

# Contents

## Chapter 1: Introduction 1

### 1.1 Terminology 1

- What is information and communication technology? 1
- What is computer science? 2
- What is ITGS? 2
- What does the term *global society* mean? 2
- What are social issues? 3
- What are ethical issues? 3
- What does Theory of Knowledge (ToK) have to do with the course? 4

### 1.2 Data and information 4

- What are the differences between data and information? 4
- What are ADC and DAC? 5
- What is microfilm? 5
- What are the advantages and disadvantages of analogue and digital data? 6
- What are some decisions when making analogue to digital conversions? 6

### 1.3 A brief history of early computing 7

- When was the first computer invented? 7
- What was the first commercial computer? 8
- What are the five generations of computers? 8
- What were some early personal computers? 9
- What is Moore's law? 10

## Chapter 2: Social and ethical issues 11

### 2.1 Reliability and integrity 11

- Reliability and integrity: Is the data correct? How well does the hardware work? 11
- Data integrity case study: The story of an upload mishap 12

### 2.2 Security 13

- Security: How can computer systems and data be protected? 13
- Security case study: A virus infection 14

### 2.3 Privacy and anonymity 15

- Privacy and anonymity: How can personal data be kept secret? 15
- Privacy case study: When deleted files are not really deleted 15

### 2.4 Intellectual property 16

- Intellectual property: Who owns the piece of work? 16
- Intellectual property case study: A copyright dispute 16

### 2.5 Authenticity 17

- Authenticity: Are you really the person who you claim to be? 17
- Authenticity case study: The case of a stolen identity 17

### 2.6 The digital divide and equality of access 19

- The digital divide and equality of access: What is accessibility? 19
- The digital divide and equality of access: On the support of a school 19

### 2.7 Surveillance 20

- Surveillance: Monitoring and controlling the activities of users 20
- Surveillance case study: The story of the notebook class 20

### 2.8 Globalization and cultural diversity 22

- Globalization and cultural diversity: On the making of a smaller world 22
- Globalization case study: The problem with the keyboard 22

### 2.9 Policies 23

- Policies: The importance of rules and regulations 23
- Policies case study: The chip card system 24

- 2.10 *Standards and protocols* 25
  - Standards and protocols: Ensuring interoperability 25
  - Standards and protocols case study: The case of lost standards 25
- 2.11 *People and machines* 26
  - People and machines: IT and its impact on a person 26
  - People and machines case study: When technology alone is not enough 26
- 2.12 *Digital citizenship* 27
  - Digital citizenship: What is responsible computer use? 27
  - Digital citizenship case study: Don't trust computers? Don't trust yourself! 27

## **Chapter 3: Information technology systems 29**

- 3.1 *Hardware* 29
  - 3.1.1 The computer system 29
  - 3.1.2 Input and output devices 40
  - 3.1.3 Social and ethical/ToK 53
- 3.2 *Software* 62
  - 3.2.1 Fundamentals 62
  - 3.2.2 System utilities 75
  - 3.2.3 Malware 78
  - 3.2.4 Utility software 82
  - 3.2.5 Social and ethical/ToK 84
- 3.3 *Networks* 94
  - 3.3.1 Network technologies 94
  - 3.3.2 Network functionality 104
  - 3.3.3 Network administration 107
  - 3.3.4 Social and ethical/ToK 116
- 3.4 *Internet* 124
  - 3.4.1 Fundamentals 124
  - 3.4.2 Tools 135
  - 3.4.3 Services 147
  - 3.4.4 Internet threats and security 151
  - 3.4.5 Social and ethical: ToK 155
- 3.5 *Personal and public communications* 163
  - 3.5.1 Technologies 163
  - 3.5.2 Services 167
  - 3.5.3 Social and ethical/ToK 169
- 3.6 *Multimedia* 172
  - 3.6.1 Theoretical concepts 172
  - 3.6.2 Data collection 176
  - 3.6.3 Product development 179
  - 3.6.4 Components: Text 183
  - 3.6.5 Graphics, images and animations 187
  - 3.6.6 Audio 194
  - 3.6.7 Video 196
  - 3.6.8 Integrating the components 199
  - 3.6.9 Social and ethical/ToK 205
- 3.7 *Databases* 213
  - 3.7.1 Database organization 213
  - 3.7.2 Database functions 219
  - 3.7.3 Data storage and access 222
  - 3.7.4 Social and ethical/ToK 223
- 3.8 *Spreadsheets, modelling and simulations* 228
  - 3.8.1 Theoretical and practical concepts for spreadsheets 228
  - 3.8.2 Modelling and simulation technologies and considerations 236
  - 3.8.3 Developing and using models and simulations 239

