

Higher National Certificate/Diploma Assessment

Qualification		Pearson BTEC Higher Nationals for England (2024)			
Unit number and title		4014: Production Engineering for Manufacture			
Assignment title		Production System			
Assessor		Engineering Team			
Academic year	1	Unit Code	H/651/0729	Assignment	3 of 3
Internal Verifier	Dr. Michael Shaw		Verification Date	1 st September 2025	
Issue Date	1 st September 2025		Final Submission Date	No later than 31st August 2026	

Policy on the Use of Artificial Intelligence (AI)

- Students are required to acknowledge the use of AI in the preparation of any assignment.
- AI tools **may be** permissible for use as learning aids, subject to the AI Assessment Scale designation given below.
- AI cannot be used to generate the final, submitted work in its entirety.
- AI cannot be used to substitute for a student's own critical thinking, analysis, and original expression.
- Assignments must reflect the student's original thought and understanding.
- Assignments are checked automatically on submission for AI content, through Turnitin.
- Assignment grades are only confirmed following viva voce examination at the end of each unit.

Artificial Intelligence Assessment Scale (AIAS)

Full details of the Artificial Intelligence Assessment Scale (AIAS) are available at [this link](#).

The AI Assessment Scale (AIAS)

Level	Description	Guidelines
1 NO AI	The assessment is completed entirely without AI assistance in a controlled environment, ensuring that students rely solely on their existing knowledge, understanding, and skills.	You must not use AI at any point during the assessment. You must demonstrate your core skills and knowledge.
2 AI PLANNING	AI may be used for pre-task activities such as brainstorming, outlining and initial research. This level focuses on the effective use of AI for planning, synthesis, and ideation, but assessments should emphasise the ability to develop and refine these ideas independently.	You may use AI for planning, idea development, and research. Your final submission should show how you have developed and refined these ideas.
3 AI COLLABORATION	AI may be used to help complete the task, including idea generation, drafting, feedback, and refinement. Students should critically evaluate and modify the AI suggested outputs, demonstrating their understanding.	You may use AI to assist with specific tasks such as drafting text, refining and evaluating your work. You must critically evaluate and modify any AI-generated content you use.
4 FULL AI	AI may be used to complete any elements of the task, with students directing AI to achieve the assessment goals. Assessments at this level may also require engagement with AI to achieve goals and solve problems.	You may use AI extensively throughout your work either as you wish, or as specifically directed in your assessment. Focus on directing AI to achieve your goals while demonstrating your critical thinking.
5 AI EXPLORATION	AI is used creatively to enhance problem-solving, generate novel insights, or develop innovative solutions to solve problems. Students and educators co-design assessments to explore unique AI applications within the field of study.	You should use AI creatively to solve the task, potentially co-designing new approaches with your instructor.

This assignment is based on the AIAS level indicated by the colour above.
Follow the instructions for that level.

If the submitted work falls outside the scope of the AIAS designation above, the assignment will be failed.

References

- Prepare your references and correctly cite them within the body of your assignment using zbib.org.
- Use the Harvard referencing standard of any of the listed UK universities.
- In zbib.org, create a 'Link to this Version' and copy it into your References section.
- **Assignments will be rejected if this process is not followed correctly.**

Submission Format

All text elements of your submission should be word processed, mathematical solutions can be handwritten (neatly) and scanned into your document.

Word Limit

- The recommended word limit for the information pack is 4,000 words. Exceeding this limit will not result in penalties; however, concise and focused writing is encouraged.

Assignment Format

- **Organisation:** Use clear headings, paragraphs, and sub-sections, to ensure clarity and ease of reading. Refer to Task numbers or sections to make it clear which question you are answering. [Assignment Structure](#)

Your assignment **MUST** include the following sections:

- **Cover Page:** Your Course, Name, Unit Name and Assignment number/name
- **Contents Page:** List tasks or questions with page numbers.
- **References:** Correctly cite and list all sources used, but do not use Wikipedia. Please see the detailed advice on page 1.

Submission Requirements

By submitting your assignment, you confirm the following:

- **Originality:** The work is your own, with all sources properly cited.
- **Plagiarism:** You acknowledge that plagiarism and collusion are forms of academic misconduct and are strictly prohibited.
- **Plagiarism Detection:** Your assignment will be submitted to TurnItIn, a plagiarism detection service, that compares your work against databases, online sources, and other students' work.
- **False Declaration:** Making a false declaration is academic misconduct.

