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ESTABLISHING THE GEOMATIC ACCREDITATION COUNCIL IN MALAYSIA

(8752)

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Abstract

Geomatic higher education in Malaysia faces several milestones:

- the establishment of the accreditation governing body named as the Geomatic Accreditation Council (GAC);
- GAC is a governing body responsible for ensuring that all geomatics programs offered by public and private universities in Malaysia adhere to certain set standards and are relevant to current practices and industry needs;
- to describe various aspects of geomatics education in Malaysia offered by public and private universities and its roadmap, the role of the stakeholders, and the overall benefits to the industry; and
- to continuously monitor the programs offered and to ensure that the education standards offered are at par with other institutions around the globe.

Keywords: Geomatic education, Accreditation, Roadmap

Academic Programmes in Geomatics

- accreditation from the Board of Land Surveyor for Peninsular Malaysia and the Public Services Department of Malaysia

Programme Objectives

To produce graduates that have:

- a. in-depth knowledge in geomatic engineering, competent and skilful in managing geomatic engineering projects;
- b. ability to use techniques, skills and modern geomatic engineering tools to solve geomatic engineering and related problems creatively;
- c. ability to analyze, maintain, update and synthesis geo-spatial data for specific purposes and in compliance with the relevant laws; and
- d. innovative attitudes and initiatives towards creating an effective and efficient geomatic profession.

Land Surveyors Board



The Land Surveyors Board, established on 1st May 1958, under the Licensed Land Surveyors Act 1958 (Act 458), is the corporate body responsible for:

- **Controlling and maintaining standards for land surveyors and other related matters**
- **Regulating the practice of land surveying in Peninsular Malaysia**
- **Keeping the surveying profession abreast with the latest development and advancement in survey sciences**



Land Surveyors Board

The main functions of the Board are:

- to register individuals as surveyors and administer a register of surveyors, licensed surveyors and licensees;
- to hold examinations to enable persons to qualify for registration as registered surveyors and licensed surveyors;
- to register and administer a register of practices (sole proprietors and partnerships);
- to administer the collection and payment of survey fees;
- to encourage practising surveyors to undertake appropriate education and relevant Continuing Professional Development (CPD) programmes to maintain competency and professional knowledge and skills; and
- to investigate complaints against licensed surveyors and take disciplinary action in accordance with the provisions of the Act.

Association of Authorized Land Surveyors Malaysia (PEJUTA)

Aims and objectives:

- 1) Provide all types of technical, administrative and accounting training to the supporting staff and Continuous Education and Professional Development (CEPD) courses to members;
- 2) **Support and upgrade the technical skills and abilities from time to time by providing the state of art surveying hardwares and softwares; and**
- 3) Work in conjunction with Land Surveyors Board (LJT) and keeping up to date on the procedures and Scales of Fee for various types of surveying works.



GEOMATIC ACCREDITATION COUNCIL (GAC)

- 1. What is GAC?**
- 2a. Why Need Accreditation?**
- 2b. GAC Accreditation Criteria**
- 3. Deficiencies of Traditional Education**
- 4. Focus and Benefits of OBE**
- 5. Outcome Based Education (OBE)**
- 6. Continuous Quality Improvement (CQI)**
- 7. Role of Lecturers and Students**



Outcome Based Education (OBE)

What Is Outcome Based Geomatic Education?

IT'S NOT WHAT WE TEACH,
IT'S WHAT YOU LEARN

Outcome Based Education (OBE)

Basically based on International Mobility (Washington Accord)

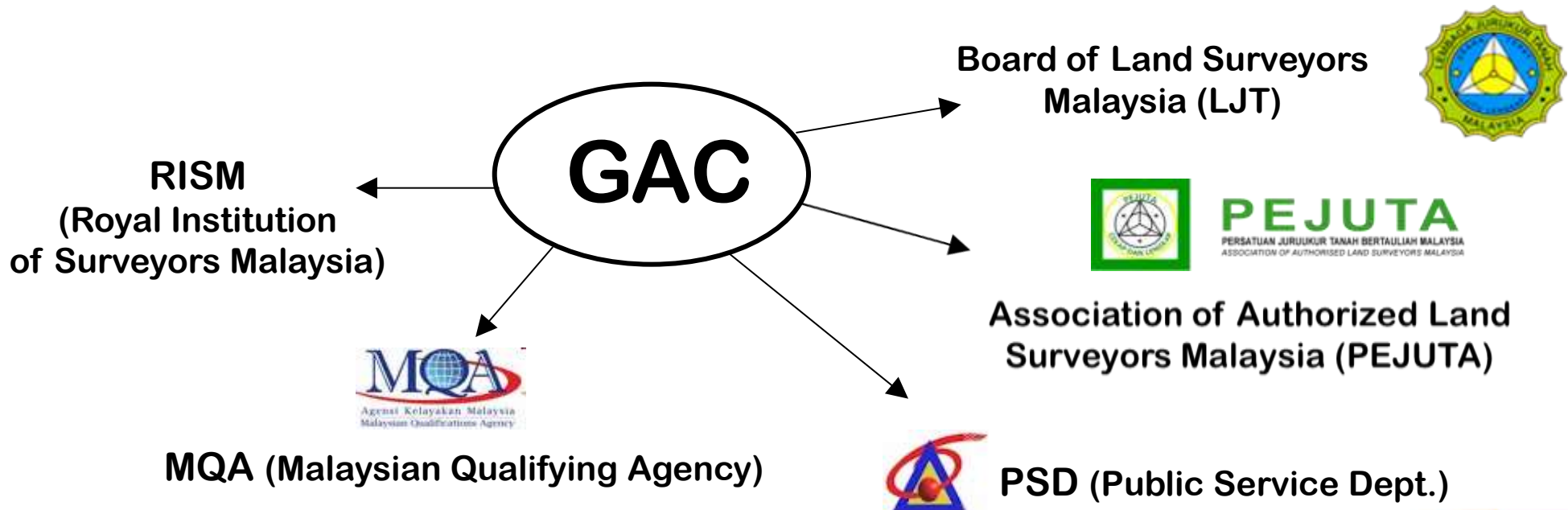
- **The Washington Accord (WA):** Agreement that establishes equivalence of other countries' accredited professional engineering programs.
- Accredited Engineering Graduates are recognized by other signatory countries - **Possible employment as engineers in those countries without further examinations.**
- Established in 1989. To date, many countries are full members of WA incl: Malaysia, Australia, Canada, Republic of Ireland, Hong Kong, Japan, New Zealand, Singapore, South Africa, South Korea, Taiwan, UK and USA.

