

Model Curriculum

Production Engineer

SECTOR: CAPITAL GOODS
SUB-SECTOR: 1. Machine Tools
2. Dies, Moulds and Press Tools
3. Plastics Manufacturing Machinery
4. Textile Manufacturing Machinery
OCCUPATION: Shop Floor Management
REF ID: CSC/Q1201, v1.0
NSQF LEVEL: 5



Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

CAPITAL GOODS SKILL COUNCIL

for the

MODEL CURRICULUM

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **'Production Engineer'** OP No. **'CSC/Q 1201, NSQF Level 5'**

Date of Issuance: Nov 24th, 2017

Valid up to : Nov 24th, 2021

*Valid up to the next review date of the Qualification Pack or the
*Valid up to' date mentioned above (whichever is earlier)



Authorized Signatory
(Capital Goods Skill Council)

TABLE OF CONTENTS

1. Curriculum	01
2. Trainer Prerequisites	08
3. Annexure: Assessment Criteria	09

Production Engineer

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Production Engineer”, in the “Capital Goods” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Production Engineer		
Qualification Pack Name & Reference ID. ID	CSC/Q1201, v1.0		
Version No.	1.0	Version Update Date	31/10/2018
Pre-requisites to Training	Diploma – Mechanical/Production, Degree preferred. Minimum 1 year work/apprenticeship in production.		
Training Outcomes	After completing this programme, participants will be able to: <ul style="list-style-type: none"> • Plan and organize machinery production and assembly processes. • Use basic health and safety practices at the workplace. • Work effectively with colleagues and supervisors. 		

