

BCA ACADEMY



## CERTIFICATION COURSE FOR

- Green Mark Advanced Accredited Professional (GM AAP)
- Green Mark Advanced Accredited Professional (Facilities Management) (GM AAP(FM))

## INTRODUCTION

In 2005, the Singapore government embarked on the green building movement and launched the BCA Green Mark scheme as a benchmark for evaluating environmental sustainability in buildings. The scheme has since become a leading green building rating system in the tropics and sub-tropics.

Against the backdrop of climate change and global warming, green building design, sustainable operations and maintenance are gaining more importance than ever to be key opportunities to cope with impact of climate change and reduce environmental impact of urban living.

In order to advance Singapore's sustainability agenda, there is a critical need to develop a pool of competent green building specialists to design, develop, manage and maintain green buildings. Certification courses on Green Mark are offered to stakeholders of the built environment sector at both entry and advanced levels to acquire knowledge and specialisation, which enable them to steer their organisations towards greater competitiveness in local and international markets.

## COURSE STRUCTURE

Each certification course comprises:

**1** Foundation Module

**5** Core Modules

**4** days of Elective Modules

### **Certification Course for Green Mark Advanced Accredited Professional (GM AAP)**

*Formally known as the Certification Course for Green Mark Professional (GMP)*








The GM AAP course aims to equip industry practitioners who are involved in **new developments** with the knowledge and skills to carry out detailed design and enhancement of building performance for higher Green Mark certification and implementation, with emphasis on **super low energy buildings**.

### **Certification Course for Green Mark Advanced Accredited Professional (Facilities Management) (GM AAP(FM))**

*Formally known as the Certification Course for Green Mark Facilities Professional (GMFP)*

The GM AAP(FM) course aims to provide professionals working on **existing buildings** with advanced level technical knowledge and skills to manage, maintain and operate green buildings at optimal efficiency, and perform post occupancy evaluation.

## MODULES, MODULAR COURSE FEE AND DURATION

Course Title	Certification Course for Green Mark Advanced Accredited Professional (GM AAP)	Certification Course for Green Mark Advanced Accredited Professional (Facilities Management) (GM AAP(FM))
<b>Formally Known as</b>	<i>Certification Course for Green Mark Professional (GMP)</i>	<i>Certification Course for Green Mark Facilities Professional (GMFP)</i>
<b>Foundation Module<sup>^</sup></b> (Compulsory)	<b>Certification Course for Green Mark Accredited Professional (GM AP)</b> 4.5 days / S\$1,220	<b>Certification Course for Green Mark Accredited Professional (Facilities Management) (GM AP(FM))</b> 4.5 days / S\$1,220
<b>Core Modules<sup>#</sup></b> (Compulsory)	<b>Design, Optimisation and Measurement of High Efficiency Central Air-Conditioning System</b>  4 days / S\$1,200	
	<b>Building Performance Simulation</b>  3 days / S\$1,250	<b>Energy Efficiency Through Management and Audit</b> 2 days / S\$930
	<b>CFD Modelling for Natural Ventilated Buildings</b>  3 days / S\$1,660	<b>Indoor Air Quality (IAQ) Management for Buildings</b> 2 days / S\$930
	<b>Efficient Building Envelope Design, ETTV and RETV</b> 2 days / S\$690	<b>Retro-Commissioning and Performance Contracting</b> 3 days / S\$1,470
	<b>Strategies for Passive Design and Maintainability</b>  2 days / S\$770	<b>Strategies for Smart Facilities Management (FM) and Maintainability</b>  2 days / S\$790
<b>Elective Modules</b> (Complete at least 4 days)	<b>1-DAY COURSE</b>	
	Building Automation Concepts, Technologies and Practices for Green Buildings*	S\$500
	Green Architecture and Integrated Design Process*	S\$500
	Sustainable Hot Water and Heat Recovery Systems*	S\$500
	<b>2-DAY COURSE</b>	
	BIM for Building Lifecycle and Facility Management* 	S\$680
	Energy Efficiency for Electrical System*	S\$825
	Solar Architecture* 	S\$650
	Sustainable Lighting Design and Technology*	S\$930
	<b>3-DAY COURSE</b>	
Solar Modelling*	S\$1,200	

<sup>^</sup> Assessment-based module. Assessment comprises an MCQ test and a group project conducted 2 weeks later.

