Bhutan Council for School Examinations and Assessment

Digital Technology and Innovation

Key Stage 5 (XI-XII)
Assessment Syllabus

2026 – 2030

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1. Why choose this syllabus?

In Bhutan, education is designed to foster seven essential competencies, balancing the preservation of cultural identity with readiness for global engagement. Digital Technology and Innovation (DTI) play a vital role in supporting the development of these competencies. Studying DTI contributes significantly to achieving these competencies in the following ways:

Spirituality & Values: Digital Technology and Innovation (DTI) education plays a vital role in fostering responsible digital citizenship. Learners will understand their responsibilities not only as users of digital tools but also as ethical participants in the digital world. Programming, in particular, builds patience, persistence, and an appreciation of cause and effect, which parallels the spiritual concept of karma. DTI education fosters the growth of thoughtful, mindful and responsible digital citizens, aligned with Bhutan's vision of Gross National Happiness, where technological progress goes hand-in-hand with inner development and societal well-being.

Language: DTI empowers students to innovate and communicate complex ideas. Examples include coding with precision and accuracy and evaluating online resources which sharpens critical thinking, while coding tasks enhance technical writing. Overall, DTI empowers learners to become confident, effective communicators in the digital age.

Transversal Competencies: Transversal competencies in DTI curriculum are essential skills that enable learners to apply their digital knowledge in practical contexts. These include critical thinking, creativity, communication, collaboration, digital literacy, ethical use of technology, adaptability, and self-management.

Enterprising & Industrious: DTI equips learners with the skills and mindset to become both enterprising (innovative, resourceful) and industrious (persistent, diligent) individuals. As learners explore digital tools, solve problems through coding, and design creative content, they develop key qualities such as initiative, resilience, and adaptability. DTI encourages learners to think critically, experiment with ideas, and persevere through challenges, fostering traits such as ingenuity, digital problem-solving, and self-motivation. These experiences not only prepare learners for careers in technology and entrepreneurship but also instil a strong work ethic and a capacity for continuous learning in a rapidly changing digital world.

Sustainable Living: DTI education plays a crucial role in promoting sustainable living by equipping learners with digital skills and an ethical mindset to tackle environmental and societal challenges. Examples include an understanding of the environmental implications of emerging technologies such as generative AI and blockchain, which often require high energy consumption. Encouraging critical awareness of their carbon footprint fosters responsible innovation and supports Bhutan's commitment to environmental sustainability and the principles of Gross National Happiness.

Health & Wellbeing: DTI education plays a vital role in learners' overall well-being by fostering healthy digital habits, balanced technology use, and awareness of online risks.

Digital Competence: DTI education serves as both the foundation and focal point of the curriculum, empowering learners to become confident, critical, and creative digital users. Through hands-on tasks such as coding, digital content creation, data analysis, and online collaboration, learners build essential skills for navigating the digital world. Topics such as cloud computing, cybersecurity awareness, and design thinking enhance their problem-solving abilities while deepening their understanding of technology's ethical and social impact.

Key benefits

Bhutan Assessment prepares students for life, helping them develop an informed curiosity and a lasting passion for learning. Our education gives students a clear path for educational success from age 6 to 19.

DTI supports the development of learners who are:

- **confident**, using a range of software
- **responsible**, using technology ethically
- **reflective** as learners, developing their knowledge and understanding of technologies to solve problems
- **innovative**, creating efficient solutions to problems
- **engaged**, in technology, how it is built and how software solutions are developed.

Key concept

Digital Technology and Innovation (DTI) was formally introduced into the Bhutanese school curriculum in the early 2000s as part of the country's effort to modernise education and prepare learners for a knowledge-based society. The Royal Government of Bhutan recognised the transformative potential of DTI in improving educational quality, promoting digital literacy, and enabling learners to participate meaningfully in the global economy (MoE, 2014). The inclusion of DTI in the curriculum was also aligned with the nation's development philosophy of Gross National Happiness (GNH), aiming to enhance learning outcomes while nurturing responsible and ethical use of technology (RGoB, 2008).

