# Model Curriculum

## Mechatronics-In-Charge

**SECTOR:** Mining
**SUB-SECTOR:** Open Cast and Underground Mines
**OCCUPATION:** Instrumentation Maintenance
**REF ID:** MIN/Q0438, V1.0
**NSQF LEVEL:** 4

Skill India
कौशल भारत - कुशल भारत

SCMS

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# Certificate

## COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

**SKILL COUNCIL FOR MINING SECTOR**

for

## MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: '**Mechatronics In-charge**' QP No. '**MIN/ Q0438 NSQF Level 4**'

Date of Issuance: **December 15th, 2018**

Valid up to*: **December 31st, 2021**

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

Authorised Signatory
(Skill Council for Mining Sector)

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# Mechatronics In-charge

## CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Mechatronics In-Charge", in the "Mining & Allied" Sector/Industry and aims at building the following key competencies amongst the learner.

| | | | |
|---|---|---|---|
| **Program Name** | Mechatronics In-Charge | | |
| **Qualification Pack Name & Reference ID.** | MIN/Q0438, V1.0 | | |
| **Version No.** | 1.0 | **Version update date** | 15.12.2018 |
| **Pre-requisites to Training** | Class XII | | |
| **Training Outcomes** | **After completing this program, participants will be able to:**<br>• Identify the mechatronics equipment<br>• Conduct mechatronics operations<br>• Operate the mechatronics equipment.<br>• Repair and maintain mechatronics equipment.<br>• Integrate electrical and mechanical systems to enhance manufacturing systems.<br>• Design and prototype mechatronic devices with motors, solenoids, gears, sensors and springs.<br>• Monitor or calibrate automated systems, industrial control systems, or system components to maximize efficiency of production.<br>• Create graphical representations of mechanical equipment<br>• Create documentation on time as per organizational requirements.<br>• Comply with occupational health and safety regulations adopted by the employer. | | |

This course encompasses 3 out of 3 National Occupational Standards (NOS) of "Mechatronics In-charge" Qualification Pack issued by "Skill Council for Mining Sector".

| Sr. No. | Module | Key Learning Outcomes | Equipment Required |
|---|---|---|---|
| 1 | **Introduction**<br><br>**Theory Duration**<br>(hh:mm)<br>10:00<br>**Practical Duration**<br>(hh:mm)<br>26:00<br><br>**Corresponding NOS Code**<br>**Bridge Module** | • Explain the role of Mechatronics In-charge in mining industry.<br>• Describe benching in quarries.<br>• Identify dressing of overhangs, undercuts, fencing.<br>• Define importance of first aid and hygiene.<br>• Illustrate the standing orders in force at the mine.<br>• Characterize the shot-firing and safety regulations.<br>• Demonstrate the procedure of taking shelter during blasting.<br>• Apply the basic skills of communication. | Projector System, Posters, Graph etc. |
| 2 | **Conduct mechatronics operations**<br><br>**Theory Duration**<br>(hh:mm)<br>40:00<br><br>**Practical Duration**<br>(hh:mm)<br>190:00<br><br>**Corresponding NOS Code**<br>**MIN/N0505** | • Choose the appropriate mechatronics equipment required for various work<br>• Explain the software coding, programming logic, electrical connections logic, hardware requirements, robotic parameters and its operation sequence etc. as per the applicability of the system<br>• Interpret mechanical & electronic technical drawing<br>• Operate the automation panel/control mechanism for the equipment and apply advanced electronic control systems, which are usually computer driven<br>• Read the mechatronics equipment readings continuously while in operation and gather statistical data<br>• Follow the quality control procedure and ensure compliance of the operations to the same<br>• Determine the fabrication requirements of the mechanical parts and conduct the same<br>• Correlate and detect the proper system functioning and resolve the issues observed. | P.T. single phase, Auto transport 0-300 V, 8 Amp Audio signal generator DC power supply 0-30 V & 2 Amp, Demonstration model for thyristorised DC motor drive (1 HP) set, Demonstration model for thyristorised AC motor drive (1 HP), Linear I.C., Digital multi-meter, Transducer, Photo diode, Photo transistor kit, AC timer kit, DC timer kit, Decimal counter kit, DC motor Hand tachometer, Ammeter, Insulated handle screw driver combination side cutting plier |
| 3 | **Repair and maintain the equipment**<br><br>**Theory Duration**<br>(hh:mm)<br>22:00<br><br>**Practical Duration**<br>(hh:mm)<br>140:00 | • Prepare a performance management schedule for the mechatronics system<br>• Inspect the systems and identify the replacements required as per the schedule.<br>• Check internal conditions of wiring, motherboards, software/ hardware malfunctioning, circuit failures etc. to verify working status to expected conditions.<br>• Discuss with the user/ operator to learn about problems /unusual phenomenon noticed in the systems | Vernier caliper, Outside micrometers, Feeler gauge and Radius gauge, Indicator with magnetic base, Adjustable micrometer, Diagonal cutter, Tweezers Knife, Neon tester, Soldering iron 25 W & 65 W, Multimeter, Ammeter, Ammeter, Voltmeter, Discrete component |

