

STEAMING SYSTEMS ITINERARY

PROGRAM DESCRIPTION

Join our engineers on a guided tour of Puffing Billy Railway's locomotive workshops. Students will learn about the concepts, principles and components of the mechanical systems that have allowed the railway to operate for over a century. Students will learn how to document and diagrammatically showcase engineering principles. They will observe Engineers working safely with materials, tools, equipment, components and machines in an active workshop. They will observe simple mechanical systems and management of work by Puffing Billy Railway engineers, whilst undertaking mechanical calculations to determine mechanical advantage and energy transformations in a steam locomotive.

Students will also experience a journey through the magnificent Dandenong Ranges on Puffing Billy Railway observing the positive and negative impacts of the system on the railway corridor. They will join an Education Officer to document and apply these observations and the observed engineering concepts to further design, plan and evaluate a mechanical system of their own. Students will draw on knowledge learnt at the railway to discuss and consider the relevant factors that influence the creation and design of the mechanical systems at the railway and consider these in their own prototype and system designs.

KEY THEMES

- Mechanical systems
- Engineering concepts, calculations and principles
- Simple machines including gears, pulleys and levers
- Energy sources and conversions
- Safety and Risk management
- Creation of a system
- Design of a mechanical system
- Renewable and non-renewable energies

YEAR LEVELS

VCE

CURRICULUM AREAS AND LEVELS

VCE-Systems Engineering

Unit 1 – Mechanical Systems

PROGRAM OPTIONS

OPTION 1 - RETURN JOURNEY

Meet the Education Officer at Belgrave Station at 9.30am for a tour of the Engineering workshop and an 11:10am Puffing Billy departure (approx. 50 minute journey). Disembark at Lakeside Station at approx 12.00pm. Enjoy lunch, the Lakeside Visitor Centre, an Educator led workshop and the natural surrounds. Board Puffing Billy at 2.15pm and return to Belgrave Station at approx. 3.05pm.

OPTION 2 - SINGLE JOURNEY

Meet the Education Officer at Belgrave Station at 9:30am for a tour of the Engineering Workshop and an 11:10am Puffing Billy departure (approx. 50 minute journey). Disembark at Lakeside Station at approx. 12pm. Enjoy lunch, the Lakeside Visitor Centre, an Educator led workshop and the natural surrounds. Depart on bus from Lakeside, approx. 2pm.

Other options can be scheduled according to Puffing Billy Railway timetable.

DURATION: Half Day (approx. 9.30am - 2pm)

COST: Midweek only - From \$24.90 per student
Midweek only - From \$36 per adult

STEAMING SYSTEMS



FOOD, BEVERAGES AND SOUVENIRS

A range of food and beverage options are available for purchase from our stations and the Lakeside Visitor Centre café, including pies, sandwiches, hot and cold drinks as well as ice creams and sweets.

Additionally, a range of Puffing Billy merchandise is for sale, including the very popular Puffing Billy flags!



TOILETS

Toilets are located at Belgrave, Menzies Creek, Emerald, Lakeside and Gembrook stations and the Lakeside Visitor Centre. Please note, there are no toilets available on board the train itself, so we encourage students to use the facilities before boarding.

Toilets with wheelchair access are located at Belgrave, Lakeside and Gembrook stations



ACCESSIBILITY

Puffing Billy Railway is committed to offering an enjoyable experience for everyone and has a range of accessible facilities available for our passengers.

Our station platforms are not at the same height as our carriage doors; however, ramps are available to provide easy wheelchair access on many of our Excursion Trains. The wheelchair ramp width is 75cm.

Pathways to Belgrave, Lakeside and Gembrook stations are all wheelchair accessible.

To assist passengers with reduced mobility and to avoid our steep pathway entrance to Belgrave Station, passengers may be dropped off at Gate 4 which is in front of our Belgrave Station building on Old Monbulk Road. The area from the station to the platform is on one level.

CURRICULUM, STAFF AND RATIOS

Our education programs are linked to the Victorian Early Years Learning Development Framework (VEYLDF) and the Victorian Curriculum. Programs are presented by passionate Education Officers, who hold level 2 first aid qualifications and Working with Children Checks or are registered teachers. Puffing Billy Railway Education programs align with the Department of Education and Training excursion ratios.