<sup>#</sup> Assessment-based module. Format of assessment includes in-class assignment, in-class hands-on assignment and / or MCQ test.

\* Non-assessment-based module.

## PACKAGE FEE

COURSE TITLE	DURATION	PACKAGE FEE <sup>##</sup> (inclusive of GST)
Certification Course for Green Mark Advanced Accredited Professional (GM AAP)	22.5 days	S\$8,090
Certification Course for Green Mark Advanced Accredited Professional (Facilities Management) (GM AAP(FM))	21.5 days	S\$7,840

Note

- Professionals who commit the package fee rate are required to complete the foundation, core and elective modules within 2 years from the commencement of any module.
- Professionals are also welcomed to sign up for the individual modules under the GM AAP and GM AAP(FM). Course fee of the respective module shall apply.

<sup>##</sup> Professionals who have successfully completed the foundation module (or the Certification Course for Green Mark Manager / Certification Course for Green Mark Facilities Manager) could also sign up for the GM AAP and GM AAP(FM) package course. The course fee of foundation module shall be deducted from the package fee.

## KEY TOPICS

Certification Course for Green Mark Advanced Accredited Professional (GM AAP)	Certification Course for Green Mark Advanced Accredited Professional (Facilities Management) (GM AAP(FM))
<b>FOUNDATION MODULE</b> <i>(Compulsory)</i>	
<b>GM AAP</b> <ul style="list-style-type: none"> <li>Green Building Initiatives and Regulatory Framework</li> <li>Green Mark Criteria for Non-Residential and Residential Buildings</li> <li>Active and Passive Green Building Design Strategies and Technologies</li> <li>Design for Maintainability (DfM)</li> </ul>	<b>GM AAP(FM)</b> <ul style="list-style-type: none"> <li>Green Mark Criteria for Existing Non-Residential Buildings, Certification and Re-Certification</li> <li>Tenant and Occupant Engagement Practices</li> <li>Smart Control Technologies, Practical Solutions and Strategies for Buildings</li> <li>Design for Maintainability (DfM)</li> </ul>
<b>CORE MODULE</b> <i>(Compulsory)</i>	
<b>Design, Optimisation and Measurement of High Efficiency Central Air-Conditioning System</b> <ul style="list-style-type: none"> <li>Air-Conditioning System – Overview, Design and Optimisation</li> <li>Smart and Predictive Solutions to Improve Reliability, Productivity and Energy Efficiency</li> <li>Measurement and Verification (M&amp;V) Guidelines and Standards</li> <li>BCA Requirements for Mandatory Periodic Chiller Plant Audit and Operating System Efficiency (OSE) Report</li> <li>Super Low Energy Building (SLEB) – General Concept, Strategies, Integration and Application</li> </ul>	
<b>Building Performance Simulation</b> <ul style="list-style-type: none"> <li>Green Mark Criteria for Energy Modelling</li> <li>Introduction to Software – Fundamentals and Use</li> <li>3D Geometry Model Development for Baseline, Simulation, and Data Analysis</li> <li>Case Study, Practical Sessions and Hands-on Assignment</li> </ul>	<b>Energy Efficiency Through Management and Audit</b> <ul style="list-style-type: none"> <li>Overview of Energy Management</li> <li>Tools for Appraising Energy Management Performance</li> <li>Energy Economic Analysis</li> <li>Energy Audit and Preparation of Report</li> </ul>
<b>CFD Modelling for Natural Ventilated Buildings</b> <ul style="list-style-type: none"> <li>CFD Process and Use of CFD Software</li> <li>Creating 3D Geometry Model, Meshing Computational Model, Boundary Conditions, Numerical Settings</li> <li>Practical Sessions and Hands-on Assignment</li> </ul>	<b>IAQ Management for Buildings</b> <ul style="list-style-type: none"> <li>Standards, Guidelines, Measurement and Verification and Green Mark Requirements for IAQ</li> <li>Air-Conditioning and Mechanical Ventilation (ACMV) for Good IAQ</li> <li>Consideration in Design, Construction, Renovation and Commissioning Works</li> <li>IAQ Audit for Buildings</li> </ul>
<b>Efficient Building Envelope Design, ETTV and RETV</b> <ul style="list-style-type: none"> <li>Building Envelope – Design and Functions for Efficiency</li> <li>Key Concepts on Daylighting</li> <li>Efficient Building Envelope and Innovative Façade Design</li> </ul>	<b>Retro-Commissioning and Performance Contracting</b> <ul style="list-style-type: none"> <li>Retro-Commissioning – Introduction, Identification of the Need and Stages</li> <li>Performance Contracting – Introduction, Development of Plan, Process and Implementation, and Legal Documentation</li> <li>Economic Analysis and Measurement and Verification</li> </ul>
<b>Strategies for Passive Design and Maintainability</b> <ul style="list-style-type: none"> <li>Design for Maintainability (DfM) and Maintainability in Design Appraisal System (MiDAS)</li> <li>Passive Design and Ventilation – Introduction and Strategies</li> <li>Design of Façade</li> <li>Thermal Comfort for Tropical Conditions</li> </ul>	<b>Strategies for Smart FM and Maintainability</b> <ul style="list-style-type: none"> <li>Design for Maintainability (DfM) and Maintainability in Design Appraisal System (MiDAS)</li> <li>Smart FM – Fundamentals, Benefits, Framework and Implementation</li> <li>Building Data – Management and Analysis</li> <li>Smart FM Systems, and Integration of FM Services</li> </ul>