Initially offered as an elective subject at the secondary level, DTI has gradually expanded to include integration across subjects and levels, with increasing emphasis on digital competence, coding, and 21st-century skills (MoE, 2019). The curriculum development has been guided by the need to bridge the digital divide, particularly between rural and urban schools, and to equip learners with skills for employability and lifelong learning. Furthermore, the National Education Frameworks and policies, including Bhutan's *Education Blueprint 2014–2024*, underscore the role of DTI in driving innovation, enhancing access to learning resources, and enabling equitable education for all (MoE, 2014).

Bhutan's DTI curriculum continues to evolve, with current reforms focusing on integrating DTI not only as a standalone subject but also as a cross-cutting tool to enhance teaching and learning across disciplines. This approach aims to foster digital citizenship, critical thinking, and creativity among learners, preparing them to thrive in an increasingly digital world (BCSEA, 2020). In alignment with the vision for digital technology and innovation, the curriculum emphasises the development of future-ready skills such as computational thinking, coding, data literacy, and the ethical use of emerging technologies such as artificial intelligence, cloud computing, and cybersecurity. By embedding innovation-driven competencies within the curriculum, Bhutan seeks to empower learners to become active contributors to a knowledge-based society and catalysts for sustainable digital transformation.

Rationale

Equipping Learners with Essential 21st-Century Skills: DTI subject fosters critical digital competencies such as computational thinking, coding, data literacy, systems thinking, and problem-solving. These skills are crucial not only for careers in technology but also for navigating everyday life and active citizenship in a digital society.

Supporting Economic Diversification and Innovation: Bhutan's transition toward a knowledge-based economy demands a digitally literate and innovative workforce. DTI education lays the foundation for careers in DTI, AI, robotics, digital entrepreneurship, and other emerging sectors, reducing youth unemployment and supporting national innovation goals.

Ensuring Equity and Inclusion in Digital Competency: Providing DTI to all the learners ensures that digital literacy and innovation skills are not limited to urban or elite groups. A universal approach helps close the digital divide, promoting equitable access to opportunities and enabling all citizens to thrive in a digital society.

Promoting Digital Citizenship and Ethical Technology Use: DTI helps learners understand not only how to use technology but also how to engage with it ethically, safely, and responsibly. This includes media literacy, data privacy, cybersecurity awareness, and respectful online communication.

Aligning with Bhutan's Vision for Gross National Happiness: DTI supports all four pillars of Bhutan's GNH philosophy: it contributes to sustainable economic development, preserves culture through digital storytelling and content creation, supports environmental monitoring and conservation through technology, and promotes good governance via digital transparency and civic participation.

1.1 Recognition and Support

National and International Recognition

BCSEA qualifications are designed to meet high academic standards and prepare learners for success both within Bhutan and globally. Our DTI curriculum equips students with skills and knowledge that are valued by universities and employers worldwide.

Students who complete the DTI syllabus can confidently pursue higher education locally or internationally, as our programmes align with global expectations for analytical thinking, problem-solving, and ethical decision-making. Graduates are well-prepared to continue studies in DTI, or related fields, and are equally equipped for careers that demand practical and transferable skills.

Supporting Teachers

Effective education depends on the alignment of curriculum, teaching, learning, and assessment**.** BCSEA provides teachers with the guidance, resources, and professional development opportunities needed to deliver the DTI curriculum effectively.

Teachers have access to:

- **Planning and preparation resources**: syllabus frameworks, schemes of work, sample papers, and teacher guides.
- **Learning and revision tools**: model answers, past papers, and exemplars to support students' understanding and performance.
- **Results analysis and reporting**: insights from assessments to inform teaching strategies and improve student outcomes.

Professional Development in Assessment

As an awarding body, BCSEA offers targeted professional development focused on assessment. This ensures teachers and examiners:

- Understand assessment objectives and criteria.
- Can accurately interpret and apply marking schemes.
- Are skilled in providing feedback that supports learner improvement.
- Stay up-to-date with changes in assessment standards and processes.

Through this approach, BCSEA ensures high-quality assessment, fairness, and reliability, supporting both learners and educators in achieving excellence.