This course encompasses 3 out of 3 National Occupational Standards (NOS) of “Production Engineer” Qualification Pack issued by “Capital Goods Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p>Introduction</p> <p>Theory Duration (hh:mm) 03:00</p> <p>Practical Duration (hh:mm) 00:00</p> <p>Corresponding NOS Code Bridge Module</p>	<ul style="list-style-type: none"> Define terms ‘Work’, ‘Power’ and ‘Energy’. Explain the meaning of ‘Torque’ and ‘Couple’. List SI units for work, power energy, voltage, current, torque, couple. State physical properties of commonly used metals and non-metals. Explain roles and responsibilities of a ‘Production Engineer’. 	Training kit (Trainer guide, Presentations).
2	<p>Planning and organizing machinery production and assembly processes</p> <p>Theory Duration (hh:mm) 37:00</p> <p>Practical Duration (hh:mm) 100:00</p> <p>Corresponding NOS Code CSC/N1201</p>	<ul style="list-style-type: none"> Explain methods and procedures used for different types of production processes and activities. Describe various quality systems used by the industry. Assess the site for suitability of the production process. Distinguish between abbreviations and notations used in the manufacturing. Interpret engineering drawings, circuit diagrams and piping layouts. Interpret charts, tables, graphs and applicable standards. Explain principles of document control. Identify right material for production. List various forms and types of material used in the production. Describe heat treatment process and its necessity. Describe various fastening methods. State benefits of jigs and fixtures. Describe adhesive bonding in the joining of fabricated assemblies. Infer weld dimensions and weld symbols. Define ‘Limit’ and ‘Tolerance’. List range of machine tools used in the production process. Analyze specifications of various machine tools. Inspect alignment of machine tools to avoid any misalignment. Compare numerically controlled (NC) and computer numerically controlled (CNC) machine tools. Describe CAD/CAM design concepts. Use simulation software effectively to prove the part program. 	Training kit (Trainer guide, Presentations), charts, graphs, standards, jigs and fixtures, various commonly used machine tools, CAD/CAM environment, commonly used machine tools, Work holding devices, material handling equipment.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> • Identify various types of cutting tools used in NC and Non NC machine tools. • Develop preventive maintenance schedule for each machine. • Describe the use of coolants and lubrication. • List various documents used in production activities. • Evaluate the efficiency of the production department. • Implement production enhancement measures. • State the requirements of material handling equipment. • Analyze the critical production requirements and quality criteria for each production and assembly activity. • Assess the production facility to conform to the required standards. • Organize resources required for production by coordinating with various departments. • Resolve any resources supply or control issues. • Ensure that the production area is safe and train team on the importance of following safety practices. • Implement and monitor quality assurance systems. • Develop plans to improve the production processes. • Inspect finished goods, processes, incoming material as per the schedule. • Train technicians and production staff on safety, process efficiency, quality control, inspection etc. • Communicate with various departments and vendors to achieve the set target to meet required quality standards. • Use basic office applications like spreadsheet, word processor and presentations. • Feed the required data in the ERP. • Plan production sequence as per the component to be manufactured. • Evaluate the performance of self and team members. 	
3	<p>Health and safety</p> <p>Theory Duration (hh:mm) 10:00</p> <p>Practical Duration</p>	<ul style="list-style-type: none"> • Explain the importance of Personal Protective Equipment (PPE). • Identify appropriate PPE for the various tasks performed. • Identify job site risks and hazards to avoid accidents at the work place. Hazards: sharp edged and heavy tools; 	<p>Training kit (Trainer guide, Presentation), leather gloves, leather apron, welding screen – helmet types, hand</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	(hh:mm) 08:00 Corresponding NOS Code CSC/N1335	<p>heated metals; gas cylinders; welding radiation; hazardous surfaces(sharp, slippery, uneven, chipped, broken, etc.); hazardous substances(chemicals, gas, fumes, dust, etc.); physical hazards(working at heights, large and heavy objects and machines, sharp and piercing objects, tools and machines, intense light, load noise, obstructions in corridors, by doors, blind turns, noise, over stacked shelves and packages, etc.) electrical hazards (power supply and points, loose and naked cables and wires, electrical machines and appliances, etc.).</p> <p>Possible causes of risk and accident: physical actions; reading; listening to and giving instructions; inattention; sickness and incapacity (such as drunkenness); health hazards (such as untreated injuries and contagious illness)</p> <ul style="list-style-type: none"> Identify the names and locations of people responsible for health and safety in the workplace. Identify documents that refer to health and safety in the workplace and where they are located. Carry out safe working practices while dealing with hazards to ensure the safety of self and others. <p>Safe working practices: using protective clothing and equipment; putting up and reading safety signs; handle tools in the correct manner and store and maintain them properly; keep work area clear of clutter, spillage and unsafe object lying casually; while working with electricity take all electrical precautions like insulated clothing, adequate equipment insulation, use of control equipment, dry work area, switch off the power supply when not required, etc.; safe lifting and carrying practices; use equipment that is working properly and is well maintained; take due measures for safety while working in confined places, trenches or at heights, etc. including safety harness, fall arrestors, etc.</p> <ul style="list-style-type: none"> Inspect steps and ladders for faults, set them and use them safely. <p>Ladder faults: corrosion of metal components, deterioration, splits and cracks timber components, imbalance,</p>	screen welding and safety shoes.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>loose rungs, missing/ unfixed nuts or bolts, etc. Ladders set up: firm/level base, clip/lash down, leaning at the correct angle, etc.</p> <ul style="list-style-type: none"> • Work safely in and around trenches, elevated places and confined areas. • Lift heavy objects safely using correct procedures. • Apply good housekeeping practices at all times. Good housekeeping practices: clean/tidy work areas, removal/disposal of waste products, protect surfaces • Identify common hazard signs displayed in various areas. Various areas: on chemical containers; equipment; packages; inside buildings; in open areas and public spaces, etc. 	
4	<p>Fire Safety</p> <p>Theory Duration (hh:mm) 05:00</p> <p>Practical Duration (hh:mm) 30:00</p> <p>Corresponding NOS Code CSC/N1335</p>	<ul style="list-style-type: none"> • Identify causes of fire accidents. • Recognise required fire extinguisher based on the type of fire. Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no longer receiving electricity); Class D: combustible metals such as magnesium, titanium, and sodium (These fires burn at extremely high temperatures and require special suppression agents). • Use the various appropriate fire extinguishers on different types of fires correctly. • Interpret fire safety signs. • Inspect evacuation plan in case of fire. • Identify the location of assembly point, fire exit and fire alarm. • Follow reporting procedure in case of a fire. • Participate in fire safety drills at the workplace. • Demonstrate good housekeeping in order to prevent fire hazards. 	Training kit (Trainer guide, Presentation), Class A, B, C and D fire extinguishers.
5	Emergencies, rescue	<ul style="list-style-type: none"> • Follow electrical safety procedures. 	Training kit