Certification Course for Green Mark Advanced Accredited Professional (GM AAP)	Certification Course for Green Mark Advanced Accredited Professional (Facilities Management) (GM AAP(FM))
<b>ELECTIVE MODULES</b> <i>(Complete at least 4 days)</i>	
<b>1-Day Course</b>	
<p><b>Building Automation Concepts, Technologies and Practices for Green Buildings</b></p> <ul style="list-style-type: none"> <li>• Building Automated System (BAS) – Overview, Sensors and Field Instruments, and Control Basics</li> <li>• Energy Management Strategies for HVAC Control Systems and Lighting Management System</li> <li>• Building Management for Indoor Environmental Quality and Building Performance</li> </ul>	
<p><b>Green Architecture and Integrated Design Process</b></p> <ul style="list-style-type: none"> <li>• The Greening Challenge</li> <li>• The Design Process – Theory and Practice</li> <li>• Multi-Disciplinary Collaboration – Perspective Gaps and Value</li> </ul>	
<p><b>Sustainable Hot Water and Heat Recovery Systems</b></p> <ul style="list-style-type: none"> <li>• Hot Water and Heat Recovery Systems – Fundamentals and Application</li> <li>• Water Distribution System in Buildings</li> <li>• Business and Environmental Impact</li> </ul>	
<b>2-Day Course</b>	
<p><b>BIM for Building Lifecycle and Facility Management</b></p> <ul style="list-style-type: none"> <li>• Data Management and Operational BIM</li> <li>• Delivery of Smart Building</li> <li>• Smart Operations, Maintenance and Building Lifecycle Management</li> </ul>	
<p><b>Energy Efficiency for Electrical System</b></p> <ul style="list-style-type: none"> <li>• Real Power, Power Factors and Correction, and Power Quality Issues</li> <li>• Lift System, and Motor Power for Fans and Pumps</li> <li>• Uninterruptible Power Supply (UPS), Metering and Monitoring</li> <li>• Building Load Management, Power Distribution Arrangements and Renewable Electricity Generation</li> </ul>	
<p><b>Solar Architecture</b></p> <ul style="list-style-type: none"> <li>• Photovoltaic – Introduction and Global Outlook</li> <li>• Solar Application in the Building Skin</li> <li>• Building Integrated Photovoltaic (BIPV) – Technologies, Applications, Standardisation and Certification</li> <li>• Evaluation of BIPV Projects</li> </ul>	
<p><b>Sustainable Lighting Design and Technology</b></p> <ul style="list-style-type: none"> <li>• Principles of Light and Colour</li> <li>• Eco-Friendly Lighting Design</li> <li>• Light Sources and Gear</li> <li>• Maintenance of Lighting Systems</li> </ul>	
<b>3-Day Course</b>	
<p><b>Solar Modelling</b></p> <ul style="list-style-type: none"> <li>• Solar Position and Sun Path</li> <li>• Sunlight, Daylight and Sunlit Hours</li> <li>• Integrated Environmental Solutions and its Modelling Capabilities</li> <li>• Heat Gain and Thermal Comfort</li> </ul>	

## REGISTRATION



To register, log on to our Online StoreFront (OSF) at:

<https://eservices.bcaa.edu.sg/registration/#/login> or scan QRcode.

