Electronic Hardware Design Engineer

QP Code: ELE/Q6102
Version: 2.0
NSQF Level: 5

Electronic Sector Skill Council of India || 602, 6th Floor, Ansal Chambers 2, Bikaji Cama Place
New Delhi - 110066
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ELE/Q6102: Electronic Hardware Design Engineer

Brief Job Description

The individual at work is responsible for undertaking research on new products, work with R&D on developing the schematics, converting them to PCB layout using CAD and other software and generating the Gerber file to pass on to PCB manufacturers.

Personal Attributes

The job requires the individual to attention to detail, good eyesight, and physically fit with ability to work for long hours on computer.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. ELE/N6102: Develop design for manufacture
2. ELE/N9905: Work effectively at the workplace
3. ELE/N1002: Apply health and safety practices at the workplace

Qualification Pack (QP) Parameters

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<td>Sub-Sector</td>
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| **Minimum Educational Qualification & Experience** | Diploma (Electrical or Electronics Engineering) with 2 Years of Relevant experience)  
OR  
B.E./B.Tech (Degree in Electrical or Electronics Engineering)  
OR  
Certificate (NSQF Level-4 in Design Engineer with 2 years of relevant Experience) |
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**Remarks:**

NA
ELE/N6102: Develop design for manufacture

Description

This OS unit is about undertaking research on new products, design and create layout, verify prototype, and approve layout for PCB manufacture

Scope

The scope covers the following:

- Understand new product specifications
- Design and create layouts
- Test prototype and modify design
- Verify and approve the design
- Achieve productivity and quality standards

Elements and Performance Criteria

Understand new product specifications

To be competent, the user/individual on the job must be able to:

PC1. interact with customer and understand the requirement
PC2. interact with R&D team in order to confirm understanding on the product’s specifications and output
PC3. modify the existing products and designs as per market requirement
PC4. initiate and coordinate the overall design and development process
PC5. maintain and comply with developments in technologies as well as regulations

Design and create layouts

To be competent, the user/individual on the job must be able to:

PC6. outline layout rules and details to develop design process and analysis
PC7. create schematic symbols and layer stack up
PC8. develop and finalize schematics along with R&D team
PC9. convert the schematic to PCB layout including component symbol, footprint and manufacturing data packages
PC10. build circuits according to engineering instructions, technical manuals, knowledge of electronic systems and components
PC11. create design blueprints using computer software
PC12. provide a detailed layout of complex PCB designs
PC13. generate, maintain and manage parts library, i.e., component building and selection
PC14. create Gerber artwork file
PC15. generate fabrication packages including fabrication drawings, assembly drawings, peer reviews, DFM requests and preliminary RFQs
PC16. create netlist and routing rules for manufacturing process
PC17. perform high speed bus routing, differential pairs and impedance control routing to meet signal integrity

PC18. respond to customer’s requests and queries as they occur

Test prototype and modify design

To be competent, the user/individual on the job must be able to:

PC19. create prototype, hand or machine assembled

PC20. verify the design outputs

PC21. examine, debug and validate hardware design

PC22. analyze and interpret test data against customer’s specifications

PC23. assist debugging, trouble shooting and correction of latent defects

PC24. recommend changes in specifications to simplify assembly and maintenance

PC25. edit, develop and implement solutions as per customer specifications

Verify and approve the design

To be competent, the user/individual on the job must be able to:

PC26. check drawing plots according to customer’s specifications and standards of conformance

PC27. review layouts and designs according to engineering specifications using and application software

PC28. approve final PCB design for production

PC29. create final Gerber file

PC30. collaborate with PCB manufacturer and assembly line to finalize PCB manufacturing and assembly processes

PC31. create backup copies and file them securely

Achieve productivity and quality standards

To be competent, the user/individual on the job must be able to:

PC32. ensure customer’s specifications are met

PC33. ensure 100% product safety approvals are met

PC34. achieve deadlines, schedule, and commitments for assigned projects

PC35. collaborate with quality assurance team to ensure quality standards

PC36. conform to statutory requirements on environment and criticality knowledge

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. company’s policies on: incentives, delivery and quality standards, personnel management and IPR

