
Model Curriculum

Aerospace Structural Engineer (Elective 1: Designer) (Elective 2: Analyst)

SECTOR: AEROSPACE AND AVIATION
SUB-SECTOR: DESIGN AND DEVELOPMENT
OCCUPATION: AEROSPACE DESIGN/R&D
REF ID: AAS/Q3103, V1.0
NSQF LEVEL: 6



Certificate

**CURRICULUM COMPLIANCE TO
QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS**
is hereby issued by the

AEROSPACE & AVIATION SECTOR SKILL COUNCIL (AASCC)

for the

MODEL CURRICULUM

Complying to National Occupational Standards of

Job Role/Qualification Pack : **Aerospace Structural Engineer (Elective 1: Designer) (Elective 2: Analyst)** QP No. **'AAS/Q3103' NSQF level 6**

Date of issuance : 22 December 2017
Valid up to : 21 December 2018
* Valid up to the next review date of the Qualification Pack



(Authorised signatory)
Aerospace & Aviation Sector Skill Council (AASCC)

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Aerospace Structural Engineer

(Elective 1: Designer) (Elective 2: Analyst)

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Aerospace Structural Engineer (Elective 1: Designer) (Elective 2: Analyst)”, in the “Aerospace and Aviation” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Aerospace Structural Engineer (Elective 1: Designer) (Elective 2: Analyst)		
Qualification Pack Name & Reference ID.	AAS/Q3103		
Version No.	1.0	Version Update Date	24 – 08 - 2017
Pre-requisites to Training	Graduate in Mechanical / Aeronautical Engineering and allied engineering branches		
Training Outcomes	After completing this programme, participants will be able to <ul style="list-style-type: none"> • Carry out aerospace structural design, analysis and detailing in a responsible manner. • Achieve good communication and interpersonal skills • Work well in a team. 		

This course encompasses 3 out of 3 Compulsory National Occupational Standards (NOS) and 3 out of 3 Elective NOS of “Aerospace Structural Engineer (Elective 1: Designer) (Elective 2: Analyst)” Qualification Pack issued by “Aerospace and Aviation Sector Skill Council (AASCC)”.

COMPULSORY NOS

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	<p>Create documents for knowledge sharing Theory Duration (hh:mm) 12:00 Practical Duration (hh:mm) 36:00 Corresponding NOS Code SSC/N0703</p>	<p>Candidates will be able to;</p> <ul style="list-style-type: none"> • establish with appropriate people the purpose, scope, formats and target audience for the documents • access existing documents, language standards, templates and documentation tools from your organization’s knowledge base • liaise with appropriate people to obtain and verify the information required for the documents • confirm the content and structure of the documents with appropriate people • create documents using standard templates and agreed language standards • review documents with appropriate people and incorporate their inputs • submit documents for approval by appropriate people • publish documents in agreed formats • update your organization’s knowledge base with the documents • comply with your organization’s policies, procedures and guidelines when creating documents for knowledge sharing 	<p>White/Black board/ Chart paper, Markers/Computer and projector, trainer’s guide, student handbook,</p>
2	<p>Work Effectively in a Team Theory Duration (hh:mm) 14:00 Practical Duration (hh:mm) 18:00 Corresponding NOS Code AAS /N0503</p>	<p>Candidates will be able to;</p> <ul style="list-style-type: none"> • display courteous and helpful behaviour at all times • take opportunities to enhance the level of assistance offered to colleagues • meet all reasonable requests for assistance within acceptable workplace timeframes • complete allocated tasks as assigned • seek assistance when difficulties arise • use questioning techniques to clarify instructions or responsibilities, • identify and display a non discriminatory attitude in all contacts with customers and other staff members • observe appropriate dress code and presentation as required by the 	<p>White/Black board/ Chart paper, Markers/Computer and projector, trainer’s guide, student handbook,</p>