For GM AAP search for course code **80056** / GM AAP(FM) course code **80057**

## ASSESSMENT AND AWARD OF CERTIFICATE

All foundation and core modules under the GM AAP and GM AAP(FM) certification course are assessment-based. To pass a module, a participant is required to fulfil the following requirements:

- i. Achieve at least 75% class attendance; and
- ii. Pass the assessment(s) of the module.

A Certificate of Successful Completion (CSC) for the module will be issued to participants who have fulfilled the attendance and assessment requirement of the module.

For participants who achieved 75% class attendance of a module but unable to pass the assessment(s), they are allowed to retake the assessment(s) one time. Re-assessment fee applies.

## EXEMPTION FOR PARTICIPANTS WITH PROFESSIONAL QUALIFICATION

Participants with professional qualification listed in the table below may be given exemptions from certain modules of the certification course. A CSC will not be issued for the module(s) exempted, unless otherwise stated. Necessary document(s) has to be submitted at the point of application for exemption.

Professional Qualification	Exempted Module(s)	Document(s) to be Submitted
<b>Professional Engineer (Mechanical Engineering)</b>	<ul style="list-style-type: none"> <li>Design, Optimisation and Measurement of High Efficiency Central Air-Conditioning System (2 days) <i>Exemption granted for Day 1 and 2 only. Participant is required to attend Day 3 and 4 and submit a group assignment. A CSC will be issued if the participant pass the assignment.</i></li> </ul>	<ul style="list-style-type: none"> <li>Certificate of Registration for Professional Engineer issued by The Professional Engineers Board Singapore (PEB)</li> </ul>
<b>Professional Engineer (Electrical Engineering)</b>	<ul style="list-style-type: none"> <li>Energy Efficiency for Electrical System</li> </ul>	<ul style="list-style-type: none"> <li>Certificate of Registration for Professional Engineer issued by The Professional Engineers Board Singapore (PEB)</li> </ul>
<b>Singapore Certified Energy Manager (SCEM)</b>	<ul style="list-style-type: none"> <li>Energy Efficiency Through Management and Audit</li> <li>Energy Efficiency for Electrical System</li> </ul>	<ul style="list-style-type: none"> <li>Certificate of Registration for SCEM issued by The Institution of Engineers Singapore (IES). Expired Certificate of Registration is also acceptable.</li> </ul>
<b>Qualified Energy Services Specialists (QuESS) of Accredited Energy Service Company (ESCO)</b>	<ul style="list-style-type: none"> <li>Energy Efficiency Through Management and Audit</li> </ul>	<ul style="list-style-type: none"> <li>Valid QuESS status – Accredited ESCO information with name of QuESS. Expired ESCO / QuESS is not acceptable.</li> </ul>
<b>Energy Auditor Registered with BCA</b>	<ul style="list-style-type: none"> <li>Energy Efficiency Through Management and Audit</li> </ul>	<ul style="list-style-type: none"> <li>Valid Certificate of Registration under the BCA Energy Auditor Scheme is issued by BCA. Expired Certificate of Registration is not acceptable.</li> </ul>

## REQUIRED MODULES FOR ADDITIONAL GREEN MARK QUALIFICATION

### EXISTING HOLDERS OF CERTIFICATE OF SUCCESSFUL COMPLETION (CSC) FOR THE GM AAP AND GM AAP(FM)

Existing Holders for GM AAP or GM AAP(FM) are required to complete 1 foundation module and 4 core modules. The table below shows the required modules for existing holders of each certification course.

