

# Diploma in Geo-Spatial Information and Technology (Part Time)

Geographic Information System (GIS) applications are in great demand nowadays due to many of their value-added services. To generate any recommended solution using GIS applications, there must be accurate data collected by the land surveyors. In addition, the development of many new challenging construction and civil engineering projects also requires a higher level of service from the land surveyors.

The part-time Diploma in Geo-Spatial Information and Technology offers graduates the integratead domain knowledge of various surveying techniques and GIS applications with the use of latest technology and equipment. Developed in collaboration with the **Singapore Institute of Surveyors and Valuers (SISV)**, this diploma creates a unique opportunity for graduates to venture into different aspects of the surveying services. With this, graduates are able to begin or advance their career in the surveying and geospatial profession.



## PROGRAMME OBJECTIVES

This programme has been structured to meet the following objectives:

- (I) Enable graduates to comprehend the fundamental principles and knowledge in the following domains:**
  - Land surveying
  - Engineering surveying
  - Cadastral surveying
  - Satellite-based surveying
  - Underground surveying
  - Hydrographic surveying
  - Geographical Information System (GIS)
- (II) Equip graduates with the domain relevant skills such as:**
  - Operating surveying equipment
  - Collecting data
  - Applying GIS / GPS software
  - Setting out physical sites for engineering works
  - Mapping the earth and the sea floor
  - Establishing property boundaries
  - Analysing data information about land, water and other natural resources for environment and resource management
  - Evaluating data obtained to consult clients on optimal alternatives
- (III) Equip graduates with necessary problem-solving and management skills such as:**
  - Effective communication across all levels in an organisation
  - Creative and think-out-of-the-box problem-solving skills
  - Contract administration and project management skills
- (IV) Cultivate in the graduates positive attitudes such as:**
  - Being meticulous in data collection
  - Ensuring integrity and accuracy in data handling
  - Being open-minded in upgrading themselves and adopting new technology to enhance productivity

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## ENTRY REQUIREMENTS

The candidate must be a Singapore Citizen or Permanent Resident or holder of a valid employment pass/work permit; and possesses any **ONE** of the following criteria:

3 GCE 'O' LEVEL results

- a) English (Grade 1 – 7);
- b) Mathematics (Grade 1 – 6); and
- c) a relevant subject (Grade 1 – 6).

### OR

5 GCE 'N' LEVEL results

- a) English (Grade 1 – 8);
- b) Mathematics (Grade 1 – 7);
- c) 3 other subjects (Grade 1 – 8); and at least 1 year of relevant working experience.

### OR

ESS Workplace Literacy and Numeracy Level 5; and at least 1 year of relevant working experience.

### OR

HIGHER NITEC / ITC

### OR

NITEC / NTC and at least 1 year of relevant working experience.

Candidates whose GCE "O" or "N" level results fall below the criteria will have to sit for an English and/or Mathematics test. Candidates who possess equivalent qualifications but whose language of instruction was not English may also be required to take the test.

Candidates who have completed one or more surveying certificates issued by SISV will be offered exemption from certain courses within the diploma.

## Course synopsis

### GT051 LAND SURVEYING

This course provides students with an overview of land surveying, map and plan interpretation, pre-computation plan and setting out plan and survey computation. Students will learn levelling and computation of heights using digital level; measure horizontal angles, zenith angles, slope distance and electronic tacheometry using electronic total station. Students will do group tutorials and projects on field surveys.

### PE904 MATHEMATICS 1

This course covers topics including algebra, factors and factoring, quadratic equations, functions, graphs, trigonometry identities and equations, right triangles and vectors, linear equation, differentiation, exponents, logarithms and complex numbers.

### FB851 TECHNICAL COMMUNICATIONS

This course teaches students the use of effective words and techniques in writing technical reports, academic reports, minutes of meetings and memorandums. Students will also learn how to use effective visual aids and master the skills involved to plan and deliver powerful presentations.

