



Technical Education
and Skills Development Authority

Webliography

The Webliography is an electronic bibliographic listing of topics related to the qualification titles of a particular TVET priority sector, with pre-searched *URLs* (uniform resource locators) and descriptions (abstracts).

The pre-searched *URLs* provide contents in reference to the title of promulgated Training Regulations (TR). By clicking the weblinks (underlined *URLs* in blue text), your internet browser will direct you to the website/webpage where you can find the topic related to the title you selected. The Webliography is a useful tool for trainers who are designing and developing competency-based curriculum and learning materials.

[TESDA](#) » [Webliography](#) » [Automotive and Land Transport Sector](#)

INTERNET RESOURCES

Automotive and Land Transport

Scope:

A self-propelled passenger vehicle that usually has four wheels and an internal-combustion engine, used for land transport. Also called *motorcar*. Technicians on this sector have various classifications and levels.

Source:

<http://www.thefreedictionary.com/automobile>

List of qualifications:

- Automotive body painting /finishing NC I – III
- Automotive body repairing NC II
- Automotive engine rebuilding NC II
- Automotive electrical assembly NC II - III
- Automotive mechanical assembly NC II - III
- Automotive servicing NC I – IV
- Automotive servicing III [LPG retrofitting and re-powering]
- Driving NC II – III
- Foundry melting /casting NC II - III
- Foundry molding NC II -III
- Foundry patternmaking NC II - III
- Heat treatment NC II
- Laboratory metrology/calibration services NC II
- Motorcycles/small engine servicing NC II
- Process inspection NC II
- Tinsmithing (automotive manufacturing) NC II

❖ Automotive Industry

https://en.wikipedia.org/wiki/Automotive_industry

This webpage provides a definition of automotive industry that comprises a wide range of companies and organizations involved in the design, development, manufacturing, marketing, and selling of motor vehicles.

[Updated June 10, 2019]

❖ Securing the Future of Philippine Industries: Automotive

<http://industry.gov.ph/industry/automotive/>

This webpage provides information about the automotive manufacturing industry's aim to make the Philippines a competitive manufacturing base of motor vehicles and parts and components, serving both the domestic and export markets, and a global hub for automotive-related human resource development and process outsourcing.

[Updated June 10, 2019]

❖ Automotive Training

<https://www.sgs.ph/en/training-services/industry-based-training/automotive-training>

This website provides information on automotive training courses from SGS – providing essential skills for automotive industry professionals.

[Updated June 10, 2019]

❖ Automotive Technology A Systems Approach

<http://automotivetechologyasystemsapproach.blogspot.com/2011/10/automotive-technology-systems-approach.html>

This webpage provides theory on automotive technology including links to quizzes, answers to queries with textbook type learning materials.

[Updated June 10, 2019]

❖ Land transportation in the Philippines

<http://www.lto.gov.ph/>

This website pertains to the profiles of LTO; policies, systems; and guidelines in which auto technicians/mechanics should know.

[Updated June 10, 2019]

❖ Land transportation Franchising and Regulatory Board

<http://lfrb.gov.ph/#sthash.s0SUOfwF.dpbs>

This webpage pertains to the profiles of LFRB; policies, systems; and guidelines in which vehicle owners/operators should know.

[Updated June 10, 2019]

❖ Land Transportation and Traffic Code of the Philippines

http://www.lawphil.net/statutes/repacts/ra1964/ra_4136_1964.htmls

This webpage provides information about the laws relative to the land transportation and traffic rules in the Philippines under RA 4136.

[Updated June 10, 2019]

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Automotive Body Painting/Finishing NC I

This qualification consists of competencies that a person must achieve to paint or repaint new automotive body panels, which do not have any damage using solid color paints. It also includes competency in polishing the painted panels.

Core Competencies:

- Prepare undamaged surface for painting
- Apply and remove masking
- Spray solid color paints
- Perform polishing

Automotive Body Painting/Finishing NC II

This qualification consists of competencies that a person must achieve to restore damaged or change undamaged automotive body or panel paints. Automotive painting includes any land based motor vehicles such as automobiles, trucks, buses vehicle body panels and parts including big bikes or motorcycles that have been repaired or assembled or those vehicles that have lost their luster. It involves putty application, color-matching and paint repair procedures utilizing two-stage paint technology.

Core Competencies:

- Assess Auto Paint Jobs
- Prepare Undamaged Surface for Painting
- Prepare Damaged Surface for Painting
- Apply and Remove Masking
- Spray Solid Color Paints
- Repair Solid Color Paints
- Perform Polishing
- Perform Solid/Metallic Color Mixing
- Spray Metallic Color Paint
- Repair Metallic Color Paints

Automotive Body Painting/Finishing NC III

This qualification consists of competencies that a person must achieve to repair pearl/mica metallic body panels specifically applying the skill in pearl/mica, metallic color matching. It also covers the competency in painting pearl or mica

❖ Car body work: how to polish your car rims: guide

<http://carbodywork.blogspot.com/2006/10/how-to-polish-your-car-rims-guide.html>

This webpage provides information and the steps to polish the stock integral car rims

[Updated June 10, 2019]

❖ 6 car repairs you can't afford to skip

[http://autos.yahoo.com/articles/autos_content_landing_pages/1013/6-car-repairs-you-cant-afford-to-skip/;](http://autos.yahoo.com/articles/autos_content_landing_pages/1013/6-car-repairs-you-cant-afford-to-skip/)

This webpage is an online learning resource that offers six (6) repair topics for automotive and land transport industry.

[Updated June 10, 2019]

❖ Leaning center-all automotive...a complete list of automotive titles

<http://www.tcpglobal.com/learningcenter/lc030.asp>

This webpage provides an online catalogue of automotive learning materials in which the contents may be viewed. It includes quizzes to test the knowledge gained in a certain learning material titles.

[Updated June 10, 2019]

❖ Painting and coating workers, except construction and maintenance

https://www.jobbankusa.com/career_employment/painting_coating_workers_except_construction_maintenance/jobs_outlook.html

This webpage provides a handbook of information on occupational outlook for the years 2008-2009 for painting occupations.

[Updated June 10, 2019]

❖ How to Prep a Car for a New Paint Job

<https://itstillruns.com/prep-car-new-paint-job-2296204.html>

This webpage provides information on the preparation of an auto body before painting is critical to a good paint job. It's been said that 90 percent of the work involved in a good paint job is the prep work and only 10 percent of the time is spent actually painting the car.

[Updated June 10, 2019]

❖ How to Spray Paint

<https://www.wikihow.com/Spray-Paint>

This webpage provides a comprehensive guide in spraying solid color liquid paint on a surface. It includes illustrations and links to related topics.

[Updated June 10, 2019]

❖ How to Polish a Car

<https://www.wikihow.com/Polish-a-Car>

This webpage provides a comprehensive guide in polishing the surface of a car. It includes illustrations and links to related topics

[Updated June 10, 2019]

❖ How to Assess the Quality of Your Car Paint Job

<https://sheengroup.com.au/resources/information-centre/how-to-assess-the-quality-of-your-car-paint-job>

This webpage provides information and guide in assessing the quality of paint used in a car.

[Updated June 10, 2019]

❖ How to Assess the Quality of Your Car Paint Job

<https://sheengroup.com.au/resources/information-centre/how-to-assess-the-quality-of-your-car-paint-job>

This webpage provides information and guide in assessing the quality of paint used in a car.

[Updated June 10, 2019]