| | | | |
|---|---|---|---|
| | **Corresponding NOS Code**<br>**MIN/N0506** | • Execute sequence of activities for changing, correcting the situation after opening, verifying contact/ insulation conditions, failure of internal wires etc.<br>• Check all the systems are integrated through a computer interface<br>• Reconstruct the system by replacing the defective part/section with appropriate sensors.<br>• Analyze that the software used for system interfacing are upgraded as per the process requirement<br>• Maintain a record of all system (2D/3D- as built drawings, equipment operation related diagrams, program codes etc.) in a legible and safe condition. | trainer P.F. Meter, Frequency meter, Megger 500 V. AC squirrel cage induction motor 30 with D.O.L. starter, Star delta 30 starter, C.T. single phase, Thermocouple kit, L.D.R.S. kit, Thermistor kit, L.V.D.T. kit |
| 4 | **Health and Safety**<br><br>**Theory Duration**<br>(hh:mm)<br>20:00<br><br>**Practical Duration**<br>(hh:mm)<br>62:00<br><br>**Corresponding NOS Code**<br>**MIN/N0901** | • Comply with occupational health and safety regulations adopted by the employer.<br>• Follow mining operations procedures with respect to materials handling and accidents<br>• Follow the correct safety steps in case of fire, accident, major failure<br>• Perform storage and transport of hazardous materials compliant with safety guidelines prescribed by DGMS.<br>• Comply with safety regulations and procedures in case of fire hazard.<br>• Operate various grades of fire extinguishers.<br>• Demonstrate careful practices while working near blasting zone.<br>• Demonstrate careful practices while operating on heavy machinery.<br>• Identify characteristics of post-blast fumes and take necessary precautions. | Fire Extinguisher Cylinders, First Aid Box, Fire Fighting Charts, First Aid Charts |
| | **Total Duration**<br><br>**Theory Duration**<br>92:00<br><br>**Practical Duration**<br>418:00 | **Unique Equipment Required:**<br><br>Helmet, Dust Mask, Goggles, Ear Plug, Gloves, Reflective Jacket, Safety Belt Gum Boots/ Safety shoes, LCD Projector, | |

Grand Total Course Duration: 510 Hours, 0 Minutes
(This syllabus/ curriculum has been approved by SSC: Skill Council for Mining Sector)

## Trainer Prerequisites for Job role: "Mechatronics In-charge" mapped to Qualification Pack: "MIN/Q0438", V1.0

| Sr. No. | Area | Details |
|---|---|---|
| 1 | **Description** | To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack "MIN/Q0438", V1.0. |
| 2 | **Personal Attributes** | Aptitude for conducting training, and pre/ post work to ensure competent, employable candidates at the end of the training. Strong communication skills, interpersonal skills, ability to work as part of a team; a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in the mentioned field. |
| 3 | **Minimum Educational Qualifications** | Diploma |
| 4a | **Domain Certification** | Certified for Job Role: "Mechatronic In-Charge" mapped to QP: "MIN/Q0438, V1.0". Minimum accepted score as per SSC guideline is 80%. |
| 4b | **Platform Certification** | Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "MEP/Q2601". Minimum accepted score as per SSC guideline is 80%. |
| 5 | **Experience** | For Diploma in Mechanical / Electronics/ Instrumentation/ Automation - 6 Years.<br>For B.Tech. in Mechanical / Electronics/ Instrumentation - 5 Years.<br>For M. Tech. in Mechanical / Electronics/ Instrumentation - 4 Years. |