- 3.8.4 Social and ethical/TOK 242
- 3.9 *Project management* 247
  - 3.9.1 Theoretical fundamentals 247
  - 3.9.2 The product development life cycle 250
- 3.10 *IT systems in organizations* 253
  - 3.10.1 Information systems, people and teams 253
  - 3.10.2 The system development life cycle 255
  - 3.10.3 Project management issues 258
- 3.11 *Robotics, artificial intelligence and expert systems* 269
  - 3.11.1 Robotics 269
  - 3.11.2 Artificial intelligence 271
  - 3.11.3 Expert systems 279
  - 3.11.4 Applications of robotics, artificial intelligence and expert systems 282
  - 3.11.5 Social and ethical/ToK 287

## **Chapter 4: Application to specific scenarios 291**

- 4.1 *Application to specific scenarios: Business and employment* 291
  - 4.1.1 Traditional businesses 291
  - 4.1.2 Online business and e-commerce 296
  - 4.1.3 Transportation 301
- 4.2 *Application to specific scenarios: Education and training* 308
  - 4.2.1 Distance learning over large areas 308
  - 4.2.2 Use of IT in teaching and learning 311
  - 4.2.3 Hardware and network technologies in the classroom 316
  - 4.2.4 Provision for special needs 319
  - 4.2.5 School administration 320
- 4.3 *Application to specific scenarios: Environment* 322
  - 4.3.1 Modelling and simulations 322
  - 4.3.2 Satellite communication 325
  - 4.3.3 Mapping and virtual globes 326
  - 4.3.4 E-waste 329
  - 4.3.5 Resource depletion 332
- 4.4 *Application to specific scenarios: Health* 334
  - 4.4.1 Diagnostic and therapeutic tools 334
  - 4.4.2 Online medical information and sales 338
  - 4.4.3 Medical research 344
  - 4.4.4 Psychological and physical issues 345
- 4.5 *Application to specific scenarios: Home and leisure* 348
  - 4.5.1 Homes and home networks 348
  - 4.5.2 Digital entertainment 351
  - 4.5.3 Social networking 354
  - 4.5.4 Published and broadcast information 356
  - 4.5.5 Digital policing 357
  - 4.5.6 Hardware, software and networks 359
- 4.6 *Application to specific scenarios: Politics and government* 361
  - 4.6.1 Political processes 361
  - 4.6.2 Government information sites 364
  - 4.6.3 Access to personal information held on government databases 366
  - 4.6.4 Government control and use of information 367
  - 4.6.5 Law and order 369
  - 4.6.6 Military 371

**Chapter 5: Assessment 373****5.1 Internal assessment 373**

What is the ITGS internal assessment? 373

What are the parts of the documentation? 374

What are the formal requirements? 375

**5.2 External assessment 375**

What are the definitions of the command terms? 375

Assessment objective 1: Knowledge and understanding 375

Assessment objective 2: Application and analysis 375

Assessment objective 3: Synthesis and evaluation 376

External assessment overview 376

SL Paper 1 and HL Paper 1 377

SL Paper 2 and HL Paper 2 377

Paper 3 (HL only) 377

What are stakeholders? 377

**Glossary 379****Index 390**