### GT052 ENGINEERING SURVEYING

This course teaches students components of a relational database system and the various object-oriented modelling techniques with a particular focus on Internet-based application development. Topics covered include conceptual, logical and physical design of relational database,

use of SQL in data definition, retrieval and manipulation, administration, backup, security and integrity, recovery and concurrency.

### FB825 INFORMATION AND COMMUNICATION TECHNOLOGY

This course is designed to provide students with a broad understanding of the hardware and software components of the information technology. Topics covered include concepts and design of the digital computer system, operating system, networking, client-server architecture, information processing, communication systems, the Internet architecture and system development life cycle as well as awareness of trends, security, crime and ethics in the information industry. The course also introduces students to the underlying method of computer programming in terms of data structure and algorithms, outside of any particular programming language, with particular focus on designing the data items and aspects of information security from application to system and network level. Topics covered here include aspects of information security policy, procedures, guidelines, standards, methods, process, tools and technologies used to meet confidentiality, integrity, authentication, non-repudiation and authorisation requirements.

### GT053 SURVEYING COMPUTATION AND STATISTICS

This course equips students with the basic knowledge and skill in reduction of survey observations into useful spatial data; perform calculation pertaining

to layout of engineering structure for construction; horizontal and vertical route alignment and setting out survey. The students will also learn basic statistics to access the accuracy, uncertainty of survey measurements and the quality of measurements adopted for survey. Students will do group tutorials and assignments.

### GT054 SATELLITE-BASED SURVEYING

This course equips students with the knowledge on the basic theory of GPS/GNSS, the types of GPS/GNSS equipment and their applications to land surveying. The use of differential GPS techniques, workflow to survey using GPS/GNSS, processing of observables, Network adjustment and SLA's SIRENT reference network (Network RTK) in control survey, cadastral survey, setting out survey and mapping application will be covered. Students will do group tutorials and projects on field surveys.

### GT418 LAND LAW AND ADMINISTRATION

This course equips students with the knowledge of the essential land legislations and administration of relevance to cadastral surveying in Singapore. It will also cover the statutory definition of land and the different land grants and uses pertaining to private lands and state lands. Topics will include alienation, compulsory acquisition, title registrations, development, planning, reclamation & erosion of land and encroachment issues. Students will also learn about the importance and purpose of cadastral surveying and the relevant

survey plans in providing such services and records required under the respective land law and administration in Singapore. Students will do group tutorials.

### GT865 2D CAD FOR SURVEYING

This course aims to equip the students with the necessary computer aided drafting tools to carry out the drafting of topographical maps, pre-computation plans, "as-built" drawing of completed building projects, longitudinal sections, cross sections of the development site and subdivision of land parcels. The students will need to understand basic mapping symbols, creation of a library of these symbols in the CAD environment. The students will be taught to handle and understand scale factors, both in the horizontal and vertical scales. They will be able to set the necessary surveying units in the 2D CAD environment. The student will be introduced to the software to process the field surveys data and imports them into the CAD drawing for editing to complete the final drawing. Emphasis on the CAD tools for surveying purpose will be made and explained. Students will do group laboratory and projects on 2D drafting.

### GT867 SPATIAL DATA INFRASTRUCTURE 1

The first section of a two-part course aims to provide the students with a broad understanding of the concept of Spatial Data Infrastructure (SDI) in order to gain an insight on its objectives, benefits, stakeholders involved and the challenges associated with SDI implementation. Students will also be introduced to SDI's

## PROGRAMME STRUCTURE

### YEAR 1 – SEMESTER 1

- GT051** Land Surveying
- PE904** Mathematics 1
- FB851** Technical Communications

### YEAR 1 – SEMESTER 2

- GT052** Engineering Surveying
- FB825** Information and Communication Technology
- GT053** Surveying Computation and Statistics

### YEAR 2 – SEMESTER 1

- GT054** Satellite-based Surveying
- GT418** Land Law and Administration
- GT865** 2D CAD for Surveying
- GT867** Spatial Data Infrastructure 1