Current Qualification	GM AAP	GM AAP(FM)
<b>Additional Qualification Sought</b>	<b>GM AAP(FM)</b>	<b>GM AAP</b>
<b>Foundation Module</b>	GM AP(FM) <sup>+</sup>	GM AP <sup>+</sup>
<b>Core Module</b>	Energy Efficiency Through Management and Audit	Building Performance Simulation
	Indoor Air Quality (IAQ) Management for Buildings	CFD Modelling for Natural Ventilated Buildings
	Retro-Commissioning and Performance Contracting	Efficient Building Envelope Design, ETTV and RETV
	Strategies for Smart FM and Maintainability (1.5 days)	Strategies for Passive Design and Maintainability (1.5 days)

### EXISTING HOLDERS OF CERTIFICATE OF SUCCESSFUL COMPLETION (CSC) FOR THE CERTIFICATION COURSE FOR GREEN MARK PROFESSIONAL (GMP) AND GREEN MARK FACILITIES PROFESSIONAL (GMFP)

Existing Holders for GMP or GMFP are required to complete the foundation module and core modules listed in the table below.

Current Qualification	GMP	GMFP
<b>Additional Qualification Sought</b>	<b>GM AAP(FM)</b>	<b>GM AAP</b>
<b>Foundation Module</b>	GM AP(FM) <sup>+</sup>	GM AP <sup>+</sup>
<b>Core Module</b>	Energy Efficiency Through Management and Audit	Building Performance Simulation
	Indoor Air Quality (IAQ) Management for Buildings	CFD Modelling for Natural Ventilated Buildings
	Retro-Commissioning and Performance Contracting	Efficient Building Envelope Design, ETTV and RETV
	Strategies for Smart FM and Maintainability	Strategies for Passive Design and Maintainability
	Design, Optimisation and Measurement of High Efficiency Central Air-Conditioning System (2 days) <i>Exemption granted for Day 1 and 2 only. Participant is required to attend Day 3 and 4 and submit a group assignment. A CSC will be issued if the participant pass the assignment.</i>	

+ The participant is exempted from the group project but is required to sit for the MCQ test.

## GREEN MARK PROFESSIONAL QUALIFICATION SCHEME

Participants who have successfully completed the Certification Course for GM AAP and GM AAP(FM) are considered to have partially fulfilled the requirements of Green Mark Advanced Accredited Professional and Green Mark Advanced Accredited Professional (Facilities Management) respectively.

The Green Mark Professional Qualification Scheme is administered by the Singapore Green Building Council (SGBC). You may wish to refer to the qualifying criteria under SGBC's website: <https://gmp.sgbc.online/public/about>

**Certification Course for Green Mark Advanced Accredited Professional (GM AAP) 2021 - Batch 2**

**Package Code: 80056**

Updated on 25 Nov 2020

No	Module Code	Module Title	Days	Jan-2021	Mar-2021	Apr-2021	May-2021	Jun-2021	Jul-2021	Aug-2021	Sep-2021	Oct-2021	Registering For
<b>FOUNDATION Module _Compulsory (Assessment-based module)</b>													<i>Please tick if you do not hold a GMM or GMAP certificate</i>
1	71925	Certification Course for Green Mark Accredited Professional (GM AP) <i>(Lectures &amp; Project - E-learning / MCQ - F2F)</i>	4.5	7, 8, 11, 12, 28 & 29 Jan									
<b>CORE Module _Compulsory (Assessment-based module)</b>													<b>Compulsory</b>
2	80045	Design, Optimisation and Measurement of High Efficiency Central Air-Conditioning System <i>(E-learning)</i>	4			19, 20, 21, 22, 26, 27, 28 & 29 Apr (all AM sessions)							✓
3	71929	Efficient Building Envelope Design, ETTV and RETV <i>(E-learning)</i>	2				17 & 18 May						✓
4	80052	Strategies for Passive Design and Maintainability <i>(E-learning)</i>	2						29, 30 Jul, 2 & 3 Aug (all AM sessions)				✓
5	80039	CFD Modeling for Natural Ventilated Buildings <i>(F2F)</i>	3							12, 13 & 16 Aug (F2F)			✓
6	80053	Building Performance Simulation <i>(F2F)</i>	3								16, 17 & 20 Sep (F2F)		✓
<b>Elective Modules* (Non-assessment-based module)</b>													<i>Please tick (must complete at least 4 days)</i>
7	78078	Building Automation Concepts, Technologies and Practices for Green Buildings* <i>(E-learning)</i>	1		9-Mar								
8	80046	Solar Architecture* <i>(E-learning)</i>	2		30 & 31 Mar								
9	78053	Sustainable Lighting Design and Technology* <i>(E-learning)</i>	2			5 & 6 Apr							
10	73085	Green Architecture and Integrated Design Process* <i>(E-learning)</i>	1				31-May						
11	77085	Sustainable Hot Water and Heat Recovery Systems* <i>(E-learning)</i>	1					15-Jun					
12	78085	Energy Efficiency for Electrical Systems* <i>(E-learning)</i>	2						5 & 6 Jul				
13	73086	Solar Modeling* <i>(F2F)</i>	3									21, 22 & 25 Oct (F2F)	