KU2. work flow involved in assembly process of the company

KU3. importance of the individuals role in the workflow

KU4. reporting structure

KU5. organizational capabilities with respect to input materials and processes

KU6. safety and quality standards followed in the organization

KU7. electronics and electrical engineering
KU8. components values and polarities
KU9. CADSTAR, Cadence Or CAD & Allegro, AutoCAD LT, Eagle, Protel, Altium, AutoCAD, Hyperlynx and layout techniques for good signal integrity
KU10. Mentor graphics, Valor NPI, DXDesigner and PADs with DXDatabook, CAD packages,CAM350 and other software for schematic capture
KU11. other PCB design and layout tools
KU12. PCB layout design placement, routing, Gerber verification, building library (footprints, schematic symbols), ERP systems, BOM structures, design for test (DFT) and design for manufacturability (DFM), foot-printing, Net listing, constraint setup
KU13. PCB manufacturing process, fabrication drawings and assembly process
KU14. modular design techniques, designing for double side and multilayer
KU15. design constraints and complete design cycle from understanding customers specifications to production
KU16. quality standards associated with PCB design
KU17. installing and configuring Operating Systems (Linux, Windows), Storage subsystems
KU18. servers, storage hardware, RAID technology, hardware design, testing, verification and validation
KU19. debugging, schematics, PCB design, assembly process, wire diagram and interpretation of technical drawings
KU20. procedure to make changes to the design
KU21. circuit diagrams and wiring
KU22. research sources for obtaining technical information
KU23. statutory regulations, standards and codes of practice and their implications
KU24. importance of keeping designs developed confidential and consequences of breaching IPR clause
KU25. IPC standards for printed circuit board

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. to read schematics, blueprints, product and customer specifications
GS2. to document designs
GS3. to read job sheet, process, production schedules, machine operation manuals
GS4. to use computer work with designing software
GS5. to effectively communicate with external PCB manufacturers
GS6. to communicate with in-house assembly team to deliver high quality boards and manufacturability in a timely manner
GS7. to communicate with customer in order to resolve any discrepancies in the design for manufacture aspect
GS8. to coordinate with various departments such as marketing, sales, production, research and development
GS9. to work in teams to devise creative solutions
GS10. to plan and organize own tasks
GS11. to multi-task, handle additional responsibility, and adapt quickly to changing priorities
GS12. to suggest on corrective actions to reduce repetitive errors
GS13. to improve work process with less rework within PCB layout function release process for high-volume product manufacturing
GS14. to demonstrated leadership in CAD system, library management and design release process for high-volume product manufacturing
GS15. to be prompt to resolve problems effectively
GS16. to use test and measurement equipment like Oscilloscopes, PCIe/SAS protocol analysers, etc.
GS17. to use various design tools, equipment, and computer applications and software
GS18. to ensure designs are feasible with knowledge on physics, engineering and mathematics
GS19. to have a creative and innovative approach for generating new ideas
GS20. to spot process disruptions and delays
GS21. to troubleshoot and identify problems
GS22. to propose possible solutions
## Assessment Criteria

<table>
<thead>
<tr>
<th>Assessment Criteria for Outcomes</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
<th>Project Marks</th>
<th>Viva Marks</th>
</tr>
</thead>
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<tr>
<td><em>Understand new product specifications</em></td>
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<td>PC1. interact with customer and understand the requirement</td>
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<td>PC2. interact with R&amp;D team in order to confirm understanding on the product’s specifications and output</td>
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<td>PC3. modify the existing products and designs as per market requirement</td>
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<td>PC4. initiate and coordinate the overall design and development process</td>
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<td>PC5. maintain and comply with developments in technologies as well as regulations</td>
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<td><em>Design and create layouts</em></td>
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<td>PC7. create schematic symbols and layer stack up</td>
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<td>PC8. develop and finalize schematics along with R&amp;D team</td>
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<td>PC14. create Gerber artwork file</td>
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<td>PC15. generate fabrication packages including fabrication drawings, assembly drawings, peer reviews, DFM requests and preliminary RFQs</td>
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<td>PC17. perform high speed bus routing, differential pairs and impedance control routing to meet signal integrity</td>
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<td>PC18. respond to customer’s requests and queries as they occur</td>
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<td>Test prototype and modify design</td>
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<td>PC22. analyze and interpret test data against customer’s specifications</td>
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<td>PC23. assist debugging, trouble shooting and correction of latent defects</td>
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<td>PC24. recommend changes in specifications to simplify assembly and maintenance</td>
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<td>Verify and approve the design</td>
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<td>PC27. review layouts and designs according to engineering specifications using and application software</td>
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<td>PC29. create final Gerber file</td>
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National Occupational Standards (NOS) Parameters