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>workplace, job role and level of customer contact</p> <ul style="list-style-type: none"> • follow personal hygiene procedures according to organisational policy • interpret, confirm and act on workplace information, instructions and procedures relevant to the particular task • interpret, confirm and act on legal requirements with regards to anti-discrimination, sexual harassment and bullying • ask questions to seek and clarify workplace information • plan and organise daily work routine within the scope of the job role • prioritise and complete tasks according to required timeframes • identify work and personal priorities and achieve a balance between competing priorities 	
3	<p>Maintain organisational safety and information security Theory Duration (hh:mm) 24:00 Practical Duration (hh:mm) 24:00 Corresponding NOS Code AAS/N3201</p>	<p>Candidates will be able to;</p> <ul style="list-style-type: none"> • comply with your organisation's IT policies and procedures for safety of data and information • adhere to the organisation's policies pertaining to accesses granted, usage, modification of any information or recording or destruction of information • report any identified breaches of data or information in any form to the authority as described by the organization • report any theft of intellectual property according to the organisation policy • record, control the document version and take appropriate approvals for the documents, plans or drawings according to organisational hierarchy • follow your organisation's safety procedures at workplace and act promptly, calmly, and efficiently in case of disruption • recommend improvement related to safety and security at the workplace • comply to any health and safety requirements set by an organisation 	<p>White/Black board/ Chart paper, Markers/Computer and projector, trainer's guide, student handbook, Charts regarding health & hygiene, fire-fighting, first aid</p>
	<p>Total Duration (hh:mm) 128:00 Theory Duration (hh:mm) 50:00 Practical Duration (hh:mm) 78:00</p>		

Sr. No.	Module	Key Learning Outcomes	Equipment Required
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Electives (Mandatory to select at least one title)

Elective 1. Designer

1.1	<p>Create simple mechanical designs Theory Duration (hh:mm) 67:00 Practical Duration (hh:mm) 157:00 Corresponding NOS Code SSC/N4201</p>	<p>Candidates will be able to</p> <ul style="list-style-type: none"> • establish your role and responsibilities in creating mechanical designs • establish the design requirements and constraints • use standard design tools to create multiple design concepts that comply with the design requirements and constraints • analyse design concepts to identify best fit with the design requirements and constraints • present your design concepts and recommendations to appropriate people • incorporate inputs from appropriate people in finalized design concepts • carry out DfX/ DFMA/ Stack-up analysis on the finalized design concepts and make amendments, where required • obtain approval of finalized design concepts from appropriate people • create engineering documents for manufacturing and bills of materials (BOMs) for finalized designs • obtain advice and guidance on creating mechanical designs from appropriate people, where required • comply with your organization's policies, standards, procedures and guidelines when creating mechanical designs 	<p>White/Black board/ Chart paper, Markers/Computer and projector, trainer's guide, student handbook</p>
1.2	<p>Design of aerospace structural components/assemblies/subassemblies Theory Duration (hh:mm) 96:00 Practical Duration (hh:mm) 128:00 Corresponding NOS Code AAS/N3103</p>	<p>Candidates will be able to</p> <ul style="list-style-type: none"> • review customer requirements • conceptualise preliminary & detail design, qualify, and document aircraft structural components • apprehend the applicable structural standards for an aircraft • select appropriate usage of metallic, non-metallic and composites material while designing structures • design for appropriate aircraft loads • design primary and secondary structures by using appropriate design and software tool • work with respective designers and structural analysis engineers for design optimisation 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> • carryout detail design for the developed structural component • oversee work by in-house and contract designers and analysts • document and maintain the basis of design and selection of appropriate structure • Create / modify 3D models, sub-assemblies, assemblies, manufacturing drawings single part, assembly, installation and obtain approvals from appropriate design authority • work within the aircraft design modification team(s), to assist with the generation of design documentation and drawings, and interface with the customer on required changes • conform to configuration management and change control procedures and policies • conduct/participate in design reviews and customer audits • interact with internal and external customers to present design development outputs • co-ordinate within the team and effectively communicate with all levels of the organization • create / modify Bill of Material (BOM), weight report, change note etc • develop composite models & drawings with MEOP (manufacturing edge of part) & EEOP (Engineering edge of parts) • release manufacturing drawings based on approved design 	
	<p>Total Duration (Elective 1) (hh:mm) 448:00</p> <p>Theory Duration (hh:mm) 163:00</p> <p>Practical Duration (hh:mm) 285:00</p>		