Outcome-Based Education (OBE)

- OBE is an educational process that focuses on what students **can do** or the **qualities** they should develop after they are taught.
- OBE involves the **restructuring of curriculum, assessment and reporting practices in education** to reflect the achievement of high order learning and mastery rather than accumulation of course credits.
- Both **structures and curricula are designed** to achieve those **capabilities** or **qualities**.
- **Discourages traditional education approaches** based on direct instruction of facts and standard methods.
- It requires that the **students demonstrate** that they have learnt the required skills and content.

1. What is GAC?

- Formed in 2016, a delegated body (Statutory) from Board of Land Surveyors Malaysia, the only body for accrediting Geomatic degree programs.
- Comprises members from RISM, LJT, PEJUTA, MQA, PSD, Academic & Industry Representatives.

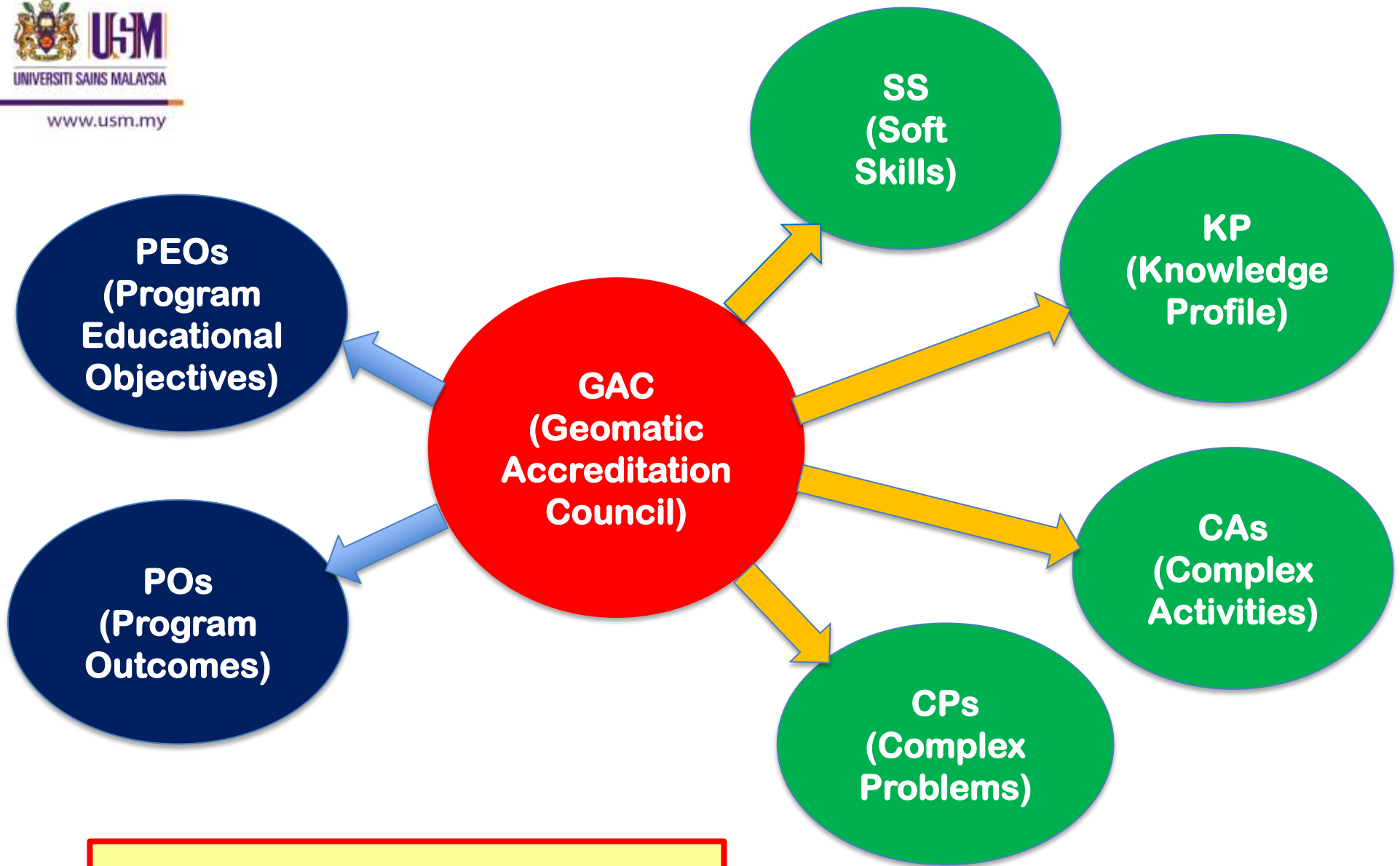


2a. Why Need Accreditation?

- ***Recognition by Malaysian Government***
- An accredited geomatic degree means the degree is recognized by the Malaysian government.
- It is also a sign of the degree being of high quality and the holder of the degree has already attained a certain level of knowledge, skill and maturity of thought related to the relevant disciplines.
- A person with accredited geomatic degree may be able to work for the government, as well as private sector.
- **He/she may subsequently become a Licensed Land Surveyor Under Act 458 (Rev. 1991), Malaysia.**

2b. GAC Accreditation Criteria

- **Program Objectives (PEO)**
- **Programme Outcomes (PO)**
- **Academic Curriculum**
- **Students**
- **Academic and Support Staff**
- **Facilities**
- **Quality Management Systems**



GAC INITIATIVES

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO	Description
PEO 1	To produce <i>competent, creative & innovative graduates</i> who are able to solve geomatic problems within the globe, societal & sustainable development contexts.
PEO2	To produce graduates with <i>good leadership qualities & communication skills</i> who are able to engage in geomatic tasks both independently & via interdisciplinary team.
PEO3	To produce graduates with <i>professional & ethical attributes</i> .
PEO4	To produce graduates who are <i>engaged in continuous pursuit of knowledge</i> through research, continuing education and/or professional development activities.

PROGRAM OUTCOMES (POs) *(Part 1/2)*

12 POs	Description
PO1	Able to apply knowledge of mathematics, science & geomatic fundamentals to the solution of complex geomatic problems <i>“Geomatic Knowledge”</i>
PO2	Able to identify, formulate and solve complex geomatic problems using first principles of mathematics, natural sciences & geomatic sciences <i>“Problem Solver”</i>