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ELE/N9905: Work effectively at the workplace

Description

This unit is about the communicating and managing work effectively at the workplace as well as taking measures to enhance own competence and working in a disciplined and ethical manner.

Scope

The scope covers the following:

- Communicate effectively at the workplace
- Work effectively
- Maintain and enhance professional competence
- Work in a disciplined and ethical manner
- Uphold social diversity at the workplace

Elements and Performance Criteria

Communicate effectively at the workplace

To be competent, the user/individual on the job must be able to:

PC1. exchange information and instruction with colleagues, and seek clarifications and feedback as necessary
PC2. assist colleagues where required
PC3. follow business communication etiquette in all interactions and communicative formats (online, digital, and in-person)
PC4. document and share all relevant information with stakeholders in agreed formats and as per agreed timelines

Work effectively

To be competent, the user/individual on the job must be able to:

PC5. identify and obtain clarity regarding organisational, team and own goals and targets
PC6. prioritise and plan work in order to achieve goals and targets
PC7. monitor own and team performance as per agreed plan
PC8. complete duties accurately, systematically and within required timeframes
PC9. express emotions appropriately at the workplace and manage own response to heightened emotions
PC10. maintain orderliness and cleanliness in the work area

Maintain and enhance professional competence

To be competent, the user/individual on the job must be able to:

PC11. identify own strengths and weaknesses in relation to goals and targets
PC12. adapt self, service, or product to meet success criteria
PC13. seek and select opportunities for continuous professional development
PC14. formulate a professional development plan to enhance capabilities
PC15. build or contribute to the organizational knowledge base of cases, clients, issues, solutions, and innovations

PC16. examine developments and trends in field of work and their potential impact on work

PC17. take feedback from peers, supervisors and clients to improve own performance and practices

*Work in a disciplined and ethical manner*

To be competent, the user/individual on the job must be able to:

PC18. perform tasks as per workplace standards, organisational policies and legislative requirements

PC19. display appropriate professional appearance at the workplace and adhere to the organisational dress code

PC20. demonstrate responsible and disciplined behaviour at the workplace such as punctuality; completing tasks as per given time and standards; demonstrating professional behaviour at all times, adopting environment-friendly practices, etc.

PC21. identify the cause of conflict and options for resolution with peers or escalate grievances and problems to appropriate authority as per procedure for conflict resolution

PC22. protect the rights of the client and organisation when delivering services

PC23. ensure services are delivered equally to all clients regardless of personal and cultural beliefs

PC24. operate within an agreed ethical code of practice and report unethical conduct to the appropriate authorities

PC25. follow organisational guidelines and legal requirements on disclosure and confidentiality

*Uphold social diversity at the workplace*

To be competent, the user/individual on the job must be able to:

PC26. recognize and evaluate biased practices against underrepresented groups like women and persons with disabilities, in workplace systems and processes

PC27. identify and report discrimination and harassment based on gender, disability, or cultural difference at the workplace

PC28. use inclusive or neutral language and gestures in all interactions

PC29. respect the personal and professional space of others

PC30. access grievance redressal mechanisms as per legislations

*Knowledge and Understanding (KU)*

The individual on the job needs to know and understand:

KU1. organisation’s policies on dress code, workplace timings, workplace behaviour, performance management, incentives, delivery standards, information security, etc.