2. Syllabus Overview

2.1 Aims

The aims of this course are to enable students to develop:

- **computational thinking and problem-solving skills**, applying logic, abstraction, algorithms, and programming to real-world contexts.
- **an understanding of the core principles of computer systems**, including hardware, software, data, memory, operating systems, and emerging technologies.
- **knowledge of data representation, structures, and algorithms**, and how these influence efficiency, storage, and processing.
- **an understanding of modern communication systems and networking**, including protocols, mobile technologies, wireless systems, and cloud computing.
- **the ability to design, test, and evaluate** computer-based solutions, using programming, databases, web technologies, and robotics.
- **awareness of artificial intelligence concepts and practices**, including model training, bias, fairness, accountability, and ethical implications.
- **an understanding of cybersecurity principles and practices**, including cryptography, security frameworks, privacy, and legal/ethical concerns.
- **the capacity to analyze the impact of information and communication technologies and emerging technologies on individuals**, society, and the environment, adopting responsible and ethical practices.
- t**he skills to communicate, collaborate, and manage digital projects effectively**, using modern tools and teamwork strategies.

2.2 Content Overview

Class XI	Class XII
1. Computer systems and architecture	8. Advanced system software and emerging
2. Number systems and data representation	9. Communication and networking
3. Logic circuits	10. Cybersecurity and ethics
4. System software and operating systems	11. Computational thinking and programming
5. Emerging technologies	
6. Computer communication and networking	
7. Cybersecurity	

3. Assessment Overview

Paper 1

Theory **2 hours**

70 marks

Externally assessed written paper.
Students answer all questions.
Section A has 20 marks of multiple-choice questions with four answer options.
Section B has 50 marks of structured questions.

40% of the total mark.
Subject Content: minimum of 25% from class XI

Paper 2

Practical skills **2 hours**

70 marks

Externally assessed written paper.
Students answer all questions.
This paper has short structured questions in which students apply practical and problem-solving skills to a scenario.

40% of the total mark.

Coursework

Project work

40 marks

The coursework assignment is project work based on a context that is built upon all content in Grades XI and XII.
Internally assessed
Externally moderated

20% of the total mark.

3.1 Assessment objectives

The assessment objectives (AOs) are:

AO1: **Knowledge and understanding**
Demonstrate knowledge and understanding of the principles and concepts of computer science, including abstraction, logic, algorithms and data representation.

AO2: Application and analysis
Apply knowledge and understanding of the principles and concepts of computer science, including to analyse problems in computational terms.

AO3: Design, implementation and evaluation
Design, program and evaluate computer systems to solve problems, making reasoned judgements about these.

Weighting of assessment objectives

The weightings allocated to each of the assessment objectives (AOs) are summarised below.

Assessment objective	Weighting in Key Stage V (%)
AO1	30
AO2	30
AO3	40
Total	**100**

Approximate assessment objectives as a percentage of each component:

Assessment objective	Weighting in components (%)		
	Paper 1	**Paper 2**	**Coursework**
AO1	50	25	0
AO2	50	25	0
AO3	0	50	100
Total	**100**	**100**	**100**

3.2 Details of the assessment

Paper 1 Theory

Written paper, 2 hours, 70 marks.

All questions in the examination paper are compulsory.

Section A in this paper has 20 multiple-choice items of the four-choice type.
Section B in this paper has 50 marks of short-answer and structured questions.

Questions will test assessment objectives AO1 and AO2 and all topics of the Key Stage V curriculum content.

Paper 2 Practical Skills

Written paper, 2 hours, 70 marks.

All questions in the examination paper are compulsory.

Students will be asked two to three questions with multiple parts in which they are presented with a scenario. Students are asked to apply their practical and problem-solving skills to the given scenario.

Questions will test assessment objectives AO2 and AO3 and all topics of the Key Stage V curriculum content.

Where students are asked to give a response in programming code, students must write their answer in pseudocode.

Coursework

Project work, 40 marks
Internally assessed and externally moderated.

The coursework is a project carried out by students, testing assessment objective AO3 – Design, program, and evaluate computer systems to solve problems, making reasoned judgements about these.

Students will complete a digital innovation and technology project suitable for their context (school, local community, or personal initiative). The project must address a real-world problem or scenario.

Students are expected to spend approximately 70 hours to complete their project work across the duration of the qualification. This time allows for research, analysis, system design, programming, testing, and evaluation. This reflects the weighting of the component in the total assessment (20%).