PO3	Able to design solutions for complex geomatic problems to meet specified needs considering safety, cultural, societal & environmental requirements <i>“Solution Designer”</i>
PO4	Able to conduct investigation into complex geomatic problems using research based knowledge & appropriate research methods <i>“Investigative & Observant”</i>
PO5	Able to create, select & apply appropriate modern geomatic tools necessary for complex geomatic activities, with comprehension of the limitations <i>“Comfortable with Tools & Aids”</i>
PO6	Able to apply reasoning informed by contextual knowledge to assess societal, safety, legal & cultural issues & the consequent responsibilities relevant to professional geomatic practice <i>“Societal Sensitive”</i>

PROGRAM OUTCOMES (POs) *(Part 2/2)*

12 POs	Description
PO7	Able to appraise the impact of professional geomatic solutions in societal, environmental context & sustainability development <i>“Environmentally & Sustainability Concern”</i>
PO8	Able to apply ethical principles & commit to professional ethics & responsibilities & norms of geomatic practice <i>“Ethical”</i>
PO9	Able to communicate effectively on complex geomatic activities with the geomatic community & with society at large <i>“Communication”</i>
PO10	Able to function effectively as an individual & as a member or leader in diverse teams & in multi-disciplinary settings <i>“Individuality & Team Player Versatility”</i>
PO11	Able to recognize the need for & have the preparation & ability to engage in independent & life-long learning in the broadest context of technological change <i>“Life-long Learning”</i>
PO12	Able to demonstrate knowledge & understanding of geomatic & management principles & apply these to one’s own work, as a member & leader in a team, to manage projects & in multi-disciplinary environment <i>“Take Charge & be Accountable”</i>

Complex Problems (CP)

CP	Description
CP1	<i>Range of conflicting requirements</i> – Involve wide-ranging or conflicting technical, geomatic & other issues.
CP2	<i>Depth of analysis required</i> – Have no obvious solutions & require abstract thinking, originality in analysis to formulate suitable needs.
CP3	<i>Depth of knowledge required</i> – Requires research-based knowledge or informed by the forefront of the professional discipline & which allows fundamental –based first principles & analytical approach.
CP4	<i>Familiarity of issues</i> – Involve infrequently encountered issues.
CP5	<i>Extent of applicable codes</i> – Outside problems encompassed by standards & codes of practice for professional geomaticians.
CP6	<i>Extent of stakeholder involvement & level of conflicting requirements</i> – Involve diverse groups of stakeholders with widely varying needs.
CP7	<i>Consequences</i> – Have significant consequences in a range of context.
CP8	<i>Interdependence</i> – High level problems including many component parts or sub-problems.