❖ How to Prep a Car for Paint

<https://www.wikihow.com/Prep-a-Car-for-Paint>

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<p>colors.</p> <p>Core Competencies:</p> <ul style="list-style-type: none"> • Perform Pearl Color Matching • Spray Three-Stage Pearl or Mica Color Paint 	<p>This webpage provides information and guide on preparing a car for painting by removing rust or dents by grinding the affected part, applying sealant and regrinding. [Updated June 10, 2019]</p> <p>❖ How to Repair Car Paint Chips https://www.wikihow.com/Repair-Car-Paint-Chips This webpage provides information and guide on repairing car paint damages by applying simple and practical solutions. [Updated June 10, 2019]</p> <p>❖ How to Color Match a 3-Stage Pearl https://thegunman.net.au/how-to-color-match-a-3-stage-pearl/ This webpage provides information and guide on matching pearl color for painting. Includes videos and images. [Updated June 10, 2019]</p>
<p>Automotive Body Repairing NC II</p> <p>This qualification consists of competencies that a person must achieve in repairing automotive bodies and panels of light and heavy duty vehicles according to manufacturer's specification manuals using hand and power tools and welding equipment. It includes the competency in planning and preparing job activities prior to repairing body panels ; dismantling automotive accessories, disassembling, cleaning and inspecting of parts to be repaired; performing basic benchwork (such as layout, cutting and filing, drilling, tapping) body panel alignment and applying of anti-corrosion.</p> <p>Core Competencies:</p> <ul style="list-style-type: none"> • Prepare Vehicle Body for Repair • Repair Body Panel • Replace Damaged Parts with Pre-Fabricated Parts 	<p>❖ Automobile repair shop https://en.wikipedia.org/wiki/Automobile_repair_shop The webpage provides definition of automobile repair shop or garage as an establishment where automobiles are repaired by auto mechanics and technicians. [Updated June 10, 2019]</p> <p>❖ 11 Great Tips for DIY Car Body Repair https://www.familyhandyman.com/automotive/11-great-tips-for-diy-car-body-repair/ This webpage provides a guide in body repair and professional-grade detailing. [Updated June 10, 2019]</p> <p>❖ Automotive repair shops: industry profiles http://valuationresources.com/Reports/SIC7532AutoBodyShops.htm This webpage provides information for industry profile issues, trends and outlook of various automotive repair shops for accepting on-the-job training. [Updated June 10, 2019]</p> <p>❖ Body repair manuals https://procarmanuals.com/body/ This webpage contains various quality body repair manuals according to the brand and model of vehicles. [Updated June 10, 2019]</p> <p>❖ A New Velocity in Collision Repair https://www.autoindustriya.com/features/a-new-velocity-in-collision-repair.html This webpage provides information on collision repair.. [Updated June 10, 2019]</p> <p>❖ The complete guide to auto body repair https://www.bookdepository.com/Complete-Guide-Auto-Body-Repair-Dennis-Parks/9780760349458 This webpage provides learning resource materials on the overview, editorials and product details in automotive body repair. [Updated June 10, 2019]</p>
<p>Automotive Engine Rebuilding NC II</p> <p>This qualification consists of competencies that a person must achieve to restore defective/worn-out engine parts back to manufacturer's specifications; inspects, measures and</p>	<p>❖ Automotive engine rebuilding http://shop.ebay.com/items/?_nkw=automotive+engine+rebuilding&_armrs=1&_from The webpage features a catalogue learning resource materials with six (6) relevant resource materials for engine rebuilding. [Updated June 10, 2019]</p> <p>❖ Engine Overhaul & Rebuild http://www.speedlab.com.ph/index.php/shop-services/engine-overhaul-</p>

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interprets blueprints and repair procedures; sets up and operates variety of specialized metalworking machines and uses precision measuring instrument in repairing automotive engine parts.

Core Competencies:

- Interpret Technical Manual Specification of Engine Components
- Disassemble Engine Block and Sub-Assemblies, Checks Tolerances and Components
- Disassemble Engine Sub-Assemblies/Cylinder Heads and Check Components
- Carry Out Pre-Repair Operations on Engine Components
- Inspect Engine Components and Determine Preferred Action
- Carry Out Machining Operations
- Set, Operate and monitor Specialized Machines
- Use and Maintain Measuring Instrument
- Assemble Engine Block and Sub-Assemblies, Check Tolerances and Carry Out Relevant Testing
- Assemble Engine/Cylinder Heads, Check Tolerances and Carry Out Relevant Testing Procedures

[rebuild](#)

This webpage shows the process of overhauling and rebuilding an engine..
[Updated June 10, 2019]

❖ **How to Use a Maintenance Manual**

<https://www.wikihow.com/Use-a-Maintenance-Manual>

This webpage provides information on using a shop manual..
[Updated June 10, 2019]

❖ **How to rebuild an automotive engine**

http://www.crankshaftcoalition.com/wiki/How_to_rebuild_an_engine

This webpage illustrates the process details of engine rebuilding.
[Retrieved June 10, 2019]

❖ **How to rebuild an engine: Engine block assembly**

<http://www.taskmap.com/How%20to%20rebuild%20an%20engine%20-%20Engine%20Block%20Assembly%20-%20part%201.html>

This webpage provides the parts of an engine block assembly and servicing procedures.
[Retrieved June 10, 2019]

❖ **Steps for Disassembling and Reassembling Parts with Ease**

<https://www.dummies.com/home-garden/car-repair/steps-for-disassembling-and-reassembling-parts-with-ease/>

This webpage provides a guide in disassembling automotive parts with ease.
[Retrieved June 10, 2019]

❖ **How to remove a cylinder head**

<https://www.howacarworks.com/engine/how-to-remove-a-cylinder-head>

This webpage provides a guide in removing cylinder head with tools.
[Retrieved June 10, 2019]

❖ **Introduction to Engine Repair – Study Guide**

<https://www.abss.k12.nc.us/cms/lib02/NC01001905/Centricity/Domain/2007/Engine%20Repair%20Study%20Guide.pdf>

This webpage provides a study guide that introduces learners to engine repair. It includes illustrations and explanations on related topics.
[Retrieved June 10, 2019]

❖ **Engine Machining 101: Getting Started with Your Engine Build**

<https://www.dragzine.com/news/engine-machining-101-getting-started-with-your-engine-build/>

This webpage provides a guide in machining engine parts after rebuilding and fitting to improve engine performance.
[Retrieved June 10, 2019]

❖ **Randy's Engine Repair: Specialty Tools**

<https://randysengine.repair/collections/specialty-tools?page=10>

This webpage features specialty tools that are recommended for engine repair. Specialty tools for use in certain vehicle brands can be found in the vehicle's manual.
[Retrieved June 10, 2019]

❖ **How to Assemble an Engine Block**

<https://humblemechanic.com/assemble-engine-block/>

This webpage provides information on assembling a newly repaired or reconditioned engine. .
[Retrieved June 10, 2019]

❖ **How to Test Pressure in an Engine Block**

<https://itstillruns.com/test-pressure-engine-block-7854107.html>

This webpage provides information on testing an engine block pressure.
[Retrieved June 10, 2019]

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Automotive Electrical Assembly NC II

This qualification consists of competencies that a person must achieve to mount/install electrical parts and electronic units to automotive vehicle body in accordance with manufacturer's specification. It also covers headlight focus aiming operations.

Core Competencies:

- Install/Fit Out Electrical Parts to Engine Assembly
- Install/fit Out Electrical Parts and Electronic Units to Body Interior Compartment
- Install/Fit Out Electrical Parts and Electronic Units to Dash Instrument Panel
- Install/Fit Out Electrical Parts to Exterior and Engine Compartment
- Install/Fit Out Audio and Video Systems
- Perform Headlight Focus Aiming Operations

Automotive Electrical Assembly NC III

This qualification consists of competencies that a person must achieve to: rectify faults on installed electrical parts to engine assembly, rectify faults on installed electrical parts and electronic units to body interior compartment, rectify faults on installed electrical parts and electronic units to dash instrument panel and rectify faults on installed electrical parts to exterior and engine compartment. It also covers competencies of rectifying faults on installed audio and video system to automotive vehicle.

Core Competencies:

- Rectify Faults on Installed Electrical Parts to Engine Assembly
- Rectify Faults on Installed Electrical Parts and Electronic Units to Body Interior Compartment
- Rectify Faults on Installed Electrical Parts and Electronic Units to Dash Instrument Panel
- Rectify Faults on Installed Electrical Parts to Exterior and Engine compartment
- Rectify Faults on Installed Audio

❖ Automotive Electrical Circuits and Wiring

http://www.ave.dee.isep.ipp.pt/~mjf/act_lect/SIAUT/Material%20Auxiliar/Automotive%20electrical%20systems.pdf

This webpage provides a PDF document detailing the components and procedures in automotive electrical wiring.

[Updated June 10, 2019]

❖ How car electrical systems work

<https://www.howacarworks.com/basics/how-car-electrical-systems-work>

This webpage provides a guide in installing car electrical parts with illustrations and diagrams.

[Retrieved June 13, 2019]

❖ Electrical System

<https://www.silvhornautomotive.com/services/electrical-system/>

This webpage provides links related to the installation of car electrical system installation inside and outside..

[Retrieved June 13, 2019]

❖ Engine compartment electrical installation

<http://www.manualsdir.com/manuals/546122/skytrak-8042-parts-manual-10042-parts-manual-10054-parts-manual.html?page=310>

This webpage provides a guide in installing boom sensor, alarm, and other engine electrical components.

[Retrieved June 13, 2019]

❖ How to Install a Car Stereo

<https://www.wikihow.com/Install-a-Car-Stereo>

This webpage provides a guide in installing a new car stereo with illustrations and instructions in each step.

[Retrieved June 13, 2019]

❖ How to Adjust Car Headlights

<https://www.wikihow.com/Adjust-Car-Headlights>

This webpage provides a guide in adjusting the headlight of a car using easy to follow instructions with illustrations.

[Retrieved June 13, 2019]

❖ How to Adjust Car Headlights

<https://www.wikihow.com/Adjust-Car-Headlights>

This webpage provides a guide in adjusting the headlight of a car using easy to follow instructions with illustrations.

[Retrieved June 13, 2019]

❖ Repair Car Electrical Problems

<https://www.fixmyoldride.com/repair-car-electrical-problems.html>

This webpage provides a guide in diagnosing and repairing car electrical problems with links to related topics.