Elective 2. Analyst

2.1	<p>Analysis and testing of aerospace structural components/assemblies/subassemblies Theory Duration (hh:mm) 193:00</p> <p>Practical Duration (hh:mm)</p>	<p>Candidates will be able to</p> <ul style="list-style-type: none"> • review customer structural requirements and lead decomposition to lower level requirements • conceptualise, model, qualify, and document aircraft structural components and systems 	<p>White/Black board/ Chart paper, Markers/Computer and projector, trainer's guide, student handbook,</p>
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Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<p>255:00 Corresponding NOS Code AAS/N3114</p>	<ul style="list-style-type: none"> • preliminary & detail design activities related to stress and F&DT justification, analyse and document aircraft structural components justification results • establish the structural requirements and constraints • apprehend the applicable structural standards for an aircraft • select and implement appropriate metallic, non-metallic and composites material while analysing structures • create global and sub models. Perform internal load generation using global FE model and detail analysis using sub structuring approach using global and sub models. • perform structural calculations such as buckling, natural mode and frequencies, fatigue, flutter speed, reserve factor, stress analysis on various aircraft sections and design concepts for appropriate aircraft loads • analyse primary and secondary structures by using appropriate standard hand calculation methods and FE analysis. Various analyses to be performed are free-free analysis, normal modes, linear and nonlinear analysis, buckling and post buckling analysis. • analyse the components/features not captured in the FE model, justify them using detailed hand calculations. Example - Joint and fastener calculations, attachment lugs etc. • perform fatigue life and crack growth analysis through selection of critical primary and secondary locations on structure • comply with your organisation's policies, standards, procedures and guidelines for analysis while performing stress and F&DT justifications • work with respective designers and structural analysis engineers for design optimisation. • carry out optimisation on the finalised design concepts and make/suggest amendments, where required • document and maintain the basis of structural calculations and selection of appropriate structure concept • undertake mathematical modelling and 3D modelling for verification of output and safety factor • prepare test specimens, strain gage locations, their numbers based on simulation results. • prepare test plans and procedure, conduct static, dynamic and fatigue test, 	

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>document test results and correlate the test with simulation.</p> <ul style="list-style-type: none"> • obtain approvals from appropriate stress authority • work within the aircraft modification team(s), to assist with the generation of stress documentation and interface with the customer on required changes • conform to configuration management and change control procedures and policies. • conduct/participate in stress reviews and customer audits • interact with internal and external customers to present analysis development/ outputs • co-ordinate within the team and effectively communicate with all levels of the organization • general Aerospace analysis process & standard methods 	
	<p>Total Duration (Elective 2) (hh:mm) 448:00 Theory Duration (hh:mm) 193:00 Practical Duration (hh:mm) 255:00</p>	<p>Unique equipment used</p> <ul style="list-style-type: none"> • 2D/3D CAD software • Analysis software • Relevant cross sectional/working models • Real/Mock-up aircraft • Computer vibrational testing machine • Creep testing machine • Universal Testing Machine • Composite hand layup setup • Autoclave 	

Minimum duration of course : **576 Hours, 0 Minutes**

Grand Total Course Duration (Minimum) : **576 Hours, 0 Minutes**

Grand Total Course Duration (Maximum) : **576 Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by **Aerospace and Aviation Sector Skill Council**)

Trainer Prerequisites for Job role: “ Aerospace Structural Engineer (Elective 1: Designer) (Elective 2: Analyst) ” mapped to Qualification Pack: “AAS/Q3103”

Sl. No.	Area	Details
1	Description	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “AAS/Q3103”.
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	Post graduate in Mechanical / Aeronautics and allied engineering branches
4a	Domain Certification	Statutory Certificate from Aerospace and Aviation Sector Skill Council (AASSC) for Job Role: “ Aerospace Structural Engineer (Elective 1: Designer) (Elective 2: Analyst) ” mapped to QP: “AAS/Q3103”. Minimum accepted score for domain certification will be 80%.
4b	Platform Certification	Recommended that the Trainer is certified for the job role “Trainer” mapped to the Qualification Pack : “MEP/Q 0102”. Minimum accepted percentage as per respective SSC guidelines is 80%.
5	Experience	2-3 years of experience

Annexure : Assessment Criteria

Job Role : Aerospace Structural Engineer

Qualification Pack : AAS/Q3103

Sector Skill Council : Aerospace and Aviation Sector Skill Council

Guidelines for Assessment

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center 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.