Coursework Guidance

Further details about types of coursework task, mark schemes and guidance around administration will be provided before the first year of assessment.

3.4 Examination information

Structure of the question paper

All questions in the examination papers are compulsory. An approximate number of questions for each paper is given in the Assessment overview of this syllabus. Questions are of varied lengths and often contain several parts, labelled (a), (b), (c), which may have sub-parts (i), (ii), (iii), as needed.

Answer space

Candidates answer on the question paper. If additional space is required, candidates should use the blank page at the end of the question paper, where the question number or numbers must be clearly shown. Some questions might require candidates to sketch diagrams or provide an answer in pseudocode.

Materials not permitted in the examinations

The following tools and materials are **not** permitted for use by candidates in the examinations:

- Calculators
- Electronic devices
- Pre-prepared algorithms
- Pseudocode sheets, printed or handwritten reference sheets.

4. Grade descriptors

Grade descriptors are intended to illustrate the standards of achievement expected of candidates awarded particular grades. They provide a general indication of the performance required at Grades A, C and E. The descriptors are not mark schemes and should be interpreted in relation to the content of this syllabus, the assessment objectives, and the contexts in which tasks are set. They are designed to help teachers and examiners understand the level of performance typical of each grade, and to support benchmarking of candidate work.

Area of Knowledge	Typical performance at grade E	Typical performance at grade C	Typical performance at grade A
Computer Systems, Architecture, and Data Representation	**Key Areas of Knowledge:** memory hierarchy, CPU components, instruction cycle, addressing modes, negative number and floating-point representation, performance, data compression, error detection		
	Basic knowledge of system components and memory hierarchy. Performs simple number system conversions. Recognizes instruction cycle and CPU components. Limited understanding of floating-point and negative number representation.	Sound understanding of memory hierarchy, number systems, CPU operations, instruction and machine cycles, addressing modes, interrupts. Performs arithmetic operations and explains floating-point and error detection concepts.	Comprehensive understanding of system architecture, pipelining, hazard analysis, IEEE 754 floating-point, error detection/correction codes, interrupts, and instruction set architecture. Analyses and evaluates system performance.
Logic Circuits and Digital Systems	**Key Areas of Knowledge:** Boolean algebra, logic gates, truth tables, adders, multiplexers, flip-flops, counters, registers		
	Basic understanding of Boolean laws and logic gates. Constructs simple truth tables. Recognizes adders and flip-flops.	Applies Boolean algebra to simplify expressions. Designs logic circuits using truth tables. Explains adders, multiplexers, decoders, flip-flops, counters, and registers. Differentiates between combinational and sequential circuits.	Comprehensive understanding of digital circuits. Designs and analyses complex combinational and sequential circuits. Evaluates circuit designs for efficiency and correctness.
System Software and Operating Systems	**Key Areas of Knowledge:** OS types, process and memory management, file systems, device management, language translators		
	Basic awareness of OS functions, process/memory management, and language translators.	Explains OS types and functions, process scheduling, memory management, file	Detailed understanding of advanced OS concepts, scheduling, deadlock handling,

		systems, and translators.	virtual memory, file management, system software evaluation, and language translators.
Computer Communication and Networking	**Key Areas of Knowledge:** Networks, network types, topologies, transmission media, IP addressing, switching, routing, internet services		
	Basic knowledge of networks, topologies, devices, IP addressing, switching, and routing.	Explains network models, devices, IP addressing/subnetting, switching/routing, and internet services. Describes mobile communication technologies.	Comprehensive understanding of networks. Analyses network performance, routing algorithms, advanced addressing, web technologies, and evaluates real-world applications.
Cybersecurity, Ethics, and Emerging Technologies	**Key Areas of Knowledge:** Cyber threats, security measures, authentication, encryption, laws, AI, cloud, robotics		
	Basic awareness of cyber threats, protection, and ethical issues. Recognises AI, cloud, and robotics concepts.	Explains cybersecurity principles, attack types, encryption, authentication, AI, cloud computing, and robotics applications. Identifies cyber laws and ethical responsibilities.	Comprehensive understanding of cybersecurity frameworks, advanced security methods, ethical analysis, societal/legal/ environmental impacts of emerging technologies.
Computational Thinking and Programming	**Key Areas of Knowledge:** Problem decomposition, algorithms, pseudocode, OOP, file handling, data analysis, testing, project development		
	Breaks problems into sub-tasks. Writes basic programs. Performs basic file handling. Limited understanding of project development stages.	Designs structured solutions using computational thinking. Applies OOP, data structures, data analysis, and visualization. Tests, debugs, and documents programs effectively.	Designs efficient programs using advanced concepts. Performs complex data analysis and visualization. Evaluates program performance. Manages full project development lifecycle.