[Retrieved June 13, 2019]

❖ How to Read Schematics

<https://www.wikihow.com/Read-Schematics>

This webpage provides a guide in reading electrical schematic diagrams with illustrations and some schematics.

[Retrieved June 13, 2019]

❖ How to Read Schematics

<https://www.wikihow.com/Read-Schematics>

This webpage provides a guide in reading electrical schematic diagrams with illustrations and some schematics.

[Retrieved June 13, 2019]

❖ Common Car Amp Problems (and How to Fix Them!)

<https://www.lifewire.com/common-amp-problems-and-solutions-534492>

This webpage provides a guide with explanations in repairing car audio

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<p>and Video System to Automotive Vehicle</p>	<p>electrical problems with illustrations. [Retrieved June 13, 2019]</p>
<p>Automotive Mechanical Assembly NC II</p> <p>This qualification consists of competencies that a person must achieve to assemble and to mount/install mechanical assemblies and parts/components into automotive vehicle body in accordance with manufacturer's specification. It also covers competencies like final engine run and wheel alignment operations that are required for a person to undertake.</p> <p>Core Competencies:</p> <ul style="list-style-type: none"> • Assemble Mechanical Assemblies using Jigs/Fixtures • Mount/Install Brake and Fuel Systems • Mount/Install Power Drive System • Mount/Install Suspension Drive Train • Install/Fit out Trim Parts/ and Assemblies • Perform Final Engine Run • Perform Wheel Alignment Operations <p>Automotive Mechanical Assembly NC III</p> <p>This qualification consists of competencies that a person must achieve to rectify assembly faults on assembled mechanical assemblies; rectify faults on mounted/installed brake and fuel system; rectify faults on mounted /installed power drive system; and rectify faults on mounted/installed suspension drive train in accordance with manufacturer's specification. It also covers competencies of conducting engine hot test that determines the status of an engine for operating inconsistencies or faults.</p> <p>Core Competencies:</p> <ul style="list-style-type: none"> • Conduct Engine Hot Test • Rectify Assembly Faults on Assembled Mechanical Assemblies • Rectify Faults on Mounted/Installed Brake and Fuel System • Rectify Faults on Mounted/Installed Power Drive System • Rectify Faults on Mounted/Installed Suspension Drive Train 	<p>❖ What is a Mechanical Assembly? https://www.wisegeek.com/what-is-mechanical-assembly.htm This webpage provides an explanation of what a mechanical assembly is all about and its role in automotive industrial manufacturing [Retrieved June 13, 2019]</p> <p>❖ Mechanical Engineering: Jigs and Fixtures https://engineeringhut.blogspot.com/2010/11/jigs-and-fixtures.html This webpage provides information on mechanical engineering jigs and fixtures. The device which guides the tool is called jig and the device which holds the job in position is called fixture. [Retrieved June 13, 2019]</p> <p>❖ How the braking system works https://www.howacarworks.com/basics/how-the-braking-system-works This webpage provides information on brake system components and its operation with illustrations and diagrams. [Retrieved June 13, 2019]</p> <p>❖ How to Replace a Rear Differential https://www.automd.com/160/how-to-replace-a-rear-differential/ This webpage provides a guide in installing rear differential of a car with illustrations. [Retrieved June 13, 2019]</p> <p>❖ Camneticsinc: recommended books http://www.camnetics.com/books.htm#MechDesignHandbook This webpage features a list of recommended titles with corresponding brief scopes of its title, some pages are downloadable. [Retrieved June 13, 2019]</p> <p>❖ Free e-Book download c2008; manuals books, tutorial, service manual http://www.ebooksquad.com/category/automotive This webpage provides freed downloadable service manuals, books and tutorials according to brand of automobile. [Retrieved June 13, 2019]</p> <p>❖ Automotive systems: the open content textbooks collection by Wikipedia http://en.wikibooks.org/wiki/Automotive_Systems This webpage is an open content learning resource with different titles and can be commented or edited. [Retrieved June 13, 2019]</p> <p>❖ How to Install Brakes on Vehicles https://itstillruns.com/how-to-install-brakes-on-vehicles-10796.html This webpage provides information on installing brakes on vehicles. [Retrieved June 13, 2019]</p> <p>❖ How to Fix the Alignment on a Car https://www.wikihow.com/Fix-the-Alignment-on-a-Car This webpage provides information on aligning the wheels and tires of vehicles to improve safety and avoid excessive tire wear. [Retrieved June 13, 2019]</p> <p>❖ How to Test an Ignition Coil of a Vehicle https://www.carbibles.com/how-to-test-ignition-coil/ This webpage provides information on testing the ignition coil or induction coil to provide the required voltage to the spark plug for starting the vehicle. [Retrieved June 13, 2019]</p>

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❖ How to Repair a Fuel Line in a Car

<https://itstillruns.com/repair-fuel-line-car-4423522.html>

This webpage provides a guide in repairing fuel the fuel lines of a vehicle.
[Retrieved June 13, 2019]

❖ How to Inspect Your Suspension System

<https://www.wikihow.com/Inspect-Your-Suspension-System>

This webpage provides a guide in repairing suspension system a vehicle with illustrations.
[Retrieved June 13, 2019]

Automotive Servicing NC I

This qualification consist of competencies that a person must achieve to perform basic engine servicing, removal and installation of vehicle components for both diesel and gasoline-engine powered vehicles.

Core Competencies:

- Perform diesel engine tune up
- Perform gas engine tune up
- Remove and replace electrical/electronic units/ assemblies
- Remove and tag engine system components
- Remove and tag automotive steering, suspension and brake system components
- Remove and tag transmission system components

Automotive Servicing NC II

This qualification consists of competencies that a person must achieve to inspect, clean and repair mechanical or electrical parts, components, assemblies and sub-assemblies of light and heavy-duty automotive vehicle with diesel or gas engine in accordance with manufacturer's specification. It also covers servicing of engine mechanical components such as cooling and lubricating system; performing power train and underchassis servicing and repair.

Core Competencies:

- Service Automotive Battery
- Service Ignition System
- Test and Repair Wiring/Lighting System
- Service Starting System
- Service Charging System
- Service Engine Mechanical System
- Service Clutch System
- Service Differential and Front Axle

❖ Automotive brake: SCI-TECH

<http://www.answers.com/topic/automotive-brake>

This Website of learning resource material are terminologies commonly used in assembling mechanical parts of an automobile.
[Updated June 13, 2019]

❖ Automotive systems: the open content textbooks collection by Wikipedia

http://en.wikibooks.org/wiki/Automotive_Systems

This webpage is an open content learning resource material with different titles and can be commented or edited.
[Updated June 13, 2019]

❖ ASE: advanced engine performance specialist (L1)

http://www.ase.com/AMTemplate.cfm?Section=Test_Catalogs&Template=/ContentManagement/ContentDisplay.cfm&ContentID=664

This webpage features a learning resource material for an advanced engine performance specialist in preparation for the assessment of auto mechanic.

[Updated June 13, 2019]

❖ ASE automobile test: the official ASE study guide

http://www.ase.com/AMTemplate.cfm?Section=Test_Catalogs&Template=/ContentManagement/ContentDisplay.cfm&ContentID=6646

This webpage provides learning resource materials for the profile of the ASE, components of the assessment tools and tips on how to become a certified automobile technician.

[Updated June 13, 2019]

❖ ASE collision repair and refinish test: study guide

http://www.ase.com/AMTemplate.cfm?Section=Test_Catalogs&Template=/ContentManagement/ContentDisplay.cfm&ContentID=6649"

This webpage discusses the collision repair/refinish tasks such as painting and refinishing, non-structural analysis and damage repair, structural analysis and damage repair; mechanical and electrical components and damage analysis and estimating.

[Updated June 13, 2019]

❖ ASE: electronic diesel engine diagnosis specialist test(L2)

http://www.ase.com/AMTemplate.cfm?Section=Test_Catalogs&Template=/ContentManagement/ContentDisplay.cfm&ContentID=6649"

This is a learning resource material webpage that discusses the overview, test specification; task list; sample questions for assessment test for an electronic diesel engine specialist.

[Updated June 13, 2019]

❖ How to Maintain Car Batteries

<https://www.wikihow.com/Maintain-Car-Batteries>

This webpage provides a guide in maintaining car batteries.

[Retrieved June 13, 2019]

Automotive Troubleshooting Secrets

http://www.automotivetroubleshootingsecrets.com/automotive_wiring.html

This webpage provides tips in wiring a vehicle for lighting and other components.

[Retrieved June 13, 2019]

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- Service Steering System
- Service Brake System
- Service Suspension System
- Perform Underchassis Preventive Maintenance
- Overhaul Manual Transmission

How car electrical systems work

<https://www.howacarworks.com/basics/how-car-electrical-systems-work>

This webpage provides information and guide in wiring and installing electrical system of a vehicle.