Vocational Scenario or Context	<p>You are a newly appointed Production Engineer in a car manufacturing plant and your Engineering Manager has informed you that you are required to complete various tasks regarding production engineering before you are assigned to active production projects. Before you take on a project, you need to show that you understand the subject area. Your manager has therefore set you tasks to determine your level of knowledge.</p>
Task 1	<p>a) Produce a flowchart which illustrates the processes of manufacturing of a component of your choice. The process should start from initial design specification through to manufacture and distribution.</p> <p>b) List and describe the functions of three production processes or facilities within a modern manufacturing plant of your choice. Discuss both where gains can be made and where limitations may constrain the production processes.</p> <p>c) The effectiveness and efficiency of a modern manufacturing plant can be compromised by certain materials, components, and sub-assembly handling/conveyancing. Give TWO examples of techniques used by Production Engineers to combat these issues.</p> <p>d) Provide a detailed examination of the similarities and differences between JIT/Lean manufacturing and TQM/World Class manufacturing. Outline their effects on the production processes of your chosen product and compare the benefits and limitations of each approach.</p>
Task 2	<p>a) Assess which type of data a car factory Production Engineer would need to collect and analyse in order to measure the performance of a production line.</p> <p>b) Give an account of which measures a Production Engineer may take in order to improve the performance of a car production line.</p> <p>c) A robotic welding station within the chassis fabrication line of a car manufacturing plant is discovered to have a faulty visioning system. How would a Production Engineer determine which individual chassis, or more, would need to be recalled and rectified? If the fault would not have been discovered, what would be the long-term effects for the manufacturing plant?</p> <p>d) How would you, as a Production Engineer, interpret the data collected in Task 2 a)</p>

**Sources of
information to
support you with
this Assignment**

- Baudin M. and Netland T. (2023) *Introduction to Manufacturing: An Industrial Engineering and Management Perspective*. 1st Ed. Routledge.
- Burduk A., Batako A.D.L., Machado J., Wyczolkowski R., Dostatni E. and Rojek I. (Editors (2023) *Intelligent Systems in Production Engineering and Maintenance III – Lecture Notes in Mechanical Engineering* (Paperback). Springer.
- Davim J.P. (Editor) (2016) *Design of Experiments in Production Engineering*. Springer International Publishing Switzerland.
- Durakbasa N.M. and Gencyilmaz M.G. (Editors) (2021) *Digitizing Production Systems: Selected Papers from ISPR2021 – Lecture Notes in Mechanical Engineering* (Paperback). Springer.
- Grote K.H. and Hefazi H. (Editors) (2021) *Springer Handbook of Mechanical Engineering*. Springer Nature.
- Groover M.P. (2020) *Fundamentals of Modern Manufacturing: Materials, Processes, and Systems*. John Wiley & Sons.
- Machado C. and Davim J.P. (Editors) (2022) *Green Production Engineering and Management*. 1st Ed. Woodhead Publishing.
- Mair G. (2019) *Essential Manufacturing*. Wiley.
- Phanden R.K., Kumar R., Pandey P.M., and Chakraborty A. (Editors) (2023) *Advances in Industrial and Production Engineering: Select Proceedings of FLAME 2022 – Lecture Notes in Mechanical Engineering* (Paperback). Springer.

Relevant Learning Outcomes and Assessment Criteria					
Pass		Merit		Distinction	
LO3	Analyse how a production system can incorporate a number of different production processes for a given product or assembly			LO3	
P5	Review the type and sequence of production processes a product or component would follow from initial design through to manufacture and distribution.	M3	Explain how materials, components and sub assembly handling and conveyance can impact on the effectiveness and efficiency of a modern manufacturing plant.	D3	Critique the relationship of just-in-time (JIT) and lean manufacturing to total quality and world-class manufacturing and their effects on production processes for a given product or assembly.
P6	Analyse the function of the various production processes within a modern manufacturing plant considering the benefits and drawbacks.				
LO4	Explore the effectiveness of a production system in terms of its operation within the wider manufacturing system.			LO4	
P7	Review the type of data that would be collected and analysed to measure production performance.	M4	Explain the immediate and long-term effects that production errors and rectification can have on a manufacturing company.	D4	Analyse the criteria by which production performance can be measured within the wider manufacturing system.
P8	Explore the measures that can improve production performance criteria.				