Complex Activities (CA)

CA	Description
CA1	<i>Range of resources</i> – Involve the use of diverse resources (resources may include people, money, equipment, materials, information & technology)
CA2	<i>Level of interaction</i> – Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, geomatic or other issues.
CA3	<i>Innovation</i> – Involve creative use of engineering principles & research-based knowledge in novel ways.
CA4	<i>Consequences to society & the environment</i> – Have significant consequences in a range of contexts, characterized by difficulty of prediction & mitigation.
CA5	<i>Familiarity</i> – Can extend beyond previous experiences by applying principle-based approaches.

Knowledge Profile (KP)

KP	Description
KP1	<i>A systematic, theory-based understanding</i> of the <i>natural sciences</i> applicable to the discipline of geomatic.
KP2	<i>Conceptually-based mathematics</i> (numerical analysis & statistics) & <i>formal aspects of computer & information science</i> to support analysis & modeling applicable to the discipline of geomatic.
KP3	A <i>systematic, theory-based formulation of geomatic fundamentals</i> required in the geomatic discipline.
KP4	<i>Geomatic specialist knowledge</i> that provides theoretical frameworks & bodies of knowledge for the accepted practice areas in the geomatic discipline; much at the forefront of the geomatic discipline.
KP5	<i>Knowledge that supports geomatic (design & technology)</i> in the practice areas.
KP6	Comprehension of the <i>role of geomatic in society</i> & identified issues in geomatic practice in the discipline; <i>ethics & the professional responsibility</i> of geomatician to public safety & its impact to geomatic activities (economic, social, cultural, environment & sustainability).
KP7	<i>Engagement with selected knowledge</i> in the research literature of the discipline.

Open Ended (OE)

Level	Description
0	Problems, procedures & methods for achieving solutions are provided to the students; results verified using the manual.
1	Problems & procedures are provided to the students; students interpret data to propose viable solutions.
2	Problems are provided to the students; students develop a procedure to investigate the problem, decide what data to gather & interpret the data to propose viable solutions.
3	A “raw” phenomenon is provided to the students; students choose the way to explore, develop acceptable procedures, decide what data to gather, interpret the data & propose viable solutions.

Soft Skills

Skills	Description
CS	<i>Communication skills</i> (Levels CS1 – CS8) (e.g. delivery, listening, presentation, use of technology, negotiate, non-oral skill)
CTPS	<i>Critical Thinking & Problem Solving Skills</i> (Levels CTPS1 – CTPS7) (e.g. identify, analyze & expand, out of the box, conclusions, understanding)
TS	<i>Team work</i> (Levels TS1 – TS5) (e.g. good relation, switch tasks, responsible)
LL	<i>Life-long learning & Information management</i> (Levels LL1 – LL3) (e.g. manage infor., new ideas, thirst for knowledge)
ES	<i>Entrepreneur skills</i> (Levels ES1 – ES4) (e.g. business opportunities & plan, job creators & not just job seekers)
EM	<i>Professional moral & ethical</i> (Levels EM1 – EM3) (e.g. understanding & practice)
LS	<i>Leadership skills</i> (Levels LS1 – LS4) (e.g. theories, leadership, supervision)
	* <i>Must have skills</i> ** <i>Good to have skills</i>

Learning Taxonomy (LT)

	Category	Description
1.	Cognitive Domain	(Levels C1 – C6): remembering, understanding, applying, analyzing, evaluating & creating
2.	Psychomotor Domain	(Levels P1 – P7): perception (awareness), set, guided response, mechanism (basic proficiency), complex overt response (expert), adaptation, origination
3.	Affective Domain	(Levels A1 – A5): receiving phenomena, responding to phenomena, valuing, organizing values, internalizing values

Sustainability (S)

Sustainability	Key Indicators
Ensuring a fair society	(Code S1 – S8): ethics & governance, safety & security, educational & its development, communities, health & wellbeing, human rights, privacy & equality
Living with environmental limits	(Code S9 – S16): renewal energy, replenishing resources, logistics & transport, end of life disposal, waste management, emissions & pollution, sustaining diversity, building design
Creating a sustainable economy	(Code S17 – S24): efficient processes, profitable growth, good employer, enterprise partners, investor returns, creativity & innovation, business model, competitive advantage