[Retrieved June 13, 2019]

How to Rebuild an Alternator

<https://www.wikihow.com/Rebuild-an-Alternator>

This webpage provides a guide in rebuilding defective alternator that produces electricity and charges the battery when the engine is running.

[Retrieved June 13, 2019]

How to Diagnose a Slipping Clutch in Your Car

<https://www.wikihow.com/Diagnose-a-Slipping-Clutch-in-Your-Car>

This webpage provides a guide in diagnosing a clutch with illustrations and videos.

[Retrieved June 13, 2019]

How to Care for your Car's Differential

<https://www.popularmechanics.com/cars/how-to/g1140/how-to-care-for-your-cars-differential/>

This webpage provides a guide in maintaining the car differential.

[Retrieved June 13, 2019]

How the steering system works

<https://www.howacarworks.com/basics/how-the-steering-system-works>

This webpage provides information on the different components that make up a steering system with illustrations.

[Retrieved June 13, 2019]

How to Fix a Power Steering Hose Leak

<https://www.wikihow.com/Fix-a-Power-Steering-Hose-Leak>

This webpage provides a guide with illustrations and video on repairing a power steering hose leak.

[Retrieved June 13, 2019]

How to Fix a Power Steering Hose Leak

<https://www.wikihow.com/Fix-a-Power-Steering-Hose-Leak>

This webpage provides a guide with illustrations and video on repairing a power steering hose leak.

[Retrieved June 13, 2019]

How to Inspect Your Suspension System

<https://www.wikihow.com/Inspect-Your-Suspension-System>

This webpage provides a guide in inspecting and identifying signs of suspension system issues.

[Retrieved June 13, 2019]

Manual Transmission Diagnosis

<https://www.certifiedmastertech.com/2009/10/13/manual-transmission-diagnosis/>

This webpage provides information and guide in performing diagnosis of manual transmission of a vehicle.

[Retrieved June 13, 2019]

Automotive Servicing NC III

This qualification consists of competencies that a person must achieve to check, test, replace and repair mechanical, electrical and electronic control system components of a motor vehicle such as the automatic transmission systems; engine management system; steering and suspension systems; to inspect,

❖ Install Electrical Security System/Components

<https://www.youtube.com/watch?v=gHtBTSBHyCY>

This webpage is detailed video presentation on the different components, parts, diagram, and the procedures in the installation of car security alarm system.

[Retrieved June 13, 2019]

❖ Installing Car Alarm

<http://www.wikihow.com/Install-a-Car-Alarm>

This webpage provides information on the steps in installing car alarm.

[Retrieved June 13, 2019]

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prepare, install and service mechanical, electrical and electronic control parts, components, assemblies and sub-assemblies of LPG Kit to or gas engine light-duty automotive vehicle in accordance with manufacturer's specifications; to remove and replace auto engine and engine-related system for repowering the vehicle. It also covers testing and replacing electronic components or devices in security and engine management systems.

Core Competencies:

- Test and Repair Electrical Security System/Components
- Service Electronic Engine Management
- Overhaul Engines and Associated Components
- Service Automatic Transmission
- Perform Maintenance Service Check-Up and Repair to Auto AC System
- Remove and Replace Automotive Engine and Engine-Related Systems
- Service and repair electronically controlled steering systems
- Service and repair electronically controlled suspension systems
- Repair Instruments and warning systems
- Carry out diagnostic procedures

❖ Multi-tester

<https://www.youtube.com/watch?v=bF3OyQ3HwFU>

This webpage provides information on the steps and proper usage of multi-tester in a video form.

[Retrieved June 13, 2019]

❖ Electrical Concepts

<https://www.youtube.com/watch?v=ARxzZE36Io0>

This webpage provides information on electrical concepts" It is in the form of video presentation/video enlightening wider concepts with regards to electricity.

[Retrieved June 13, 2019]

❖ Ohm's Law

<https://www.physics.uoguelph.ca/tutorials/ohm/Q.ohm.intro.html>

This webpage is an "essential material providing information on ohm's law. It is here where learners will know the relationship between current, resistance and voltage. It also includes about electrons flow, polarity, circuit and other important information.

[Retrieved June 13, 2019]

❖ Troubleshooting Car Alarm System

<https://www.youtube.com/watch?v=YGlib98wBxAD>

This webpage provides information on the techniques, procedures, and precautions to be observed when performing troubleshooting car alarm system through video presentation.

[Retrieved June 13, 2019]

❖ How to Service an Automatic Transmission Yourself

<https://axleaddict.com/auto-repair/How-To-Service-An-Automatic-Transmission-Yourself>

This webpage provides information on servicing an automatic transmission including the tools required and the servicing procedures.

[Retrieved June 13, 2019]

❖ Engine Management System: Components and Working Explained

<https://carbiketech.com/engine-management-system-ems/>

This webpage provides information on engine management system and how it works including the control unit.

[Retrieved June 13, 2019]

❖ How to Fix Your Car's Air Conditioner

<https://www.wikihow.com/Fix-Your-Car%27s-Air-Conditioner>

This webpage provides information on repairing car air conditioning system and its associated components.

[Retrieved June 13, 2019]

❖ Vehicle Warning Indicators

<https://www.autozone.com/landing/page.jsp?name=vehicle-warning-indicators>

This webpage provides information vehicular warning system and what the dashboard lights indicate.

[Retrieved June 13, 2019]

Automotive Servicing NC IV

This qualification consists of competencies that a person must achieve to lead a section or group of workers to service and repair various types of motor vehicles. He is a master technician who can service and repair electronically controlled components or devices and emission control system of a motor vehicle. He can is also service both diesel and gasoline engines.

❖ ASE Medium/heavy truck tests: study guide

http://www.ase.com/AMTemplate.cfm?Section=Test_Catalogs&Template=/ContentManagement/ContentDisplay.cfm&ContentID=6650

This webpage provides learning resource materials in preparation for a specialist on medium/heavy truck mechanic.

[Updated June 13, 2019]

❖ ASE: parts specialist study guide (pdf)

http://www.ase.com/Content/NavigationMenu/ASE_Resource_Center1/For_ms_Publications/Study_Guides_and_Booklets.htm

This webpage provides learning resource materials that focus only on parts specialist such as medium/heavy duty truck dealership parts; automobile parts; medium/heavy duty truck aftermarket brake parts;

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Core Competencies:

- Service Diesel Engine Management System
- Service Electronic Body Management System
- Service Diesel Fuel Injection System Components
- Service Electronic Drive Management System
- Service Emission Control System
- Service and repair electronically controlled anti-lock braking system
- Service and repair electronically operated traction control System
- Service and repair electronically operated stability control System
- Plan assessment activities and processes
- Manage facility and inventory requirements
- Estimate complex jobs
- Ensure a safe workplace
- Implement continuous improvement
- Manage people performance
- Plan and manage compliance with environmental regulations in a workplace or business

general motor parts; and medium/heavy aftermarket suspension steering parts.

[Updated June 13, 2019]

❖ ASE: school bus tests study guide

http://www.ase.com/AMTemplate.cfm?Section=Test_Catalogs&Template=/ContentManagement/ContentDisplay.cfm&ContentID=6656

This webpage provides learning resource materials for school bus specialist and discusses the following: body system and special equipment, diesel engines; drive train; brakes; suspension & steering; electrical/ electronic system and the air conditioning systems & controls.

[Updated June 13, 2019]

❖ ASE truck equipment tests: study guide

http://www.ase.com/AMTemplate.cfm?Section=Test_Catalogs&Template=/ContentManagement/ContentDisplay.cfm&ContentID=6653

This webpage provides learning resource materials for truck equipment installation & repair; electrical /electronic system installation & repair and auxiliary power systems installation and repair and tips on how to become a truck equipment specialist/mechanic.

[Updated June 13, 2019]

❖ Cryogenic treatment of automotive parts

<http://www.sigmaautomotive.com/cryogenics/portal.php>

This webpage provides learning resource material in accessorizing the alternative fuel, lighting, and performance and safety measures.

[Updated June 13, 2019]

❖ Free eBook download c2008;manuals books, tutorial, service manual

<http://www.ebooksquad.com/category/automotive>

This webpage offers free downloadable eBook, which pertains to service manuals of various brands of automobile.

[Updated June 13, 2019]

❖ How cars work: an interactive tool to learn about your car and its parts

<http://www.jiffylube.com/education/howcarswork/howcarswork.aspx>

This webpage is an interactive learning resource on starting a car, powering and driving techniques. Details on its modules were fully discussed.

[Updated June 13, 2019]

❖ How to find a good repair shop video features

http://www.ase.com/Template.cfm?Section=Media_Center&CONTENTID=6921&TEMPLATE=/ContentManagement/ContentDisplay.cfm

This webpage features learning resource materials which are composed of one to three minutes video segments, and discusses the process of looking for a good repair shop for your automobile.