KU2. organizational hierarchy and escalation matrix

KU3. importance of the individual’s role in the workflow

KU4. organisational norms on health, safety and sustainability

KU5. work area inspection procedures and practices

KU6. professional etiquette and grooming
KU7. communication etiquette across communicative mediums (online, digital, and in-person) including strategies/methods for sharing information, documentation, and providing and receiving feedback

KU8. importance of self-evaluations and developing a continuous learning and professional development plan

KU9. developments and trends impacting professional practice

KU10. importance of taking and using feedback from colleagues and clients to identify and introduce improvements in work performance

KU11. professional ethics and workplace norms on reporting and/or penalizing unethical behaviour and practices.

KU12. guidelines and legal requirements on disclosure, confidentiality, and conflicts of interest

KU13. strategies for collaboration with colleagues and clients.

KU14. professional responses and strategies against inappropriate language or behaviour toward self and others

KU15. Implicit bias (based on gender, disability, class, caste, colour, race, culture, religion, etc.) and its consequences in the workplace

KU16. organizational guidelines, prevalent legislations and accessibility norms and processes to support PwDs at the workplace

KU17. strategies for time, effort and resource allocation towards the goals.

KU18. basic concepts of work productivity including waste reduction, efficient material usage and optimization of time

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. complete documentation and forms such as work orders, invoices maintenance records, activity logs, attendance sheets as per organizational format in English and/or local language

GS2. write basic accident or incident report accurately in an appropriate format

GS3. read warnings, instructions and other text material on product labels, components, etc. and relevant signages, warnings, labels or descriptions on equipment, etc. while carrying out work activities

GS4. convey and share technical information clearly using appropriate language

GS5. clarify task-related information

GS6. liaise with authorities and supervisors as per organizational protocol

GS7. listen, speak, and write in an inclusive, respectful manner in line with organizational protocol

GS8. seek clarification from immediate supervisor or responsible authority or exercise most appropriate solutions to safety breaches at work

GS9. report to the supervisor and when to deal with a colleague depending on the type of concern

GS10. deliver product to next work process on time

GS11. improve work process and report potential areas of delays and disruptions

GS12. communicate problems appropriately to others

GS13. identify symptoms of the fault to the cause of the problem and resolve, otherwise seek assistance and support from other sources to solve the problem
GS14. anticipate and avoid hazards that may occur during repairs because of tools, materials used or repair processes
GS15. complete tasks efficiently and accurately within stipulated time
GS16. appreciate and respect social diversity in all professional settings
GS17. develop awareness and accountability for perspectives on gender, disabilities, and socio-cultural issues leading to discrimination, bias, or harassment at the workplace
GS18. maintain positive and effective relationships with colleagues and customers
## Assessment Criteria

<table>
<thead>
<tr>
<th>Assessment Criteria for Outcomes</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
<th>Project Marks</th>
<th>Viva Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communicate effectively at the workplace</strong></td>
<td>5</td>
<td>13</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PC1. exchange information and instruction with colleagues, and seek clarifications and feedback</td>
<td>1</td>
<td>3</td>
<td>-</td>
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<tr>
<td>as necessary</td>
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<td>PC2. assist colleagues where required</td>
<td>1</td>
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<tr>
<td>PC3. follow business communication etiquette in all interactions and communicative formats</td>
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<tr>
<td>(online, digital, and in-person)</td>
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<tr>
<td>PC4. document and share all relevant information with stakeholders in agreed formats and as per</td>
<td>2</td>
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<tr>
<td>agreed timelines</td>
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</tr>
<tr>
<td><strong>Work effectively</strong></td>
<td>6</td>
<td>13</td>
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</tr>
<tr>
<td>PC5. identify and obtain clarity regarding organisational, team and own goals and targets</td>
<td>1</td>
<td>2</td>
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</tr>
<tr>
<td>PC6. prioritise and plan work in order to achieve goals and targets</td>
<td>1</td>
<td>2</td>
<td>-</td>
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</tr>
<tr>
<td>PC7. monitor own and team performance as per agreed plan</td>
<td>1</td>
<td>2</td>
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</tr>
<tr>
<td>PC8. complete duties accurately, systematically and within required timeframes</td>
<td>1</td>
<td>2</td>
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</tr>
<tr>
<td>PC9. express emotions appropriately at the workplace and manage own response to heightened</td>
<td>1</td>
<td>2</td>
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<tr>
<td>emotions</td>
<td></td>
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<tr>
<td>PC10. maintain orderliness and cleanliness in the work area</td>
<td>1</td>
<td>3</td>
<td>-</td>
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</tr>
<tr>
<td><strong>Maintain and enhance professional competence</strong></td>
<td>8</td>
<td>7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PC11. identify own strengths and weaknesses in relation to goals and targets</td>
<td>1</td>
<td>1</td>
<td>-</td>
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</tr>
<tr>
<td>PC12. adapt self, service, or product to meet success criteria</td>
<td>1</td>
<td>1</td>
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</tr>
</tbody>
</table>
### Assessment Criteria for Outcomes