2c. GAC Accreditation Criteria

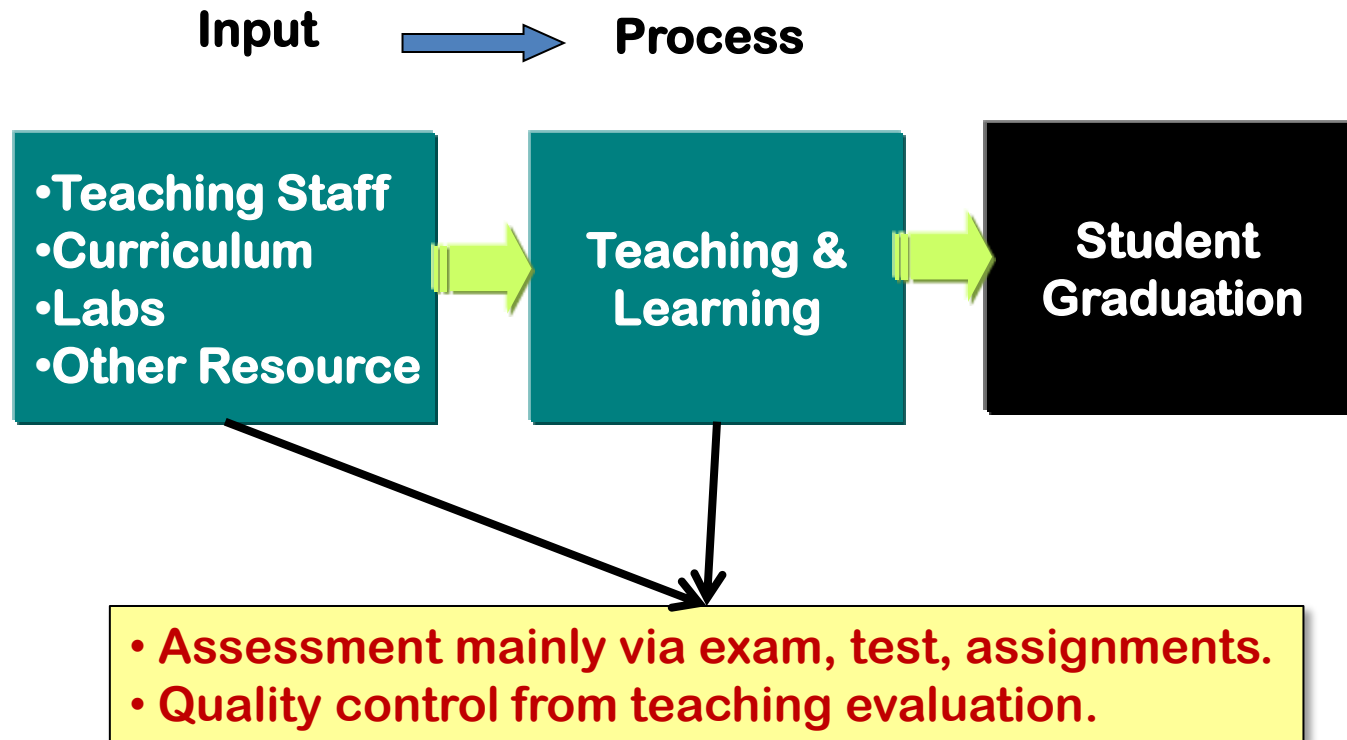
- **Academic Staff**
 - Academic qualifications
 - Professional qualification, experience & development
 - Research/publication/consultancy
 - Industrial involvement
 - Teaching load/contact hours
 - Motivation and enthusiasm
 - Involvement of lecturers from industry/public bodies
 - **Aware and practice OBE**

3. Deficiencies of Traditional Education

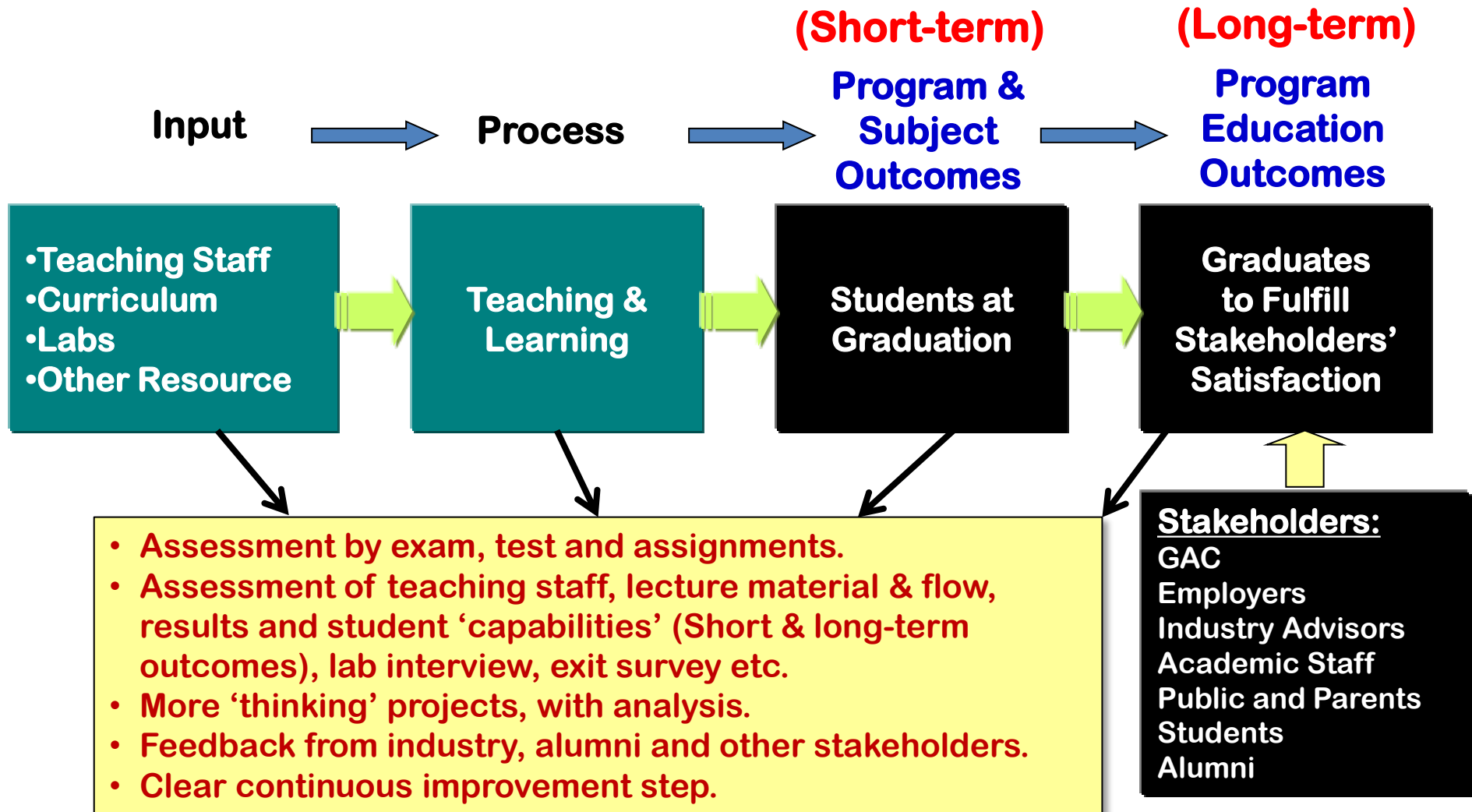
- Provides students with a learning environment with little attention to whether or not students ever learn the material.
- Students are given grades and rankings compared to each other – students become **exam oriented** or **CGPA driven**.
- Graduates are not completely prepared for the workforce.
- Lack of emphasis on **soft skills** needed in jobs e.g. communication skills, interpersonal skills, analytical skills, working attitude etc.