[Updated June 13, 2019]

❖ Low pressure carburizing for transmissions

<http://www.gearsolutions.com/article/detail/5911/low-pressure-carburizing-for-transmissions>

This webpage provides information for low- and high pressure gas quenching technology for transmissions. Heat treatment hardens the metal of transmission parts to increase its durability.

[Updated June 13, 2019]

❖ New technology delivers quality improvements for gas carburizing processes

<http://www.sigmaautomotive.com/cryogenics/portal.php>

This learning resource materials webpage describes the quality of products in the modern production of automobiles and aircrafts.

[Updated June 13, 2019]

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Driving NC II

This qualification consists of competencies that a person must achieve to operate light motor vehicles classified under LTO Restriction code 1 and 2; transport passengers and loads over specified routes to local or district location and collect fare duly authorized by the relevant government agency; comply with local traffic rules and regulations and perform minor vehicle repairs and other minor servicing.

Core Competencies:

- Carry Out Minor Vehicle Maintenance and Servicing
- Drive Light Vehicle
- Obey and Observe Traffic Rules and Regulations
- Implement and Coordinate Accident-Emergency Procedures

❖ How to Drive a Car

<https://www.wikihow.com/Drive-a-Car>

This webpage contains information on driving a car with illustrations and guide in driving.

[Retrieved June 14, 2019]

❖ Driving test, driving lessons free online

<http://www.driving-test-success.com/index.html>

This webpage covers the information on the different strategies and techniques on passing the driving assessment/test. It includes the top driving school directory for searching the best driving school.

[Updated June 14, 2019]

❖ How to Perform a Vehicle Maintenance Service

<https://www.instructables.com/id/How-to-Perform-a-Vehicle-Maintenance-Service/>

This website provides information and guide on perform basic vehicle maintenance.

[Retrieved June 14, 2019]

❖ How to Avoid Car Accidents

<https://www.wikihow.com/Avoid-Car-Accidents>

This website provides information and guide to follow on how to avoid accidents by following road safety rules and regulations.

[Retrieved June 14, 2019]

Driving (Bus) NC III

This qualification consists of competencies that a person must achieve to drive/operate buses/ straight trucks classified under LTO Restriction codes 3 up to 5 on highways; transport passengers and/or heavy goods, liquids and materials over specified long or short distances; comply with local traffic rules/ regulations and ordinances and perform minor repairs on the assigned vehicle.

Core Competencies:

- Perform Minor Maintenance and Servicing on Vehicles Classified under LTO Restriction Codes 3 up to 5
- Perform Pre-and Post-Operation Procedures Vehicles Classified under LTO Restriction Codes 3 up to 5
- Obey and Observe Traffic Rules and Regulations
- Observe Road Health and Safety Practices
- Implement and Coordinate Accident-Emergency Procedures
- Drive Passenger Bus
- Drive Straight Truck

❖ How to Drive a Bus

<https://www.wikihow.com/Drive-a-Bus>

This website provides information and guide on driving a bus.

[Retrieved June 14, 2019]

❖ How to Perform a Vehicle Maintenance Service

<https://www.instructables.com/id/How-to-Perform-a-Vehicle-Maintenance-Service/>

This website provides information and guide on perform basic vehicle maintenance.

[Retrieved June 14, 2019]

❖ The Beginner's Guide to Driving in the Philippines

<https://pop.inquirer.net/21721/beginner-guide-driving-philippines>

This website provides a guide for drivers who are starting their career in driving a bus. It includes tips on following traffic rules and regulations

[Retrieved June 14, 2019]

❖ How to check a car before driving

<https://www.wikihow.com/Check-a-Car-Before-Driving>

This website provides a guide for drivers in checking the vehicle or performing visual inspection prior to driving.

[Retrieved June 14, 2019]

❖ How to Avoid Car Accidents

<https://www.wikihow.com/Avoid-Car-Accidents>

This website provides information and guide to follow on how to avoid accidents by following road safety rules and regulations.

[Retrieved June 14, 2019]

❖ Health and Safety Hazards for City Bus Drivers

<https://www.roadsafetyobservatory.com/Evidence/Details/10500>

This website provides information on health and safety hazards that may be encountered in city bus driving.

[Retrieved June 14, 2019]

❖ Three Types of License in the Philippines

<https://www.carmudi.com.ph/journal/three-types-of-drivers-license-in-the-philippines/>

This website provides information licensing requirements before driving.

[Retrieved June 14, 2019]

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Forging NC II

This qualification consists of competencies that a person must achieve to be able to perform hand and hammer forging of low to medium carbon and alloy up to steel carbon and alloy steels using a variety of techniques, tools, formers and heating devices. It also include basic incidental heat/ quenching, tempering and annealing of ferrous and non-ferrous metals of various types and thicknesses.

Core Competencies:

- Perform Hand Forging
- Perform Hammer Forging
- Perform Basic Incidental Heat/Quenching, Tempering and Annealing

Forging NC III

This Qualification consists of competencies that a person must achieve to be able to perform hand forging to complex shapes of different metals. It also covers hammer forging to complex shapes using power hammer which applies to open die forging of complex shapes such as forged bosses, heavy rings and bushes. Both competencies also cover specialized methods of holding, positioning and lifting complex forgings. Competency on performing drop and upset forging on a range of metals is also included.

Core Competencies:

- Hand Forge Complex Shapes
- Hammer Forge Complex Shapes
- Perform Drop and Upset Forging

❖ What is Forging?

<https://www.thomasnet.com/articles/custom-manufacturing-fabricating/what-is-forging>

This website provides a definition of forging as a metal shaping technique using compressive, localized forces, has been staple metal fabrication technique since the start of metal age.

[Retrieved June 14, 2019]

❖ How to Use Fullers and Flatters in Hand Forging Process

<https://www.mechcadcam.com/how-to-use-fullers-and-flatters-in-hand-forging-process/>

This website provides a guide on performing forging using fullers and flatters that are used to form metal while in hot condition.

[Retrieved June 14, 2019]

❖ How a Forging Hammer Works-Drop Forging Processes: Design and Working Parts of a Forging Hammer

<https://www.brighthubengineering.com/machine-design/41797-drop-forging-how-a-forging-hammer-works/>

This website provides information on forging using hammers to form the metal into shape after the metal is heated to a controlled temperature.

[Retrieved June 14, 2019]

❖ How Quenching Hardens Steel in Metalworking

<https://www.thebalance.com/what-is-the-definition-of-quenching-in-metalworking-2340021>

This website provides information on quenching which is a rapid way of bringing a metal back to room temperature after heat treatment to prevent the cooling process from drastically changing the metal's microstructure.

[Retrieved June 14, 2019]

❖ Why do tools have "Drop Forged" stamped on them? What is Drop Forging?

<https://home.howstuffworks.com/question376.htm>

This website provides information on drop forging which creates harder metals for tool applications. It also identifies for other forging techniques

[Retrieved June 14, 2019]

❖ Drop Forging Process

<https://www.youtube.com/watch?v=Wf4NDkiZw6E>

This website provides a video that explains how drop forging is performed in a metal manufacturing industry. The vide shows a piece of metal is being hammered into shape while glowing hot.

[Retrieved June 14, 2019]

Foundry Melting/ Casting NC II

This qualification consists of competencies that a person must achieve to be able to melt different kinds of metals, cast it and clean. This will not be limited to ferrous metals and only one type of furnace.

Core Competencies:

- Operate Melting Furnaces (Non Electric)
- Operate Cupola Melting Furnaces
- Operate Electric Induction Melting

❖ Melting casting processes

http://thelibraryofmanufacturing.com/metalcasting_operation.html

This website of learning resource materials describes the overview, process in casting.

[Updated June 15, 2019]

❖ Metal casting made easy: a complete guide for the hobby metal caster

<http://docs7.chomikuj.pl/2579203158,PL,0,0,Metalworking---Metal-Casting-Made-Easy---3-Volumes.pdf>

This webpage features a learning resource material that discusses the selection of scrap aluminum and 'how to melt metals.