<table>
<thead>
<tr>
<th>Assessment Criteria for Outcomes</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
<th>Project Marks</th>
<th>Viva Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PC13. seek and select opportunities for continuous professional development</strong></td>
<td>1</td>
<td>1</td>
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<tr>
<td><strong>PC14. formulate a professional development plan to enhance capabilities</strong></td>
<td>2</td>
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</tr>
<tr>
<td><strong>PC15. build or contribute to the organizational knowledge base of cases, clients, issues, solutions, and innovations</strong></td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td><strong>PC16. examine developments and trends in field of work and their potential impact on work</strong></td>
<td>1</td>
<td>1</td>
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<tr>
<td><strong>PC17. take feedback from peers, supervisors and clients to improve own performance and practices</strong></td>
<td>1</td>
<td>1</td>
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<tr>
<td><strong>Work in a disciplined and ethical manner</strong></td>
<td>11</td>
<td>16</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>PC18. perform tasks as per workplace standards, organisational policies and legislative requirements</strong></td>
<td>2</td>
<td>2</td>
<td>-</td>
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</tr>
<tr>
<td><strong>PC19. display appropriate professional appearance at the workplace and adhere to the organisational dress code</strong></td>
<td>1</td>
<td>2</td>
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<tr>
<td><strong>PC20. demonstrate responsible and disciplined behaviour at the workplace such as punctuality; completing tasks as per given time and standards; demonstrating professional behaviour at all times, adopting environment- friendly practices, etc.</strong></td>
<td>1</td>
<td>2</td>
<td>-</td>
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<tr>
<td><strong>PC21. identify the cause of conflict and options for resolution with peers or escalate grievances and problems to appropriate authority as per procedure for conflict resolution</strong></td>
<td>2</td>
<td>2</td>
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<tr>
<td><strong>PC22. protect the rights of the client and organisation when delivering services</strong></td>
<td>1</td>
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<tr>
<td><strong>PC23. ensure services are delivered equally to all clients regardless of personal and cultural beliefs</strong></td>
<td>1</td>
<td>2</td>
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<tr>
<td><strong>PC24. operate within an agreed ethical code of practice and report unethical conduct to the appropriate authorities</strong></td>
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<td>PC25. follow organisational guidelines and legal requirements on disclosure and confidentiality</td>
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<td><strong>Uphold social diversity at the workplace</strong></td>
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<td>PC26. recognize and evaluate biased practices against underrepresented groups like women and</td>
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<tr>
<td>persons with disabilities, in workplace systems and processes</td>
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<td>PC27. identify and report discrimination and harassment based on gender, disability, or cultural</td>
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<td>difference at the workplace</td>
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<td>PC28. use inclusive or neutral language and gestures in all interactions</td>
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<td>PC29. respect the personal and professional space of others</td>
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<td>PC30. access grievance redressal mechanisms as per legislations</td>
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<td><strong>NOS Total</strong></td>
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## National Occupational Standards (NOS) Parameters

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<td>Sector</td>
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<td>Generic</td>
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<td>Occupation</td>
<td>Generic - Organizational Behaviour</td>
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ELE/N1002: Apply health and safety practices at the workplace

Description

This OS unit is about knowledge and practices relating to health, safety and security that candidates need to use in the workplace.

Scope

The scope covers the following:

- Deal with workplace hazards
- Apply fire safety practices
- Follow emergencies, rescue and first-aid procedures
- Effective waste management/recycling practices

Elements and Performance Criteria

**Deal with workplace hazards**

To be competent, the user/individual on the job must be able to:

PC1. identify job-site hazards and possible causes of accident in the workplace

PC2. perform work complying to organizational safe working practices and observing hazard signs displayed on containers, equipment and in various work areas such as inside buildings, in open areas and public spaces, etc.