Deficiencies of Traditional Education

- Traditional education process focuses on the inputs.

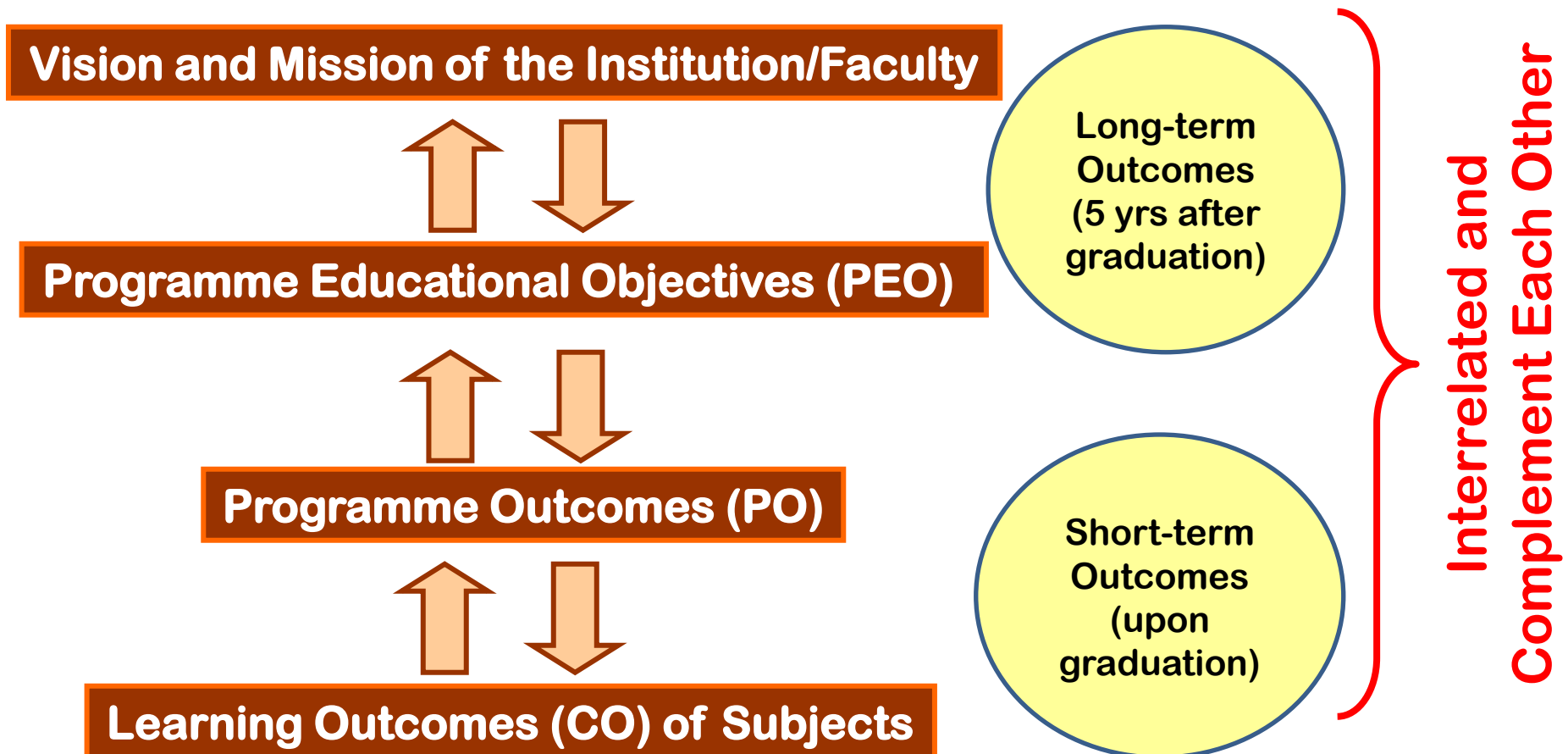


OBE Versus Traditional Education Process



Outcomes in OBE

A Model Hierarchy of Outcomes



4. Focus and Benefits of OBE

OBE addresses the following key questions:

- **What** do we want the students to have or be able to do?
- **How** can we best help students achieve it?
- **How** will we know whether they students have achieved it?
- **How** do we close the loop for further improvement (Continuous Quality Improvement (CQI))?

Benefits of OBE:

1. **More directed & coherent curriculum.**
2. **Graduates will be more “relevant” to industry & other stakeholders (more well rounded graduates)**