STEAMING SYSTEMS

CURRICULUM LINKS

UNIT 1: MECHANICAL SYSTEMS

AREA OF STUDY 1

MECHANICAL SYSTEM DESIGN

Outcome 1

On completion of this unit the student should be able to describe and apply basic engineering concepts and principles, and use components to design and plan a mechanical system using the systems engineering process. To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 1.

Key knowledge

- the function and operation of mechanical components:
- mechanical engineering concepts and principles:
- mechanical calculations
- system performance variations as a result of using different subsystems or components
- stages of the systems engineering process and factors that influence the creation and use of a mechanical system.

Key skills

- explain, using appropriate engineering terms, how mechanical systems function
- identify and select appropriate subsystems and components that will form operational systems
- test, measure and record appropriate system parameters to evaluate system performance
- perform basic calculations on linkages, gear ratios and pulleys
- apply the systems engineering process to:
 - identify and document the problem, need, opportunity or situation
 - research, design and plan the operational integrated and controlled system
- describe the factors that influence the creation and use of the system.

AREA OF STUDY 2

PRODUCING AND EVALUATING MECHANICAL SYSTEMS

Outcome 2

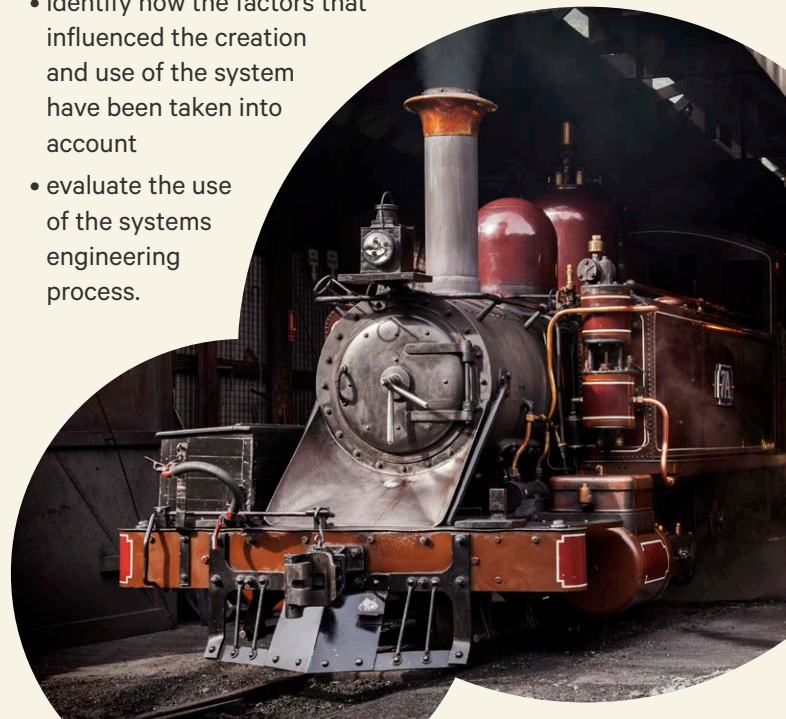
On completion of this unit the student should be able to produce, test, diagnose and evaluate a mechanical system using the systems engineering process. To achieve this outcome the student will draw on key knowledge and key skills outlined in Area of Study 2.

Key knowledge

- risk assessment and management at all stages of creation and use of the system
- use of tools, equipment, machines and components compliant with OH&S requirements
- measuring and testing equipment and methods, and fault finding in systems, subsystems and components
- evaluation methods in systems.

Key skills

- apply the systems engineering process to produce, test, diagnose, evaluate and report on the system
- identify how the factors that influenced the creation and use of the system have been taken into account
- evaluate the use of the systems engineering process.



STEAMING SYSTEMS

CURRICULUM LINKS

UNIT 3: INTEGRATED AND CONTROLLED SYSTEMS

AREA OF STUDY 2

CLEAN ENERGY TECHNOLOGIES

Outcome 2

On completion of this unit the student should be able to discuss the advantages and disadvantages of renewable and non-renewable energy sources, and analyse and evaluate the technology used to harness, generate and store non-renewable and renewable energy.