Compulsory NOS Total Marks: 100		Marks Allocation			
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of	Theory	Skills Practical
1. SSC/N0703 Create documents for knowledge sharing	PC1. establish with appropriate people the purpose, scope, formats and target audience for the documents	100	5	5	0
	PC2. access existing documents, language standards, templates and documentation tools from your organization's knowledge base		15	0	15
	PC3. liaise with appropriate people to obtain and verify the information required for the documents		5	5	0
	PC4. confirm the content and structure of the documents with appropriate people		10	0	10
	PC5. create documents using standard templates and agreed language standards		25	0	25
	PC6. review documents with appropriate people and incorporate their inputs		10	0	10
	PC7. submit documents for approval by appropriate people		5	5	0
	PC8. publish documents in agreed formats		5	5	0
	PC9. update your organization's knowledge base with the documents		5	5	0
	PC10. comply with your organization's policies, procedures and guidelines when creating documents for knowledge sharing		15	0	15

Total	100	25	75
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Compulsory NOS Total Marks: 100		Marks Allocation			
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of	Theory	Skills Practical
2. AAS/N0503 Work Effectively in a Team	PC1. display courteous and helpful behaviour at all times	100	6	3	3
	PC2. take opportunities to enhance the level of assistance offered to colleagues		7	3	4
	PC3. meet all reasonable requests for assistance within acceptable workplace timeframes		6	3	3
	PC4. complete allocated tasks as required		6	3	3
	PC5. seek assistance when difficulties arise		7	3	4
	PC6. use questioning techniques to clarify instructions or responsibilities		6	3	3
	PC7. identify and display a non discriminatory attitude in all contacts with customers and other staff members		6	3	3
	PC8. observe appropriate dress code and presentation as required by the workplace, job role and level of customer contact		7	3	4
	PC9. follow personal hygiene procedures according to organisational policy and relevant legislation		7	3	4
	PC10. interpret, confirm and act on workplace information, instructions and procedures relevant to the particular task		7	3	4
	PC11. interpret, confirm and act on legal requirements with regards to anti-discrimination, sexual harassment and bullying		7	3	4
	PC12. ask questions to seek and clarify workplace information		7	3	4
	PC13. plan and organise daily work routine within the scope of the job role		7	3	4
	PC14. prioritise and complete tasks according to required timeframes		7	3	4
	PC15. identify work and personal priorities and achieve a balance between competing priorities		7	3	4
Total		100	45	55	

Compulsory NOS Total Marks: 100		Marks Allocation			
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of	Theory	Skills Practical
3. AAS/N3201 Maintain organisational safety and information security	PC1. comply with your organisation's IT policies and procedures for safety of data and information	100	10	5	5
	PC2. adhere to the organisation's policies pertaining to accesses granted, usage, modification of any information or recording or destruction of information		10	5	5
	PC3. report any identified breaches of data or information in any form to the authority as described by the		10	5	5
	PC4. report any theft of intellectual property according to the organisation policy		20	10	10
	PC5. record, control the document version and take appropriate approvals for the document, plans or drawings according to organisational hierarchy		10	5	5
	PC6. follow your organisation's safety procedures at workplace and act promptly, calmly, and efficiently in case of disruption		20	10	10
	PC7. recommend improvement related to safety and security at the		10	5	5
	PC8. comply to any health and safety requirements set by an organisation		10	5	5
Total		100	50	50	

Elective NOS Total Marks: 100		Marks Allocation			
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of	Theory	Skills Practical
1.1. SSC/N4201 Create simple mechanical designs	PC1. establish your role and responsibilities in creating mechanical designs		5	5	0
	PC2. establish the design requirements and constraints		5	5	0
	PC3. use standard design tools to create multiple design concepts that comply with the design requirements and constraints		15	0	15

	PC4. analyse design concepts to identify best fit with the design requirements and constraints	100	15	0	15
	PC5. present your design concepts and recommendations to appropriate people		5	5	0
	PC6. incorporate inputs from appropriate people in finalized design concepts		5	5	0
	PC7. carry out DfX/ DFMA/ Stack-up analysis on the finalized design concepts and make amendments, where required		15	0	15
	PC8. obtain approval of finalized design concepts from appropriate people		5	5	0
	PC9. create engineering documents for manufacturing and bills of materials (BOMs) for finalized designs		15	0	15
	PC10. obtain advice and guidance on creating mechanical designs from appropriate people, where required		5	5	0
	PC11. comply with your organization's policies, standards, procedures and guidelines when creating mechanical designs		10	0	10
Total		100	30	70	