3. **Continuous Quality Improvement (CQI) is in place.**

5. Roles of GAC

- Formulates & updates accreditation policies & criteria.
- Approves guidelines & operating procedures.
- Oversees operational arrangements & appoints evaluation panel.
- Receives evaluation reports & decides on accreditation.
- Responds to complaints, appeals or any proposals for change.
- Oversees development & operation of accreditation & mutual recognition agreement with other countries.
- Fosters the dissemination of development & best practices in geomatics education.

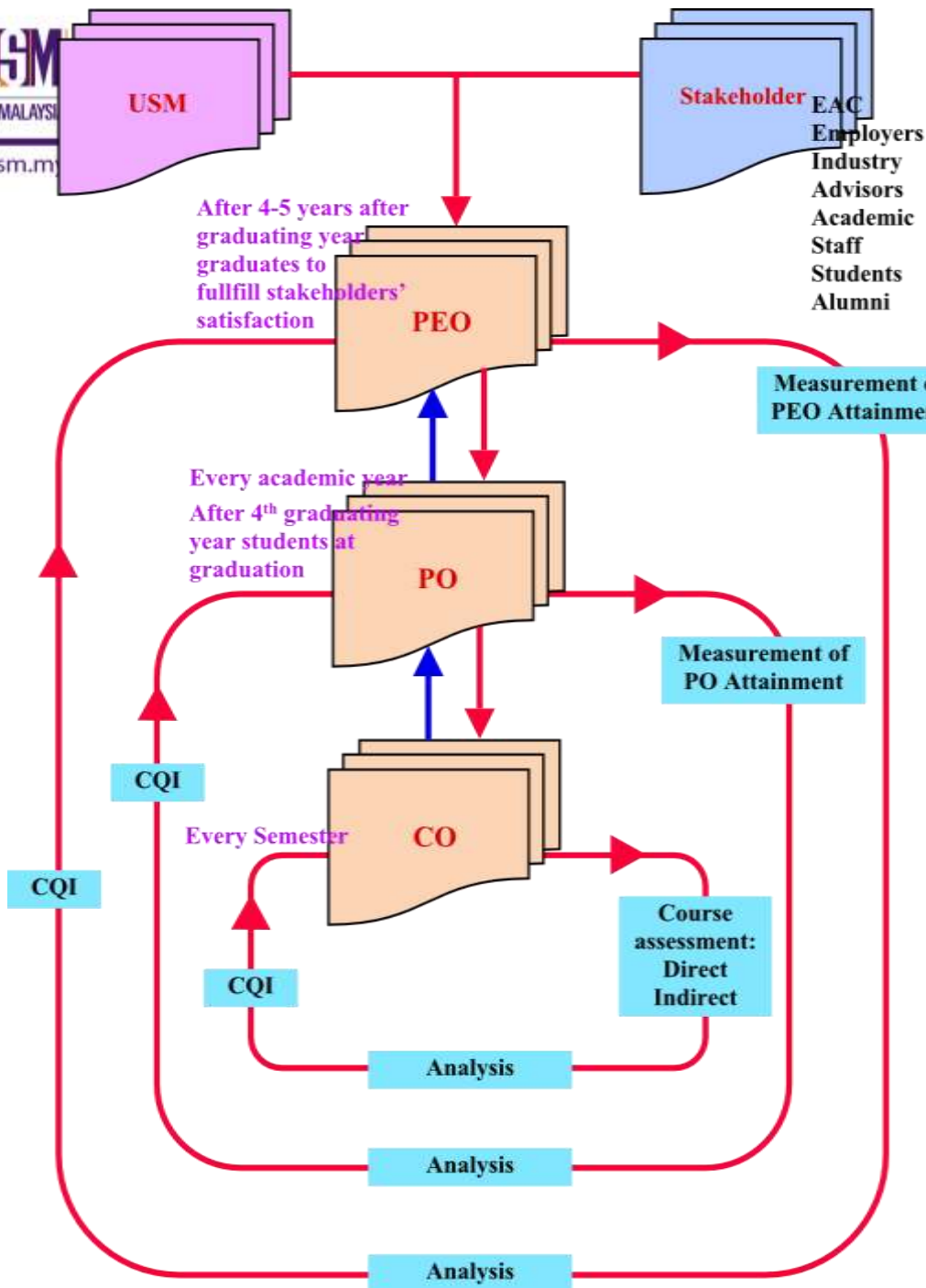
Expectation on Students under OBE – the GAC Outcomes