### YEAR 2 – SEMESTER 2

- GT055** Cadastral Surveying
- GT703** Project Management
- GT866** 3D CAD for Surveying
- GT868** Spatial Data Infrastructure 2

### YEAR 3 – SEMESTER 1

- GT056** Underground Surveying
- GT869** Geo-Spatial Information Systems 1
- GT926** Special Topics

### YEAR 3 – SEMESTER 2

- GT871** Applied Geo-Spatial Applications
- GT057** Hydrographic Surveying
- GT870** Geo-Spatial Information Systems 2

**A one-year on-the-job training (OJT) is required prior to award of this diploma. The training will be conducted concurrently with the academic programme.**

## CAREER PROSPECTS

Upon completion of the diploma programme, graduates will be competent to become assistant surveyors; surveyors or specialists in the following jobs:

- Cadastral or Title Surveys (as assistant to Registered Surveyors);
- Engineering & Construction Surveys;
- Topographic Surveys;
- Hydrographic Surveys;
- Geodetic Surveys;
- GIS (Geographic Information Systems) Services.

## AWARD OF CERTIFICATE

A participant must attain at least 75% of physical attendance and complete all assignments to acceptable standards to be eligible to take the examination at the end of the course. Students who pass all semester examinations will be awarded a Diploma in Geo-Spatial Information and Technology.

components including policy, data, institutional framework, standards, metadata and applications. This allows the students to appreciate the relevance of other courses taught in the bigger picture towards a spatially-enabled nation.

### **GT055 CADASTRAL SURVEYING**

This course is designed to prepare students to conduct cadastral surveys as legislated under the Boundaries & Survey Maps (Conduct of Cadastral Surveys) Rules and in accordance with the Co-ordinated Cadastral Surveying System. Students will learn about the whole work flow and processes starting from the request for surveys, the cadastral surveying work conducted by Registered Surveyors to the approval of the survey plans by the Chief Surveyor. It will impart the essential and necessary theoretical and practical skills for students to perform cadastral surveys in accordance with the legislation, CS Directives on Cadastral Survey Practices and the CS Circulars & Notices. This course covers both the field and office processing for executing sound cadastral practices in Singapore. Students will do group tutorials and projects on field surveys.

### **GT703 PROJECT MANAGEMENT**

This course covers the fundamental concepts of project management and identifying broad project management knowledge. Students are introduced to the management of project scope, time, cost, risk, quality, safety, human resources, communications and management of externalities. They will learn the

importance of site organization and management, and ways to set up an effective and efficient site. Students will also understand the role of IT and learn how to use Microsoft Project software to do project planning and scheduling.

### **GT866 3D CAD FOR SURVEYING**

This course aims to equip the students with the necessary knowledge and skill to draft in the 3D CAD environment. The student will learn to produce contours in 3D and use them to create digital terrain models in TIN and GRID (raster) format in order to compute volumes, prepare the cut and fill plans for earthworks purposes. They will also be introduced to creating 3D building models and rendering of such models for a more realistic presentation with fly through using relevant software. Students will do group laboratory and projects on 3D drafting.

### **GT868 SPATIAL DATA INFRASTRUCTURE 2**

The second part of the course explores more detailed implementation issues through case studies of actual SDI examples at national and regional levels. It aims to provide deeper understanding on specific key challenges faced in SDI implementation on both policy and technical areas. There will be benchmarking between few SDIs for comparison.

### **GT056 UNDERGROUND SURVEYING**

This course provides students with the essential knowledge and skills required to provide the surveying services for the constructions of the underground

MRT structures and other tunnelling projects. Students will learn how to carry out datum transfer, underground control survey, setting out survey, pre-computations and as-built surveys of tunnels and tracks. They will be required to do group tutorials and some site visits and field surveys in a simulated environment.

### **GT869 GEO-SPATIAL INFORMATION SYSTEMS 1**

This first section of a two-part course will introduce to the students the concept of geo-database and geographic information system (GIS). An outline of the nature, management and presentation of geographic data as well as applications of GIS will be covered. Geocoding in the Singapore context will also be taught. The students will learn how to design and build a geo-database and also to construct a GIS map. The integration of the two to form a simple working GIS will be a student group project.