PC3. use appropriate personal protective equipment (PPE) for specific tasks and work conditions, contaminant (concentration w.r.t air) requirements and severity of hazard while conforming to the Indian/International standards

PC4. follow standard safety procedures while handling tool/ equipment, hazardous substances and while working in hazardous environments

PC5. dispose electronic waste (such as toxins; metals such as lead, cadmium, barium; flame retardant plastics, welding slag etc.) as per industry approved techniques

PC6. avoid damage of components due to negligence in electrostatic discharge (ESD) procedures

PC7. locate general health and safety equipment in the workplace such as fire extinguishers; first aid equipment; safety instruments, clothing and installations (fire exits, exhaust fans)

PC8. maintain appropriate posture while handling heavy objects

PC9. apply good housekeeping practices at all times

**Apply fire safety practices**

To be competent, the user/individual on the job must be able to:

PC10. take preventive measures to prevent fire hazards

PC11. use appropriate fire extinguishers for different types of fires

- Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no l

PC12. exhibit rescue and first-aid techniques in case of fire or electrocution
Follow emergencies, rescue and first-aid procedures

To be competent, the user/individual on the job must be able to:

PC13. administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning etc.
PC14. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock,
PC15. participate regularly in emergency procedures such as raising alarm, safe/efficient, evacuation, correct means of taking shelter and escaping, correct assembly point, roll call, correct return to work
PC16. use correct method to move injured people and others during an emergency

Effective waste management/recycling practices

To be competent, the user/individual on the job must be able to:

PC17. identify recyclable and non-recyclable, and hazardous waste generated
PC18. segregate waste into different categories
PC19. ensure disposal of non-recyclable waste appropriately
PC20. deposit non-recyclable and reusable material at identified location
PC21. follow processes specified for disposal of hazardous waste

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. importance of working in clean and safe work environment following safety practices and procedures
KU2. health and safety roles and responsibilities of relevant personnel within and outside the organisation
KU3. key internal and external sources of health and safety information
KU4. basic knowledge of electronic devices and related health risks
KU5. meaning of hazards and risks
KU6. various types of health and safety hazards commonly present in the work environment such as physical hazards, electrical hazards, chemical hazards, fire hazards, equipment related hazards, health hazards, etc.
KU7. methods of accident prevention
KU8. importance of using protective clothing/equipment while working
KU9. general principles for identifying and controlling health and safety risks
KU10. main hazards and preventive as well as control measures while working with different types of equipment
KU11. importance of carrying out electrical and non-electrical isolation to prevent hazards from loss of machine/system/process control
KU12. main hazards and preventive as well as control measures when working with electrical systems or using electrical equipment
KU13. forms and classifications of hazardous substances
KU14. safe working practices while working at various hazardous sites
KU15. prevention and control measures to reduce risks from exposure to hazardous substances
KU16. health effects associated with exposure to noise and vibration and the appropriate control measures
KU17. precautionary activities to prevent the fire accident
KU18. various causes of fire such as heating of metal, spontaneous ignition, sparking, electrical eating, loose fires (smoking, welding, etc.) chemical fires etc.
KU19. techniques of using the different fire extinguishers
KU20. different methods and material to extinguish fires
KU21. different materials used for extinguishing fire such as sand, water, foam, CO2, dry powder
KU22. rescue techniques used during a fire hazard
KU23. various types of safety signs and their meaning
KU24. basic first aid treatment relevant to the common work place injuries e.g. shock, electrical shock, bleeding, breaks to bones, minor burns, resuscitation, poisoning, eye injuries
KU25. contents of written accident report
KU26. potential injuries and ill health associated with incorrect handing of tools and equipment
KU27. safe lifting and carrying practices
KU28. potential impact to a person who is moved incorrectly
KU29. personal safety, health and dignity issues relating to the movement of a person by others
KU30. ESD measures and 5S
KU31. efficient utilization and management of material and water
KU32. ways to recognize common electrical problems and practices of conserving electricity
KU33. usage of different colours of dustbins, categorization of waste into dry, wet, recyclable, nonrecyclable and items of single-use plastics
KU34. organization's procedure for minimizing waste
KU35. waste management and methods of waste disposal
KU36. common sources of pollution and ways to minimize it
KU37. names, contact information and location of people responsible for health and safety in the workplace
KU38. location of documents and equipment for health and safety compliance/practices in the workplace
KU39. safety notices, signs and instructions at workplace