[Updated June 15, 2019]

❖ Metal Casting

<https://www.refcoat.com/pdf/book-on-metal-casting.pdf>

This webpage contains learning resource material that discusses the

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<p>Furnaces</p> <ul style="list-style-type: none"> • Fettle and Trim Metal Castings/Forgings • Perform Refractory Installation and Repair • Use and Maintain Measuring Instrument <p>Foundry Melting/ Casting NC III</p> <p>This qualification consists of competencies that a person must achieve to melt aluminum-silicon alloys for safety tested castings; melt Metals using coreless induction furnace and melt automotive gray iron castings in cupola.</p> <p>Core Competencies:</p> <ul style="list-style-type: none"> • Melt Aluminum-Silicon Alloys for Safety Tested Castings • Melt Metals Using Coreless Induction Furnace • Melt Automotive Gray Iron Castings in Cupola 	<p>processes involved in metal casting. [Updated June 15, 2019]</p> <p>❖ Patternmaking & Foundry http://www.frederickspassage.com/new_frederickspassage_011.htm This webpage of patternmaking index, the patternmaking & foundry yard two principles of arts comprising the metal industry. [Updated June 15, 2019]</p> <p>❖ A sand casting manual for small foundry http://books.google.com.ph/books/about/Metal_Casting.html?id=3O5kqZwW24gC&redir_esc=y This webpage contains two volumes and 352 pages of information on sand casting for small foundry with clickable photos and module with step by steps explanation of the process. [Updated June 15, 2019]</p> <p>❖ How to Build a Metal Melting Furnace for Casting https://www.wikihow.com/Build-a-Metal-Melting-Furnace-for-Casting This webpage provides information on building metal melting furnace for casting soft metals like aluminum, brass and other mid-temperature melting point metals that require 1000 degree temperatures. [Updated June 15, 2019]</p> <p>❖ Melting Aluminum Using Coreless Induction Furnace https://electroheatinduction.com/melting-aluminum-using-coreless-induction-furnace/ This webpage provides information on induction-type melting furnace designed for melting aluminum and lower-temperature melting metals.. [Updated June 15, 2019]</p>
<p>Foundry Molding NC II</p> <p>This qualification consists of competencies that a person must achieve to be able to produce all types of molds and cores using different kinds of binders and sand. He may produce the molds or cores manually or he may use molding machines and core making machines.</p> <p>Core Competencies:</p> <ul style="list-style-type: none"> • Prepare & Mix Sand for Metal Molding and Coremaking • Produce Molds by Hand (Jobbing) • Produce Cores by Hand (Jobbing) • Operate Sand Molding Machines • Operate Sand Core Making Machines • Pour Molten Metal to Molds • Use and Maintain Measuring Instrument <p>Foundry Molding NC III</p> <p>This qualification consists of competencies that a person must achieve to be able to prepare sand mixture and produce all types of molds manually to cast heavy casting (500 kgs.. or more net weight) individually or as a team. It also include competency</p>	<p>❖ The Metal Casting Process Explained https://www.generalkinematics.com/blog/metal-casting-process-explained/ This webpage provides an explanation of metal casting and its history. [Updated June 15, 2019]</p> <p>❖ Foundry http://en.wikipedia.org/wiki/Foundry This webpage contains an article on foundry factories that make casting of metals. It discusses the process, advantages and the steps such as melting, mold making, pouring, shakeout, degating, surface cleaning and finishing. [Updated June 15, 2019]</p> <p>❖ Layout of the foundation of foundry molding machines http://www.springerlink.com/institutional- This webpage contains an article for a learning resource material for foundry molding machines; it's a full text preview. [Updated June 15, 2019]</p> <p>❖ Metal injection molding [MIM] https://www.optimim.com/ This webpage describes the application of metal injection molding and the availability of materials needed. [Updated June 15, 2019]</p> <p>❖ Metal injection molding (MIM) design guide http://www.finemim.com/mim-design-guide This webpage provides information in the metal injection molding design and illustrations of its process. [Updated June 15, 2019]</p> <p>❖ Metal Casting: A sand casting manual for small foundry http://stephenchastain.com/book6.htm This webpage contains two volumes and 352 pages with clickable photos and modules with step by steps explanation of sand casting. [Updated June 15, 2019]</p>

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in pouring molten metal to heavy castings. The heavy casting are usually cast to make press die parts such as forming, blanking die and trimming dies, base plates for molding machine.

Core Competencies:

- Prepare Sand Mixture for Heavy Casting
- Perform Hand Molding To Produce Heavy Castings
- Pour Molten Metal to Heavy Castings

❖ Molding Production

<https://www.ferroloyinc.com/molding/>

This webpage provides information in producing mold using a pattern pressed in prepared sand to form a desired shape such that molten metal can be poured into the cavity. Also includes molding machine.

[Updated June 15, 2019]

❖ How to Cast Metal

<https://www.wikihow.com/Cast-Metal>

This webpage provides a guide in casting metal using basic materials..

[Updated June 15, 2019]

Foundry Patternmaking NC II

This qualification consists of competencies that a person must achieve to be able to manufacture all types of solid, split and turned patterns and pattern component parts, including but is not limited to general engineering patterns, master patterns with multiple contraction, skeleton, frame and strickle, wheels, pulleys, chain sheaves, impellers, etc. It also include inspection, measurement and interpretation of drawings and repair procedures; setting up and operation of various specialized metalworking machines and utilization of precision measuring instrument in the operation and maintenance of melting equipment.

Core Competencies:

- Develop and Manufacture Wood Patterns
- Develop and Manufacture Polymer Patterns
- Develop and Manufacture Assembled Plated Patterns
- Develop and Manufacture Production Patterns
- Performs General Woodworking Machine Operations
- Use and Maintain Measuring Instrument

Foundry Patternmaking NC III

This qualification consists of competencies that a person must achieve to be able to manufacture and develop corebox for shell core sand and develop and manufacture gear, conveyor screw and propeller patterns. It also include competency to develop gravity die casting mold used to

❖ Frederick passage

<http://www.frederickspassage.com/index.html>

This website is designed for the foundry enthusiast to establish at his backyard.

[Updated June 15, 2019]

❖ Patternmaking & Foundry

http://www.frederickspassage.com/new_frederickspassage_011.htm

This webpage provides information on patternmaking index, the patternmaking & foundry yard with two principles of arts comprising the metal industry.

[Updated June 15, 2019]

❖ Casting Patterns and Patternmaking

<https://www.reliance-foundry.com/blog/what-is-a-casting-pattern/>

This webpage provides information on casting patterns as models for sand casting metallic objects.

[Updated June 15, 2019]

❖ Development of Polymer Nano Composite Patterns developed using Fused Deposition Modeling for Rapid Investment Casting Process

https://www.researchgate.net/publication/321627790_Development_of_Polymer_Nano_Composite_Patterns_developed_using_Fused_Depositio_n_Modeling_for_Rapid_Investment_Casting_Process

This webpage provides information in metal casting using polymers. A fulltext PDF is available for download

[Retrieved June 15, 2019]

❖ Polymer Casting

<https://www.sciencedirect.com/topics/chemistry/polymer-casting>

This webpage provides information in metal casting using polymer followed by porogen leaching to fabricate porous scaffolds.

[Retrieved June 15, 2019]

❖ The Casting Process Basics: Molds, Patterns, Cores and Gating

https://thelibraryofmanufacturing.com/metalcasting_basics.html

This webpage provides information on the basics of metal casting.

[Retrieved June 15, 2019]

❖ How to Properly Care for and Handle Precision Measuring Instruments

<https://westportcorp.com/blogs/calibration-repair-services/how-to-properly-care-for-and-handle-precision-measuring-instruments>

This webpage provides information on caring for precision measuring instruments used in metal casting.

[Retrieved June 15, 2019]

❖ How to Properly Care for and Handle Precision Measuring Instruments

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produce component parts for automotive, track, and allied industries.

Core Competencies:

- Manufacture and Develop Corebox for Shell Core Sand
- Develop And Manufacture Gear, Conveyor Screw And Propeller Patterns
- Develop Gravity Die Casting Mold

<https://westportcorp.com/blogs/calibration-repair-services/how-to-properly-care-for-and-handle-precision-measuring-instruments>

This webpage provides information on caring for precision measuring instruments used in metal casting.

[Retrieved June 15, 2019]

❖ Cores and Shell Core Making

<http://www.aluminum-castings.com/shell-core-making.shtml>

This webpage provides information on preparing semi-permanent molds for metal casting

[Retrieved June 15, 2019]

❖ What is Die Casting? Development, Processes and Materials in Die Casting

<https://www.spotlightmetal.com/what-is-die-casting-development-processes-and-materials-in-die-casting-a-818604/>

This webpage provides information on die casting which is one of the most economical and quickest forming processes. The advantages of this production process are that hundreds of thousands of castings can be produced relatively quickly by using just one mold.

[Retrieved June 15, 2019]

Heat Treatment NC II

This qualification consists of competencies that a person must achieve to be able to select the appropriate process of heat treatment to achieve the desired result, recording and maintaining the heat treatment information in the manufacture of many other metals. It also covers heat treatment of ferrous and non-ferrous metals using a variety of equipment such as box type pit type, boggie type furnaces either gas, oil-fired or electrically heated. Heat treatment techniques include annealing, case hardening, precipitation strengthening, tempering and quenching.

Core Competencies:

- Select Heat Treatment Process
- Perform Heat Treatment Process

❖ Heat Treatment of Steels & Metals

<https://www.brighthubengineering.com/manufacturing-technology/30476-what-is-heat-treatment/>

This webpage contains information about heat treatment of steels and cooling of metals to change their physical and mechanical properties.