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<p>and first aid procedure</p> <p>Theory Duration (hh:mm) 09:00</p> <p>Practical Duration (hh:mm) 18:00</p> <p>Corresponding NOS Code CSC/N1335</p>	<ul style="list-style-type: none"> Use approved method to rescue a person from electrocution. State the importance of first aid. Identify the contents of a first aid kit. Administer first aid in case of minor injuries, bleeding, burns, choking, electrical shock, poisoning, etc. Demonstrate the artificial respiration and CPR process. Follow correct method to move injured people and others during an emergency. Explain stages of crisis and crisis management. Participate in emergency procedures as per role. Emergency procedures: raising alarm, safe/efficient evacuation, correct means of escape, correct assembly point, roll call, correct return to work. Write an accident/incident report or dictate a report to another person and send report to person responsible. Incident Report includes details of: name, date/time of incident, date/time of report, location, environment conditions, persons involved, sequence of events, injuries sustained, damage sustained, actions taken, witnesses, supervisor/manager notified. 	<p>(Trainer guide, Presentation), First aid kit with all contents.</p>
6	<p>Working effectively with others</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 60:00</p> <p>Corresponding NOS Code CSC/N1336</p>	<ul style="list-style-type: none"> State various categories of people that one is required to communicate and co-ordinate within the organization. Explain the importance of effective communication in the workplace. Explain the importance of teamwork in organizational and individual success. Describe various components of effective communication and active listening. Describe the barriers to effective communication. Provide and receive information to and from authorized persons accurately and within agreed timescale. Give information to others clearly, at a pace and in a manner that helps them to understand. Assist others in performing tasks in a positive and helpful manner, where required and possible. Take measures to maximize effectiveness and efficiency in carrying 	<p>Training kit (Trainer guide, Presentation)</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>out tasks by consulting with and assisting others.</p> <ul style="list-style-type: none"> Follow appropriate communication etiquette while working. Communication etiquette: do not use abusive language; use appropriate titles and terms of respect; do not eat or chew while talking (vice versa), use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism, etc. Apply active listening skills while interacting with others at work. Explain the importance of ethics and discipline for professional success. Describe common reasons for interpersonal conflict and ways of managing interpersonal conflict effectively. Explain the importance of developing effective working relationships for professional success. Display responsible and disciplined behaviors at the workplace. Disciplined behaviors: e.g. punctuality; completing tasks as per given time and standards; not gossiping and idling time; eliminating waste, honesty, etc. Escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict. 	
	<p>Total Duration</p> <p>Theory Duration 84:00</p> <p>Practical Duration 216:00</p>	<p>Unique Equipment Required: Charts, graphs, standards, jigs and fixtures, various commonly used machine tools, CAD/CAM environment, commonly used machine tools, Work holding devices, material handling equipment, apron, gloves, safety boots, overalls, eye shields, goggles, ear plugs, measuring instruments, Class A, B, C and D fire extinguishers, PPE, First aid kit with all contents.</p>	

Grand Total Course Duration: **300 Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by Capital Goods Skill Council)

Trainer Prerequisites for Job role: “Production Engineer” mapped to Qualification Pack: “CSC/Q1201 v1.0”

Sr. No.	Area	Details
1	Description	Plan and organise workplace, resources and processes required for the production and assembly of machinery and components in accordance with approved procedures.
2	Personal Attributes	Basic communication, numerical and computational abilities. Openness to learning, ability to plan and organize own work and identify and solve problems in the course of working. Understanding the need to take initiative and manage self and work to improve efficiency and effectiveness
3	Minimum Educational Qualifications	Diploma /Degree in Mechanical Engineering
4a	Domain Certification	Certified for Job Role: “ <u>Production Engineer</u> ” mapped to QP: “ <u>CSC/Q1201, v1.0</u> ”. Minimum accepted score is 80%
4b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “MEP/Q0102”. Minimum accepted as per respective SSC guidelines is 80%.
5	Experience	<ul style="list-style-type: none"> • 3-4 years of industry experience in the relevant field • 3-4 years of teaching experience

Annexure: Assessment Criteria

Criteria For Assessment Of Trainees

Job Role: Production Engineer

Qualification Pack: CSC/Q1201

Sector Skill Council: Capital Goods Skill Council

Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criterion.
6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.
7. In case of *unsuccessful completion*, the trainee may seek reassessment on the Qualification Pack.

Total Marks: 300		Compulsory	NOS	Marks Allocation	
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of	Theory	Skills Practical
CSC/N1201 Plan and organize machinery production and assembly processes	PC1.obtain specification of the product to be produced from an appropriate authority	100	1	0	1
	PC2.obtain details of the required production and assembly activities review the critical production requirements and quality criteria for each production and assembly activity		1	0	1
	PC3.obtain clarification from relevant people on any aspects of the activities that are unclear		2	0	2
	PC4.discuss and facilitate any changes needed to suit the operational requirements with the relevant people		4	1	3
	PC5.ensure that methods and procedures used meet relevant regulations and guidelines		2	0	2

PC6.define the production requirements and communicate them to the relevant people	2	0	2
PC7.record the requirements in the appropriate information systems	2	0	2
PC8.identify production team personnel and contractors required and check for their availability	2	0	2
PC9.obtain the resources, based on required skills, using the appropriate organizational procedures and authorizations	2	0	2
PC10.identify materials, tools, equipment, jigs and other resources required using workplace job information	2	0	2
PC11.resolve any resource supply or control issues	2	0	2
PC12.inspect and prepare the materials, tools, equipment, jigs for safe operation	3	0	3
PC13.identify and report faulty material, tools, equipment and jigs to appropriate personnel	2	0	2
PC14.record all resource data on the appropriate company information system	2	1	1
PC15.develop job cards showing personnel, consumables and resource costs	2	0	2
PC16.develop production schedules showing job sequence and estimated start and completion dates	3	1	2
PC17.submit job cards and production schedules to the appropriate personnel for approval	2	0	2
PC18.confirm that appropriate authorization is obtained	1	0	1
PC19.confirm the availability of resources to relevant team members	2	0	2
PC20.confirm to appropriate personnel that materials, processes and the site are duly prepared	2	0	2
PC21.confirm that the health, safety and environmental requirements applicable to the production activities are being adhered to	3	1	2
PC22.provide clear and accurate instructions to all the relevant people	3	1	2
PC23.listen to and provide information to answer queries and doubts with respect to work related processes, operations as well as materials and equipment	3	1	2
PC24.ensure that all support and control systems operate effectively	2	0	2
PC25.ensure that quality assurance systems are correctly implemented	2	0	2
PC26.ensure that engineering support systems are operating correctly	2	0	2