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. interpret general health and safety guidelines labels, charts, signages
GS2. read operation manuals
GS3. write health and safety compliance report
GS4. write an accident/incident report in local language or English
GS5. provide an emergency or safety incident brief to seniors or relevant authorities in a calm, clear and to-the-point manner
GS6. communicate general health and safety guidelines to colleagues/co-workers
GS7. communicate appropriately with co-workers in order to clarify instructions and other issues
GS8. act in case of any potential hazards observed in the work place
GS9. plan and organize their own work schedule, work area, tools, equipment in compliance with organizational policies for health, safety and security
GS10. take adequate measures to ensure the safety of clients and visitors at the workplace
GS11. identify immediate or temporary solutions to resolve delays
GS12. evaluate the work area for health and safety risks or hazards
GS13. use cause and effect relations to anticipate potential issues, problems and their solution in the work area related to safety
GS14. recognise emergency and potential emergency situations
GS15. protect self and others from a health and safety risk or hazard
GS16. communicate and collaborate to incorporate sustainable practices (greening) in workplace processes
GS17. record data on waste disposal at workplace
## Assessment Criteria

<table>
<thead>
<tr>
<th>Assessment Criteria for Outcomes</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
<th>Project Marks</th>
<th>Viva Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Deal with workplace hazards</strong></td>
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<tr>
<td>PC1. identify job-site hazards and possible causes of accident in the workplace</td>
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</tr>
<tr>
<td>PC2. perform work complying to organizational safe working practices and observing hazard signs displayed on containers, equipment and in various work areas such as inside buildings, in open areas and public spaces, etc.</td>
<td>3</td>
<td>4</td>
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</tr>
<tr>
<td>PC3. use appropriate personal protective equipment (PPE) for specific tasks and work conditions, contaminant (concentration w.r.t air) requirements and severity of hazard while conforming to the Indian/International standards</td>
<td>3</td>
<td>4</td>
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</tr>
<tr>
<td>PC4. follow standard safety procedures while handling tool/ equipment, hazardous substances and while working in hazardous environments</td>
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</tr>
<tr>
<td>PC5. dispose electronic waste (such as toxins; metals such as lead, cadmium, barium; flame retardant plastics, welding slag etc.) as per industry approved techniques</td>
<td>2</td>
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</tr>
<tr>
<td>PC6. avoid damage of components due to negligence in electrostatic discharge (ESD) procedures</td>
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</tr>
<tr>
<td>PC7. locate general health and safety equipment in the workplace such as fire extinguishers; first aid equipment; safety instruments, clothing and installations (fire exits, exhaust fans)</td>
<td>2</td>
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<td>PC8. maintain appropriate posture while handling heavy objects</td>
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<tr>
<td>PC9. apply good housekeeping practices at all times</td>
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<tr>
<td><strong>Apply fire safety practices</strong></td>
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<tr>
<td>PC10. take preventive measures to prevent fire hazards</td>
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<tr>
<td>Assessment Criteria for Outcomes</td>
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</tr>
<tr>
<td><strong>PC11.</strong> • use appropriate fire extinguishers for different types of fires • Types of fires: Class A: e.g. ordinary solid combustibles, such as wood, paper, cloth, plastic, charcoal, etc.; Class B: flammable liquids and gases, such as gasoline, propane, diesel fuel, tar, cooking oil, and similar substances; Class C: e.g. electrical equipment such as appliances, wiring, breaker panels, etc. (These categories of fires become Class A, B, and D fires when the electrical equipment that initiated the fire is no l</td>
<td>1</td>
<td>3</td>
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</tr>
<tr>
<td><strong>PC12.</strong> exhibit rescue and first-aid techniques in case of fire or electrocution</td>
<td>1</td>
<td>3</td>
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</tr>
<tr>
<td>Follow emergencies, rescue and first-aid procedures</td>
<td>6</td>
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</tr>
<tr>
<td><strong>PC13.</strong> administer appropriate first aid to victims in case of bleeding, burns, choking, electric shock, poisoning etc.</td>
<td>1</td>
<td>3</td>
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</tr>
<tr>
<td><strong>PC14.</strong> administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock,</td>
<td>1</td>
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</tr>
<tr>
<td><strong>PC15.</strong> participate regularly in emergency procedures such as raising alarm, safe/efficient, evacuation, correct means of taking shelter and escaping, correct assembly point, roll call, correct return to work</td>
<td>2</td>
<td>4</td>
<td>-</td>
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<tr>
<td><strong>PC16.</strong> use correct method to move injured people and others during an emergency</td>
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<tr>
<td>Effective waste management/recycling practices</td>
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<td>12</td>
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<tr>
<td><strong>PC17.</strong> identify recyclable and non-recyclable, and hazardous waste generated</td>
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<tr>
<td><strong>PC18.</strong> segregate waste into different categories</td>
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<td><strong>PC19.</strong> ensure disposal of non-recyclable waste appropriately</td>
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<tr>
<td><strong>PC20.</strong> deposit non-recyclable and reusable material at identified location</td>
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## Assessment Criteria for Outcomes