- **Students are expected to be able to do more challenging tasks other than memorize and reproduce what was taught.**
- **Students should be able to: write project proposals, complete projects, analyze case studies, give case presentations, show their abilities to think, question, research, and make decisions based on the findings.**
- **Be more creative, able to analyze and synthesize information.**
- **Able to plan and organize tasks, able to work in a team as a community or in entrepreneurial service teams to propose solutions to problems and market their solutions.**

Most Important Consideration by Employer

Employers Rating of Skills/Qualities – 2002 vs 2016

	Item	2002	2016
1	Communication (verbal & written)	4.7	4.5
2	Honesty/Integrity	4.6	4.5
3	Teamwork skills	4.5	4.5
4	Interpersonal skills	4.5	4.6
5	Strong work ethics	4.5	4.5
6	Motivation & initiative	4.4	4.8
7	Flexibility/adaptability	4.4	4.5
8	Analytical skills	4.4	4.7
9	Computer skills	4.2	4.2
10	Organisational skills	4.1	4.2
11	Detail oriented	4.0	4.3
12	Leadership skills	3.9	4.1
13	Self confidence	3.9	4.4
14	Friendly/outgoing personality	3.8	4.0
15	Well mannered / polite	3.8	4.0
16	GPA (3.0 or better)	3.7	3.5
17	Tactfulness	3.7	3.6
18	Creativity	3.6	4.4
19	Sense of humour	3.2	3.3
20	Entrepreneurial skills/risk taker	3.21	4.2



6. Continuous Quality Improvements (CQIs)

OPPORTUNITIES FOR CQI

1. There is an enormous room for improvement for CQI in this framework
2. There is no end to the process
3. Efforts must come from
 - The institution
 - The school's management
 - The system of governance
 - The individual players

RE-VISITS

- **PEOs**
- **POs - mapping of 12 Programme Outcomes (POs) to the Soft Skills (SS), Learning Taxonomies (LT), Complex Problems (CP), Complex Activities (CA) & Knowledge Profile (KP)**

Mapping of 12 Programme Outcomes (POs) to Soft Skills (SS) & Learning Taxonomy (LT)

12 POs		Soft Skills (SS)	Learning Taxonomy (LT)
PO1	Knowledge on geomatic	-	Cognitive (C)
PO2	Problem solver	Critical Thinking & Problem Solving (CTPS) Skills	
PO3	Solution designer		
PO4	Investigative & observant		
PO5	Comfortable with tools & aids		
PO6	Societal sensitive		Moral & Ethical (ME) Professionalism
PO7	Environment & sustainability		
PO8	Ethical		
PO9	Communication	Communication Skills (CS)	-
PO10	Individual & team player	Teamwork Skills (TS) & Leadership Skills (LS)	-
PO11	Life-long learning	Life-long Learning & Information Management (LL)	-
PO12	Take charge & accountability	Entrepreneurship Skills (ES)	Cognitive (C) & Affective (A)

7a. Roles of Lecturers

- Review PEOs, POs, curriculum and courses
- Teach the relevant engineering, maths, and other relevant subjects **with the OBE way**
- Conduct relevant tutorials and laboratory practical sessions with **the OBE assessment**
- Give appropriate guide on assignments and projects.
- Conduct empirical measurements of POs and triangulation with
- Prepare the required documentation.
- Assure GAC and public on the standard of our graduates.
- Obtain and maintain accreditation from GAC through Continuous Quality Improvement (CQI).
- **Embrace OBE**

7b. Roles of Student

- **Attain the Learning Outcomes at the beginning of each semester. This gives students an idea of the knowledge and skills expected from a particular course.**
- **Be more proactive in the learning process to acquire the Learning Outcomes of subjects.**
- **Demonstrate through the assessment methods that the required skills and knowledge have been acquired.**
- **Attain the Program Outcomes and Program Objectives as a whole during the entire program.**
- **Give constructive feedbacks on the program/course/academic staff to obtain accreditation through active participation in Online Teaching Evaluation, Academic Advisory System, dialog sessions with Dean, Exit Interview.**

GEOMATIC ACCREDITATION COUNCIL (GAC)

- **OBE: IT'S NOT WHAT WE TEACH,
IT'S WHAT THE STUDENTS LEARN**
- **GAC IN MALAYSIA IS SEEN AS THE
RIGHT MOVE FORWARD**

Acknowledgement:

Board of Land Surveyors Malaysia

Association of Authorized Land Surveyors Malaysia

THANK YOU
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