Elective NOS Total Marks: 100		Marks Allocation			
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of	Theory	Skills Practical
1.2 AAS/N3103 Design of aerospace structural components/ assemblies/ subassemblies	PC1. review customer requirements	100	6	3	3
	PC2. conceptualise preliminary & detail design, qualify, and document aircraft structural components		6	3	3
	PC3. apprehend the applicable structural standards for an aircraft		6	3	3
	PC4. select appropriate usage of metallic, non-metallic and composites material while designing structures		6	3	3
	PC5. design at appropriate loads		6	3	3
	PC6. design primary and secondary structures by using appropriate design and analysis tool		5	2	3
	PC7. work with respective designers and structural analysis engineers for design optimisation		5	2	3
	PC8. carryout detail design for the developed structural component		5	2	3
	PC9. oversee work by in-house and contract designers and analysts		5	2	3

PC10. document and maintain the basis of structural calculations and selection of appropriate structure	5	2	3
PC11. Create / modify 3D models, sub-assemblies, assemblies, manufacturing drawings single part, assembly, installation and obtain approvals from appropriate design authority	5	2	3
PC12. work within the aircraft design modification team(s), to assist with the generation of design documentation and drawings, and interface with the customer on required changes	5	2	3
PC13. conform to configuration management and change control procedures and policies	5	2	3
PC14. conduct/participate in design reviews and customer audits	5	2	3
PC15. interact with internal and external customers to present design development outputs	5	2	3
PC16. co-ordinate within the team and effectively communicate with all levels of the organization	5	2	3
PC17. create / modify Bill of Material (BOM), weight report, change note etc	5	2	3
PC18. develop composite models & drawings with MEOP (manufacturing edge of part) & EEOP (Engineering edge of parts)	5	2	3
PC19. release manufacturing drawings based on approved design	5	2	3
Total	100	43	57

Elective NOS Total Marks: 100		Marks Allocation			
Assessment outcomes	Assessment Criteria for outcomes	Total Marks	Out of	Theory	Skills Practical
2.1. AAS/N3114 Analysis and testing of aerospace structural components/ assemblies/ subassemblies	PC1. review customer structural requirements and lead decomposition to lower level requirements				
	PC2. conceptualise, model, qualify, and document aircraft structural components and systems	5	2	3	

	PC3. preliminary & detail design activities related to stress and F&DT justification, analyse and document aircraft structural components justification results	100	5	2	3
	PC4. establish the structural requirements and constraints		5	2	3
	PC5. apprehend the applicable structural standards for an aircraft		5	2	3
	PC6. select and implement appropriate metallic, non-metallic and composites material while analysing structures		5	2	3
	PC7. create global and sub models. Perform internal load generation using global FE model and detail analysis using sub structuring approach using global and sub models		5	2	3
	PC8. perform structural calculations such as buckling, natural mode and frequencies, fatigue, flutter speed, reserve factor, stress analysis on various aircraft sections and design concepts for appropriate aircraft loads		4	2	2
	PC9. analyse primary and secondary structures by using appropriate standard hand calculation methods and FE analysis. Various analyses to be performed are free-free analysis, normal modes, linear and nonlinear analysis, buckling and post buckling analysis		4	2	2
	PC10. analyse the components/features not captured in the FE model, justify them using detailed hand calculations. Example - Joint and fastener calculations, attachment lugs etc		4	2	2
	PC11. perform fatigue life and crack growth analysis through selection of critical primary and secondary locations on structure		4	2	2
	PC12. comply with your organization's policies, standards, procedures and guidelines for analysis while performing stress and F&DT justifications		4	2	2
	PC13. work with respective designers and structural analysis engineers for design optimization		4	2	2
	PC14. carry out optimization on the finalized design concepts and make/suggest		4	2	2

	amendments, where required			
	PC15. document and maintain the basis of structural calculations and selection of appropriate structure concept	4	2	2
	PC16. undertake mathematical modelling and 3D modelling for verification of output and safety factor	4	2	2
	PC17. prepare test specimens, strain gage locations, their numbers based on simulation results	4	2	2
	PC18. prepare test plans and procedure, conduct static, dynamic and fatigue test, document test results and correlate the test with simulation	4	2	2
	PC19. obtain approvals from appropriate stress authority	3	1	2
	PC20. work within the aircraft modification team(s), to assist with the generation of stress documentation and interface with the customer on required changes	3	1	2
	PC21. conform to configuration management and change control procedures and policies	3	1	2
	PC22. conduct/participate in stress reviews and customer audits	3	1	2
	PC23. interact with internal and external customers to present analysis development/ outputs	3	1	2
	PC24. co-ordinate within the team and effectively communicate with all levels of the organization	3	1	2
	PC25. general Aerospace analysis process & standard methods	3	1	2
	Total	100	43	57