.org