Note: \* Please note that the conduct of an Elective Module is subject to the minimum class size being met.

Deferment is not allowed;

Only electronic course notes will be provided for the course

Participants who have attained at least 75% course attendance will be allowed to sit for the prescribe examinations(s)/assessment(s).

Participants who have obtained GMM or GM AP certificate must upload the certificate in OSF to be exempted from taking the foundation module (GM AP).

**LEGEND**

F2F

Modules conducted in classroom @ BCA Campus

**By submitting and signing this application form, the Company or Individual Applicant is deemed to have read and agreed to the conditions tied to package and the terms and conditions**

\_\_\_\_\_  
Name & Signature of Applicant / Date

\_\_\_\_\_  
Company Name & Stamp

**TERMS AND CONDITIONS**

1) The company and individual applicant has read and understood the terms and conditions. 2) The company and individual applicant warrant that the particulars given are accurate. 3) The Building and Construction Authority (BCA) can disclose to other government agencies any information relating to this application. 4) Payment for the course must be made to BCA before the course commencement date. 5) Any Direct Debit and Direct Credit Authorisation for GIRO applications previously signed and passed to BCA will apply to payments made under this course. 6) BCA reserves the right to accept or reject the application for whatever reason. 7) BCA shall at its discretion allocate a space to the registered applicant, based on availability. 8) BCA reserves the right to amend any details relating to the course, revise the course fees without prior notice, cancel or postpone the course. 9) No deferment is allowed. 10) Request for withdrawal must be made in writing. Requests are subject to approval by BCA and administration fee: Written request for withdrawal that reaches BCA - At least 2 weeks before the course commencement date: 10% of course fee is payable. - Less than 2 weeks but more than 3 working days before the course commencement date: 25% of course fee is payable. - 3 working days or less before the course commencement date: full course fee is payable. 11) No Replacement is allowed for funded participants. 12) The Continuing Professional Development (CPD) points indicated for any course offered by BCA is subject to change and final approval by the relevant professional accreditation bodies. 13) Funding and subsidies offered by BCA or third party organisations for the courses are subject to approval. The company must make the application for funding and subsidies. BCA is not to be held liable and the company agrees to pay BCA the applicable funding amount if funding and subsidies are either granted at a reduced amount, not granted at all or if funding is revoked, for whatever reason. 14) All information, materials, services, intellectual property and other property and rights provided by BCA during the course are provided on an "as is" basis. BCA makes no warranties of any kind, either express or implied, as to any matter, and all such warranties, including warranties of merchantability and fitness for a particular purpose, are expressly disclaimed. 15) The materials supplied to the company and individual applicant for the course ("Materials") are for their personal reference only and the company and individual applicant is not supposed to otherwise use the Materials. The company and individual applicant shall defend and indemnify BCA and its officers, employees and agents from and against any and all liability, damage, loss or expense (including reasonable attorneys' fees and expenses) imposed upon BCA in connection with any claim arising out of the company and individual applicant's use of the Materials. 16) Re-assessment fee is applicable for those who are required to re-take the assessment. 17) I consent to BCA, BCA Academy, and BCA's employees contacting me via my contacts (including email addresses and mobile numbers) to market future courses, seminars, conduct surveys, circulate publications (i.e. magazines, periodicals, etc.). If you wish to withdraw your consent to any use or disclosure of your personal data as set out above, you may contact us. PLEASE NOTE: All correspondence and notices addressed to BCA are to be sent to BCA Academy. Photographs of attendees will be taken at the event for our publicity materials, newsletters and other publications.



# BCA ACADEMY



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