	PC27.control the use of resources to achieve the most effective results		3	1	2
	PC28.implement production processes that comply with organizational guidelines and procedures, customer standards and requirements or national and international standards or directives		2	1	1
	PC29.identify opportunities to improve the production processes and activities and forward to relevant authorities		2	0	2
	PC30.report and communicate production processes and activities implemented through various company media		3	1	2
	PC31.record the implementation process on appropriate company media		3	1	2
	PC32.conduct an evaluation of the effectiveness of the implementation process		3	1	2
	PC33.identify and record any deviations from specifications of the implemented activity		3	1	2
	PC34.ensure that the implementation of production processes and activities complies with all relevant regulations, directives and guidelines		2	1	1
	PC35.inspect personnel, resources and timelines for production and confirm according to workplace procedures and requirements		3	1	2
	PC36.identify potential production problems and action required to resolve the problems according to workplace procedures		3	1	2
	PC37.put permanent corrective action in place to resolve production problems as per organizational procedure		4	1	3
	PC38.enhance productivity by adopting a number of appropriate measures (eg. automation, motivation, process planning, resource planning)		4	1	3
	PC39.inform appropriate personnel of production progress in a timely manner		2	0	2
	PC40.monitor production for quality, budget and time schedule		2	0	2
	PC41.ensure that work area and tools are cleaned and inspected according to workplace procedures		2	1	1
	PC42.complete job documentation according to workplace procedures		3	1	2
		Total	100	19	81
CSC/N1335 Use basic health and safety practices at	PC1.use protective clothing/equipment for specific tasks and work conditions	100	5	2	3
	PC2.state the name and location of people responsible for health and safety in the workplace		3	1	2

the workplace	PC3.state the names and location of documents that refer to health and safety in the workplace	3	1	2
	PC4.identify job-site hazardous work and state possible causes of risk or accident in the workplace	5	2	3
	PC5.carry out safe working practices while dealing with hazards to ensure the safety of self and others	4	2	2
	PC6.state methods of accident prevention in the work environment of the job role	3	2	1
	PC7.state location of general health and safety equipment in the workplace	5	2	3
	PC8.inspect for faults, set up and safely use steps and ladders in general use	5	2	3
	PC9.work safely in and around trenches, elevated places and confined areas	5	2	3
	PC10.lift heavy objects safely using correct procedures	4	2	2
	PC11.apply good housekeeping practices at all times	5	2	3
	PC12.identify common hazard signs displayed in various areas	3	1	2
	PC13.retrieve and/or point out documents that refer to health and safety in the workplace	4	1	3
	PC14.use the various appropriate fire extinguishers on different types of fires correctly	4	1	3
	PC15.demonstrate rescue techniques applied during fire hazard	3	1	2
	PC16.demonstrate good housekeeping in order to prevent fire hazards	4	1	3
	PC17.demonstrate the correct use of a fire extinguisher	4	1	3
	PC18.demonstrate how to free a person from electrocution	4	1	3
	PC19.administer appropriate first aid to victims where required eg. in case of bleeding, burns, choking, electric shock, poisoning etc.	3	1	2
	PC20.demonstrate basic techniques of bandaging	4	1	3
	PC21.respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments	3	1	2
	PC22.perform and organize loss minimization or rescue activity during an accident in real or simulated environments	3	1	2

	PC23.administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC24.demonstrate the artificial respiration and the CPR Process		3	2	1
	PC25.participate in emergency procedures		2	1	1
	PC26.complete a written accident/incident report or dictate a report to another person, and send report to person responsible		3	1	2
	PC27.demonstrate correct method to move injured people and others during an emergency		3	1	2
		Total	100	37	63
CSC/N1336 Work effectively with others	PC1.accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	100	10	3	7
	PC2.accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3.give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4.display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5.consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6.display appropriate communication etiquette while working		10	3	7
	PC7.display active listening skills while interacting with others at work		10	3	7
	PC8.use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9.demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10.escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
		Total	100	30	70