[Retrieved June 15, 2019]

❖ What Happens When Metals Undergo Heat Treatment?

<https://www.thebalance.com/what-happens-when-metals-undergo-heat-treatment-2340016>

This webpage contains information on heat treatment of metals to change their physical and mechanical properties and make them more durable.

[Retrieved June 15, 2019]

❖ What is Heat Treatment Processes?

<https://www.mech4study.com/2019/01/what-is-heat-treatment-processes.html>

This webpage provides information about heat treatment processes for increasing the strength of the material and improving its machining properties.

[Retrieved June 15, 2019]

❖ How to Determine the Best Heat Treatment for Your Parts

<https://www.machinedesign.com/materials/how-determine-best-heat-treatment-your-parts>

This webpage provides information and guide in selecting the best heat treatment process for specific materials.

[Retrieved June 15, 2019]

Laboratory Metrology/ Calibration Services NC II

This qualification consists of competencies that a person must achieve to perform laboratory and metrology/calibration services work. With the increasing demand for accuracy and reliability of dimensional measurement, laboratory and metrology/calibration services has become very important. The competence in this area requires the

❖ What is the Metrology Laboratory?

<https://www.nsai.ie/national-metrology/what-is-metrology>

This webpage introduces metrology laboratory that is responsible for establishing, maintaining and developing the national measurement standards for physical quantities and their dissemination..

[Retrieved June 15, 2019]

❖ Metrology & Calibration Services: Verifying Measurement: Ensuring Accuracy

<https://www.labtesting.com/metrology-calibration-services/>

This webpage contains information on metrology services that provides standardized measurement of materials.

[Retrieved June 15, 2019]

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understanding and knowledge of a wide spectrum of dimensional mensuration processes that includes scientific planning, execution, assessment and calibration.

Core Competencies:

- Perform Engineering Measurement
- Perform Precision Mechanical Measurement
- Calibrate Measuring Equipment

Laboratory Metrology/ Calibration Services NC III

This qualification consists of competencies that a person must achieve to perform laboratory and metrology/ calibration services work specifically on using comparison and basic measuring devices. It also include competency in measure components using coordinate measuring machines and use graphical techniques and perform simple statistical computations

Core Competencies:

- Use Comparison and Basic Measuring Devices
- Measure Components Using Coordinate Measuring Machines
- Use Graphical Techniques and Perform Simple Statistical Computations

❖ How to Read an Engineering Ruler

<https://sciencing.com/how-5887457-read-engineering-ruler.html>

This webpage contains information on reading the engineering ruler to get the proper measurement of plans that are drawn to scale .

[Retrieved June 15, 2019]

❖ What is Measurement? What are Mechanical Measurements?

<https://www.brighthubengineering.com/hvac/40130-what-is-measurement/>

This webpage provides information on measuring materials with precision mechanical accuracy.

[Retrieved June 15, 2019]

❖ Why Calibration of Your Measuring Instruments is Important

<https://www.surecontrols.com/why-calibration-of-your-measuring-instruments-is-important/>

This webpage contains information on the necessity of calibrating the measuring instruments. Calibration is a comparison between a known measurement (the standard) and the measurement using your instrument. Typically, the accuracy of the standard should be ten times the accuracy of the measuring device being tested. However, accuracy ratio of 3:1 is acceptable by most standards organizations.

[Retrieved June 15, 2019]

❖ Dimensional Measurement Blog is Important

<https://info.qpluslabs.com/blog/bid/284983/10-Types-of-Dimensional-Inspection-Hand-Tools-and-When-to-Use-Them>

This webpage contains information on measuring instruments for measuring anything including dimensional inspection.

[Retrieved June 15, 2019]

❖ Coordinate Measuring Machines (CMM) Information

https://www.globalspec.com/learnmore/manufacturing_process_equipment/inspection_tools_instruments/coordinate_measuring_machines_cm

This webpage contains information on coordinate measuring machines that are designed to move a measuring probe to determine coordinates of points on a workpiece surface.

[Retrieved June 15, 2019]

Metal Stamping NC II

This Qualification consists of competencies that a person must achieve to set up, conduct trial run and operate mechanical press; perform mechanical shearing operation which applies to a range of press operations including blanking, cutting-off, piercing/punching, trimming and bending; and perform mechanical press forming operation which applies to a range of press forming operations including piercing/ punching, trimming, and forming/drawing.

Core Competencies:

- Perform press machine setting
- Perform mechanical shearing operation
- Perform mechanical press forming operation

❖ What is Metal Stamping?

<https://www.esict.com/what-is-metal-stamping/>

This webpage contains information on metal stamping that is used in manufacturing process to convert the metal sheets into specific shapes.

[Retrieved June 15, 2019]

❖ Shearing Machines (sheet metal) Information

https://www.globalspec.com/learnmore/manufacturing_process_equipment/machine_tools/shears

This webpage contains information on fabricating metal parts by cutting to size. Shearing machines are multipurpose devices used in the cutting of alloys and other sheet metal.

[Retrieved June 15, 2019]

❖ Stamping 101: Anatomy of a Mechanical Press

<https://www.thefabricator.com/article/stamping/stamping-101-anatomy-of-a-mechanical-press>

This webpage contains information on mechanical press machine that forms components by pressing with hydraulic press machine.

[Retrieved June 15, 2019]

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Moldmaking NC II

This Qualification consists of competencies that a person must achieve to be able to machine parts using a variety of machining equipment and tools on plain carbon steel, heat resistant steel and other metals and alloy using different machining processes; perform precision assembly and testing complex engineering components and mechanical assemblies in a production, manufacturing environment. It also includes minor maintenance of equipment being used.

Core Competencies:

- Machine Parts
- Perform Precision Assembly

❖ Primer - Moldmaking

<https://makezine.com/projects/make-08/primer-moldmaking/>

This webpage contains information on moldmaking that involves a simple process intended to replicate materials by creating a mold model.
[Retrieved June 15, 2019]

❖ 6 Ways to Sidestep Undercuts in Molded Parts

<https://www.machinedesign.com/mechanical/6-ways-sidestep-undercuts-molded-parts>

This webpage contains information on preventing undercuts in molded part and make it easy to remove them. With straight-pull molds, undercuts include any protrusions, holes, cavities, or recessed areas in the part where alignment is not perpendicular to the mold's parting line.
[Retrieved June 15, 2019]

❖ Packaging, Assembly & Secondary Operations

<https://www.machinedesign.com/mechanical/6-ways-sidestep-undercuts-molded-parts>

This webpage contains information on packaging and assembling finished molded parts.
[Retrieved June 15, 2019]

Motorcycles/Small Engine Servicing NC II

This qualification consists of competencies that a person must achieve to install and service parts of motorcycle/small engine and to perform periodic maintenance. Servicing includes inspecting, diagnosing, cleaning and overhauling of mechanical and electrical parts, components, assemblies and sub-assemblies of the unit.

Core Competencies:

- Service motorcycle/small engine system
- Service Electrical System
- Service Chassis
- Overhaul Motorcycle/Small Engine

❖ 10 maintenance tasks to do yourself

<http://www.visordown.com/motorcycle-top-10s/10-maintenance-tasks-to-do-yourself/15834.html>

This webpage describes various methods in maintaining motorcycles.
[Updated June 15, 2019]

❖ Motorcycle Electrical Troubleshooting

<http://www.genebitsystems.com/david/MotorcycleElectrical/index.htm>

This webpage provides a guide in troubleshooting motorcycle electrical problems using simple tools and instruments.
[Retrieved June 15, 2019]

❖ Motorcycle Chassis

<https://auto.howstuffworks.com/motorcycle3.htm>

This webpage provides information about the motorcycle chassis.
[Retrieved June 15, 2019]

❖ How to overhaul a motorcycle engine

http://wiki.answers.com/Q/How_do_you_overhaul_motorcycle_engine

This webpage presents solutions and decisions related to motorcycle engine overhauling.
[Updated June 15, 2019]

Painting Machine Operation NC II

This qualification consists of competencies that a person must achieve to perform pre-treatment and cathodic electro-deposition process operations; perform gray primer (2 primer) application procedures; and perform top coat application procedures in accordance with manufacturer's specification.