### **GT926 SPECIAL TOPICS**

This course provides exposure to students to specialised and/or new technologies of relevant applications to geo-spatial industry of Singapore.

### **GT871 APPLIED GEO-SPATIAL APPLICATIONS**

This course puts in practice what the students had learnt in Satellite-based Surveying and Geo-spatial Information Systems 1 and 2 into real life applications in Singapore. It will cover GIS mapping using GPS, use of GPS in monitoring of engineering structures, use of GPS and GIS map in navigation, use of GPS in

height determination, etc. Students will do group tutorials and projects on GIS Mapping.

### **GT057 HYDROGRAPHIC SURVEYING**

This course equips the students with the knowledge to conduct single beam echo sounding survey. It covers the following: theory of echo sounder; narrow beam and broad beam echo sounder and the different methods and theory of the echo sounder calibrations; the control of survey launch and theory of boat handling to run the survey lines; simple theory of tide, setting up tide board and automatic tide gauges; establish Chart Datum on tide board/tide gauges; reducing sounding to Chart Datum. The primary positioning in sounding survey is Differential GPS which is covered in the Satellite-Base Surveying course. A practical single beam hydrographic survey will be arranged in a survey launch at the end of the course to demonstrate the theory learnt and to view the full process of hydrographic survey.

### **GT870 GEO-SPATIAL INFORMATION SYSTEMS 2**

This second part of a two-part course will introduce to the students the application of GIS in various spatial analysis. It will include an overview of geographic data quality and data display. The students will learn how to extract geo-spatial data from the analyses and also the reverse process of displaying map location from the textual data. Students will do group tutorials and projects on spatial analysis.

# Administration Details and General Information

## COURSE FEES AND DURATION

PART TIME DIPLOMA PROGRAMME	FEES	DURATION
Geo-Spatial Information and Technology	S\$15,087.00*	3 years - 6 semesters

\*Approval to utilize subsidies from the Skills Development Fund (SDF) for this diploma programme is still pending.

The amount shown is inclusive of Goods & Services Tax (GST) of 7% which is the prevailing GST at the time of printing this prospectus. The course fee is subject to change from year to year.

## ACADEMIC TRANSCRIPT

First copy is issued free upon graduation. Additional copies are charged at S\$5.35 per copy.

## WITHDRAWAL

If the notice of withdrawal is received by BCA Academy 14 working days or more before the course/semester commencement date, 90% of the fee paid will be refunded. If the notice of withdrawal is received by BCA Academy between 4 to 13 working days before the course/semester commencement date, 75% of the fee will be refunded. If the notice of withdrawal is received by BCA Academy less than 4 working days before the course/semester commencement date, no refund will be given.

## REPLACEMENT

Replacement of participants is allowed if the substitute meets all the entry requirements and the request is made at least 4 working days before the course/semester commencement date.

## DEFERMENT

If the application for deferment is received by BCA Academy 14 working days or more before the course/semester commencement date, an administration fee of 10% of the original course/semester fee is chargeable. If the application is received by BCA Academy less than 14 working days but more than 3 working days before the course/semester commencement date, an administration fee of 25% of the fee is chargeable. No deferment is allowed if the notice is received by BCA Academy less than 4 working days before the course/semester commencement date. Under the circumstance, the case will be treated as a withdrawal unless the registered participant decides to proceed with the original course.

## PROGRAMME SWITCHING

Application for programme switching must be submitted to the BCA Academy at least 4 working days before the course/semester commencement date. If the application is approved, the participant may be given a refund if the fee of the new programme is lower than that of the original programme. However, any refund arising from programme switching shall not be more than 10% of the fee of the original programme.

For enquiries, please call 6248-9999; or email to [bca\\_academy@bca.gov.sg](mailto:bca_academy@bca.gov.sg)