Key knowledge

- forms of non-renewable energy sources including fossil fuels
- dependence on non-renewable fossil fuels as the main source of energy supply and electricity production
- technological developments to reduce carbon emissions and improve efficiency of fossil fuels including oil, natural gas and coal
- factors that determine the efficiency of energy conversion

Key skills

- describe forms of non-renewable and renewable energy sources
- discuss advantages and disadvantages of non-renewable energy sources and renewable energy sources
- explain recent technological developments to improve environmental credentials of non-renewable resources
- evaluate the technologies and processes used to harness, generate and store renewable energy sources
- describe factors that determine the efficiency of energy conversion

UNIT 4: SYSTEMS CONTROL

AREA OF STUDY 2

NEW AND EMERGING TECHNOLOGIES

Outcome 2

On completion of this unit the student should be able to evaluate a range of new or emerging systems engineering technologies and analyse the likely impacts of a selected technology.

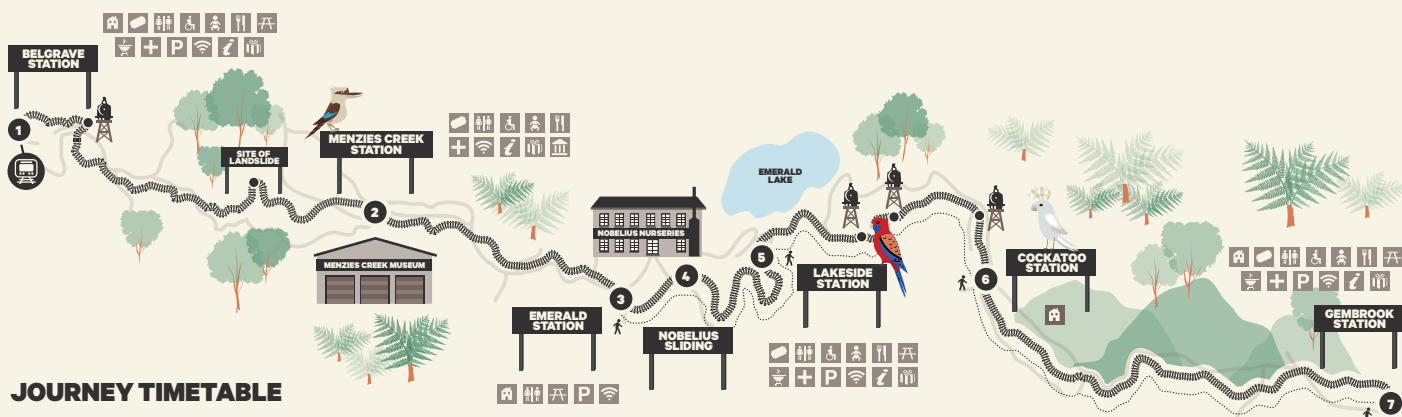
Key knowledge

- new or emerging developments in systems engineering products and components, how they work and their applications
- new or emerging developments in systems engineering processes that improve economic and environmental sustainability, efficiency and risk management
- reasons for and drivers of the development of the new and emerging technologies, including discoveries, new materials, technology convergence and new manufacturing methods and processes
- positive and negative impacts and the potential of the new and emerging developments.

Key skills

- research and evaluate the operations and applications of new and emerging developments in systems engineering processes and products
- explain reasons for and drivers of the development of new and emerging technologies
- analyse impacts and the potential of the new and emerging developments
- present and analyse information about a specific new or emerging systems engineering innovation

STEAMING SYSTEMS



JOURNEY TIMETABLE

JOURNEY (refer to map above)	SINGLE JOURNEY (subject to timetable)	RETURN JOURNEY (subject to timetable)
1 ↔ 2	30 minutes	Allow 3 hours
1 ↔ 3	50 minutes	Allow 3 hours
1 ↔ 5	60 minutes	Allow 3 hours
5 ↔ 7	40 minutes	Allow 3 hours
1 ↔ 7	1 hour 50 minutes	Allow 5 hours

MAP LEGEND

	Belgrave Metro Station		Toilet		Parenting room
	Town		Accessible toilet		Food & drink
	Booking Office		Parenting room		Picnic area
	BBQ facilities		Wi-fi		NEW! Menzies Creek Museum
	First aid		Information		Multi-purpose Eastern Dandenong Ranges Trail
	Parking		Souvenir Shop		Trestle Bridge



PUFFING BILLY
RAILWAY



BOOKINGS/ENQUIRIES

E: info@pbr.org.au P: 03 9757 0700

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