Core Competencies:

- Perform Pre-treatment and Cathodic Electro-deposition Process Operation
- Perform Gray Primer (2nd Primer)

❖ Spray painting operations

<https://www.epa.nsw.gov.au/~media/EPA/Corporate%20Site/resources/air/mod3p3spraypaint07268.ashx>

This webpage describes painting as applying protective and decorative coatings to items other than fixed architectural surfaces is generally achieved by spray painting, especially for repetitive painting job.
[Retrieved June 15, 2019]

❖ An overview of Electro-Deposition painting process for Automotive

<https://www.indiastudychannel.com/resources/160330-An-overview-Electro-Deposition-painting-process-Automotive.aspx>

This webpage provides information on electro deposition: a process used to clean the vehicle body and deposit a rustproof layer on it prior to painting.
[Retrieved June 15, 2019]

❖ Factor Effecting Electro-Deposition Process

<http://inpressco.com/wp-content/uploads/2015/03/Paper18700-703.pdf>

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<p>Application Procedures</p> <ul style="list-style-type: none"> • Perform Top Coat Application Procedures 	<p>This webpage provides information on factors that affect the electro-deposition process applied in metallic car body. [Retrieved June 15, 2019]</p> <p>❖ Applying a Primer Coat Before Painting https://www.thebalancesmb.com/importance-of-primer-844651 This webpage provides information on applying primer on vehicle body prior to painting. [Retrieved June 15, 2019]</p> <p>❖ How to Do a Good Base Coat Clear Coat Paint Job https://www.wikihow.com/Do-a-Good-Base-Coat-Clear-Coat-Paint-Job This webpage provides information on applying base coat clear coat paint job on vehicle body. [Retrieved June 15, 2019]</p> <p>❖ How to Apply Clear Coat https://www.wikihow.com/Apply-Clear-Coat This webpage provides information on applying clear coat on vehicle body. [Retrieved June 15, 2019]</p>
<p>Plastic Machine Operation NC II</p> <p>This qualification consists of competencies that a person must achieve to prepare molds for composites production, prepare materials for formulae, assemble materials and equipment for production, operate injection molding equipment and blow molding equipment, It also include competency to monitor process operations and to finish products and components</p> <p>Core Competencies:</p> <ul style="list-style-type: none"> • Prepare Molds for Composites Production • Prepare Materials for Formulae • Assemble Materials and Equipment for Production • Operate Injection Molding Equipment • Operate Blow Molding Equipment • Monitor Process Operations • Finish Products and Components <p>Plastic Machine Operation NC III</p> <p>This qualification consists of competencies that a person must achieve to change equipment dies, prepare and start equipment for production and produce injection molded products. It also include competency to produce blow molded products. Likewise the person involved in this qualification is in-charge of overall equipment set-up and readiness-check for production operation.</p>	<p>❖ What is Plastic Injection Molding? https://www.wisegeek.com/what-is-plastic-injection-molding.htm This webpage provides information on plastic injection molding which is a popular and economical industrial process for manufacturing a wide range of plastic consumer products. These include knobs, washers, valves, pulleys, gears, power tools, bottle caps, toys, car panels, computer monitors, keyboards, furniture and so on.. [Retrieved June 15, 2019]</p> <p>❖ How to Use Composite SL Molds to Produce Injection Molded Plastic Parts https://www.compositesworld.com/articles/how-to-use-composite-sl-molds-to-produce-injection-molded-plastic-parts This webpage provides information on using composite SL molds to produce injection molded parts. [Retrieved June 15, 2019]</p> <p>❖ How To Make a Fiberglass Mold http://www.cstsales.com/fiberglass_mold_instr.html This webpage provides a guide in making molds for fiberglass fabrication. [Retrieved June 15, 2019]</p> <p>❖ An automated process monitoring system for injection molding http://www.jeccomposites.com/knowledge/international-composites-news/automated-process-monitoring-system-injection-molding This webpage provides a guide in monitoring the production of injection molded products. [Retrieved June 15, 2019]</p> <p>❖ Quick Mold Change Systems https://easchangesystems.com/application/quick-mold-change-systems/ This webpage provides information on improving the plastic injection molding productivity by using quick mold change systems. [Retrieved June 15, 2019]</p> <p>❖ How to Run a Plastic Injection Molding Machine https://careertrend.com/how-7816018-run-plastic-injection-molding-machine.html This webpage provides information on starting the plastic molding machine operation for fabrication and production. [Retrieved June 15, 2019]</p> <p>❖ What Products Can Be Made from Injection Molding? https://www.ien.com/product-development/article/21014543/what-</p>

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Core Competencies:

- Change Equipment Dies
- Prepare and Start Equipment for Production
- Produce Injection Molded Products
- Produce Blow Molded Products

[products-can-be-made-from-injection-molding](#)

This webpage provides information on the products that can be manufactured using plastic machine injection, these are bottles, electronic product housing, toys, etc.

[Retrieved June 15, 2019]

Process inspection NC II

This qualification consists of competencies that a person must achieve to perform standard quality inspection of processes in different manufacturing processes in the assembly, foundry, metal and plastic sectors. Most often, inspection involves working autonomously and taking responsibility for overseeing inspection process and environment. Inspection may involve 'first piece inspection', fixed interval, sample etc. Depending on the inspection process, other technical units may need to be accessed.

Core Competencies:

- Select and Control Inspection Processes and Procedures
- Perform Inspection
- Perform Basic Statistical Quality Control
- Use Improvement Processes in Team Activities

Process inspection NC III

This qualification consists of competencies that a person must achieve to apply quality systems, conduct product and or process capability studies and maintain and supervise the application of quality procedures. These units cover improving the quality system, and collecting and summarizing data to support the quality improvement process. The data would be used to produce statistical information such as averages and ranges, and charts such as tally, run or control charts

Core Competencies:

- Apply quality systems
- Conduct product and/or process capability studies
- Maintain/supervise the application of quality procedures

❖ Complete inspection process

<http://it.toolbox.com/blogs/enterprise-solutions/complete-inspection-process-13739>

This webpage contains a document that describes the step by step process of inspection for more detailing of the system flow.

[Updated June 15, 2019]

❖ What is a Product Inspection?

http://findarticles.com/p/articles/mi_qa3618/is_200404/ai_n9397482/

This webpage provides information in process inspection being a key element of quality control, Product Inspections allow you to verify product quality on site at different stages of the production process and prior to its dispatch.

Retrieved June 15, 2019]

❖ Setting up Inspection Process in Business ByDesign Business Documents

<https://blogs.sap.com/2018/07/02/setting-up-inspection-process-in-business-bydesign-business-documents/>

This webpage contains topics in inspection in general which plays a vital role in an organization in order to detect defects, improve productivity , reduce re-work and waste .

[Retrieved June 15, 2019]

❖ Product Tracking Manufacturing Execution System - Product and Job Tracking Software

http://www.manufacturing-execution-software.com/?taguni=ppc_microsoft&msclkid=1192accb90b1b74af2df1ca842311c9

This webpage provides information on tracking production control using a product tracking software to monitor production.

[Retrieved June 15, 2019]

❖ Five Steps to Cutting Inspection Costs

<https://www.qualitymag.com/articles/84037-five-steps-to-cutting-inspection-costs>

This webpage provides information on minimizing the cost incurred in process inspection using a step-by-step path to more productivity and less scrap with an automated quality process.

[Retrieved June 15, 2019]

❖ Five Steps to Cutting Inspection Costs

<https://www.qualitymag.com/articles/84037-five-steps-to-cutting-inspection-costs>

This webpage provides information on minimizing the cost incurred in process inspection using a step-by-step path to more productivity and less scrap with an automated quality process.

[Retrieved June 15, 2019]

❖ How to Create and Implement Your Quality Management System

<https://www.bizmanualz.com/improve-quality/how-to-create-and-implement-your-quality-management-system.html>

This webpage provides information on implementing quality management system in your area.

[Retrieved June 15, 2019]

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Tinsmithing (Automotive Manufacturing) NC II

This qualification consists of competencies that a person must achieve to perform tinsmith operation in an automotive manufacturing work area. Tinsmithing involves cutting, forming, straightening, and repairing sheet metal surfaces of vehicles. It also includes sanding and grinding the shaped or repaired metal surface and joints of welded or brazed to comply with the required finish. It also includes competencies on welding & brazing in accordance with manufacturer's specification.

Core Competencies:

- Weld and Braze Automotive Body Shell
- Perform Tinsmith Operation

❖ Tinsmith

<https://en.wikipedia.org/wiki/Tinsmith>

This webpage features an annual report in promoting sustainability in road transport, provides a definition of tinsmith as sometimes known as a tinner, tinker, tinman, or tinplate worker is a person who makes and repairs things made of tin or other light metals. By extension it can also refer to the person who deals in tinware, or tin plate.[1] Tinsmith was a common occupation in pre-industrial times..

[Retrieved June 15, 2019]

❖ Car design software for the automotive industry

<https://www.autodesk.com/solutions/product-design/automotive>

This webpage provides information on design software that can be used to design automotive body that can aid in the manufacturing process.

[Retrieved June 15, 2019]

❖ Automotive Bodywork: How to Weld Body Meta

<https://www.musclecardiy.com/bodywork/automotive-bodywork-how-to-weld-body-metal/>

This webpage focuses on welding sheet metal sections for assembling or repairing automotive body

❖ MIG brazing for car body panels

<https://www.mig-welding.co.uk/forum/threads/mig-brazing-for-car-body-panels.41815/>

This webpage provides information and guide in brazing car body panels using MIG that produces a tougher and cleaner weld.

[Retrieved June 15, 2019]