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<td>PC21. follow processes specified for disposal of hazardous waste</td>
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National Occupational Standards (NOS) Parameters

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Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.

2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.

3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.

4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below).

5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criterion.

6. To pass the Qualification Pack, every trainee should score a minimum of 70% of aggregate marks to successfully clear the assessment.

7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.
Minimum Aggregate Passing % at QP Level : 70

(Please note: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

<table>
<thead>
<tr>
<th>National Occupational Standards</th>
<th>Theory Marks</th>
<th>Practical Marks</th>
<th>Project Marks</th>
<th>Viva Marks</th>
<th>Total Marks</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELE/N6102.ELE/N6102: Develop design for manufacture</td>
<td>40</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>ELE/N9905.Work effectively at the workplace</td>
<td>40</td>
<td>60</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>25</td>
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<tr>
<td>ELE/N1002.Apply health and safety practices at the workplace</td>
<td>35</td>
<td>65</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>25</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>185</td>
<td>-</td>
<td>-</td>
<td>300</td>
<td>100</td>
</tr>
</tbody>
</table>
# Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>NOS</td>
<td>National Occupational Standard(s)</td>
</tr>
<tr>
<td>NSQF</td>
<td>National Skills Qualifications Framework</td>
</tr>
<tr>
<td>QP</td>
<td>Qualifications Pack</td>
</tr>
<tr>
<td>TVET</td>
<td>Technical and Vocational Education and Training</td>
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<tr>
<td>IPR</td>
<td>Intellectual Property Rights</td>
</tr>
</tbody>
</table>
**Glossary**

<p>| <strong>Sector</strong> | Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests. |
| <strong>Sub-sector</strong> | Sub-sector is derived from a further breakdown based on the characteristics and interests of its components. |
| <strong>Occupation</strong> | Occupation is a set of job roles, which perform similar/related set of functions in an industry. |
| <strong>Job role</strong> | Job role defines a unique set of functions that together form a unique employment opportunity in an organisation. |
| <strong>Occupational Standards (OS)</strong> | OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts. |
| <strong>Performance Criteria (PC)</strong> | Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task. |
| <strong>National Occupational Standards (NOS)</strong> | NOS are occupational standards which apply uniquely in the Indian context. |
| <strong>Qualifications Pack (QP)</strong> | QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code. |
| <strong>Unit Code</strong> | Unit code is a unique identifier for an Occupational Standard, which is denoted by an ‘N’ |
| <strong>Unit Title</strong> | Unit title gives a clear overall statement about what the incumbent should be able to do. |
| <strong>Description</strong> | Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for. |
| <strong>Scope</strong> | Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required. |</p>
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
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</tr>
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</tr>
<tr>
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</tr>
<tr>
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</tr>
<tr>
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