## Annexure: Assessment Criteria

| Assessment Criteria for Banksman | |
|---|---|
| Job Role | Mechatronics In-Charge |
| Qualification Pack | MIN/Q0438 |
| Sector Skill Council | Skill Council for Mining Sector |

### 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. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).
4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criterion.
5. To pass the Qualification Pack, every trainee should score a minimum of 70% in every NOS.
6. In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack.

| | | | | Marks Allocation | |
|---|---|---|---|---|---|
| | | Total Mark (100) | Out Of | Theory | Skills Practical |
| 1. MIN/ N 0505 (Conduct mechatronics operations) | PC1. understand the work output requirements and finalize various specifications of the mechatronics machinery | 35 | 4 | 2.5 | 1.5 |
| | PC2. understand the software coding , programming logic , electrical connections logic, hardware requirements, robotic parameters and its operation sequence etc. as per the applicability of the system | | 4 | 2.5 | 1.5 |
| | PC3. translate mechanical & electronic technical drawing | | 4 | 2.5 | 1.5 |
| | PC4. operate the automation panel/control mechanism for the equipment and apply advanced electronic control systems, which are usually computer- driven | | 5 | 2.5 | 2.5 |
| | PC5. read the mechatronics equipment readings continuously while in operation and gather statistical data | | 5 | 2.5 | 2.5 |
| | PC6. understand the quality control procedure and ensure compliance of the operations to the same | | 5 | 2.5 | 2.5 |

| | | | | | |
|---|---|---|---|---|---|
| | PC7. understand the fabrication requirements of the mechanical parts and conduct the same | | 4 | 2.5 | 1.5 |
| | PC8. continuously monitor the system functioning and resolve the issues observed | | 4 | 2.5 | 1.5 |
| | | **Total** | **35** | **20** | **15** |
| 2. MIN/ N 0506 (Repair and maintain the equipment) | PC1. prepare a performance management schedule for the mechatronics system/s | 35 | 4 | 2.5 | 1.5 |
| | PC2. basis the schedule , inspect the systems and identify the replacements required | | 4 | 2.5 | 1.5 |
| | PC3. check / confirm internal conditions of wiring , motherboards, software/hardware malfunctioning, circuit failures etc. to verify working status to expected conditions. | | 4 | 2 | 2 |
| | PC4. discuss with the user/ operator to learn about problems/unusual phenomenon noticed in the systems | | 4 | 2.5 | 1.5 |
| | PC5. execute sequence of activities for changing , correcting the situation after opening, verifying contact/ insulation conditions, failure of internal wires etc | | 4 | 2 | 2 |
| | PC6. ensure that all the systems are integrated through a computer interface | | 4 | 2.5 | 1.5 |
| | PC7. ensure the replacements of identified systems | | 3 | 2 | 1 |
| | PC8. ensure that the software used for system interfacing are upgraded as per the process requirement | | 4 | 2 | 2 |
| | PC9. maintain a record of all the vendor and system 2D/3D- as built drawings , equipment operation related diagrams , program codes etc. in a legible and safe condition | | 4 | 2 | 2 |
| | | **Total** | **35** | **20** | **15** |
| 3. MIN/ N0901 (Health and Safety) | PC1. Comply with occupational health and safety regulations adopted by the employer. | 30 | 3 | 2 | 1 |
| | PC2. Follow mining operations procedures with respect to materials handling and accidents. | | 3 | 2 | 1 |

| | | | | | |
|---|---|---|---|---|---|
| | PC3. Follow the correct safety steps in case of fire, accident, and major failure. | | 3 | 2 | 1 |
| | PC4. Work responsibly and carefully so as not to put the health and safety of self or others at risk. | | 3 | 2 | 1 |
| | PC5. Perform storage and transport of hazardous materials compliant with safety guidelines prescribed by DGMS. | | 3 | 2 | 1 |
| | PC6. Comply with safety regulations and procedures in case of fire hazard. | | 3 | 2 | 1 |
| | PC7. Operate various grades of fire extinguishers. | | 3 | 2 | 1 |
| | PC8. Work responsibly and as safe and careful as possible so as not to put the health and safety of self or others at risk, including members of the public. | | 3 | 2 | 1 |
| | PC9. Demonstrate careful practices in handling explosives and heavy machinery. | | 3 | 2 | 1 |
| | PC10. Identify characteristics of post-blast fumes and take necessary precautions. | **Total** | 3 | 2 | 1 |
| | | | **30** | **20** | **10** |