5. Command words

Command words and their meanings help candidates know what is expected from them in the exam. The table below includes command words used in the assessment for this syllabus. The use of the command word will relate to the subject context.

Command word	What it means
Analyse	examine in detail to show meaning, identify elements and the relationship between them
Assess	make an informed judgement
Calculate	work out from given facts, figures or information
Comment	give an informed opinion
Compare	identify/comment on similarities and/or differences
Complete	add information to an incomplete diagram or table
Consider	review and respond to given information
Contrast	identify/comment on differences
Define	give precise meaning
Demonstrate	show how or give an example
Describe	state the points of a topic / give characteristics and main features
Develop	take forward to a more advanced stage or build upon given information
Discuss	write about issue(s) or topic(s) in depth in a structured way
Draw	draw a line to match a term with a description
Evaluate	judge or calculate the quality, importance, amount, or value of something
Examine	investigate closely, in detail
Explain	set out purposes or reasons / make the relationships between things evident / provide why and/or how and support with relevant evidence

Give	produce an answer from a given source or recall/memory
Identify	name/select/recognise
Justify	support a case with evidence/argument
Outline	set out main points
Predict	suggest what may happen based on available information
Sketch	make a simple freehand drawing showing the key features, taking care over proportions
State	express in clear terms
Suggest	apply knowledge and understanding to situations where there are a range of valid responses in order to make proposals
Summarise	select and present the main points, without detail
Write	write an answer in a specific way

6. What else you need to know

This section provides key information about the syllabus and administrative processes. It is intended to help teachers, candidates, and schools understand how to manage entries, assessments, and access arrangements effectively. More information is available on the BCSEA portal (www.bcsea.bt) and through official guidance documents.

6.1 Before you start

Previous study
Learners beginning this course are recommended to have completed prior study in Digital Technology and Innovation equivalent to the Bhutan Certificate of Secondary Education (BCSE).

Guided learning hours
The course is designed to require approximately 140 guided learning hours for class XI and 140 guided learning hours for Class XII.

Combining with other syllabuses
Candidates may take this syllabus alongside other BCSEA syllabuses, except where syllabuses have the same name and key stage.

Making entries
Schools are responsible for submitting candidate entries. Schools should ensure candidates are entered for the correct syllabus components. Entry instructions are available in the Operation Guidelines for Examination and Assessment (OGEA) available at www.bcsea.bt.

Retakes
Candidates may retake strand Digital Technology and Innovation components as required.

Language
This syllabus and all assessment materials are available in English only.

6.2 Accessibility and equality

Syllabus and assessment design

- BCSEA aims to avoid discrimination and maximise inclusivity for all candidates, including those with special educational needs and disabilities (SEN), religion, gender, or other protected characteristics.
- Materials are designed to be accessible, using clear language and design principles.

Access arrangements

- BCSEA provides access arrangements to minimise barriers for candidates with SEN, disability, illness, or injury.
- Arrangements should reflect a candidate's normal way of working. Approval must ensure that adjustments are reasonable, cost-effective, and do not compromise assessment integrity.
- schools should confirm access arrangements at the start of the course. For special arrangements not included in standard lists as per OGEA, contact BCSEA for guidance.
- Candidates unable to access all components may receive an award based on completed components.

6.3 After the exam

Grading and reporting

Grades A, B, C, D or E indicate the standard a candidate achieved at BHSEC level. 'A' is the highest and 'E' is the lowest grade.

'Ungraded' (U) means that the candidate's performance did not meet the standard required for the lowest grade (E or e).