Development of Engineering Technology Degree Programmes in State Universities in Sri Lanka

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Technology subjects are offered in the GCE A/L since 2003 to students in the Arts Stream. The establishment of the University of Vocational Technology in 2008 opened the pathway to Technology degrees in Engineering disciplines under National Vocational Qualification (NVQ) Framework. It offered of 40,000 government jobs to unemployed graduates in 2008 -2009 period.

The Initial discussions and preparation were made in 2010 and 2011 to establish a separate Technology Stream at GCE A/L and launched the stream in 2013 under funding received from the Governments to schools and universities. The first university admissions started in late 2016 and early 2017 (The academic year 2015/16).

The Overall objectives of establishing Technology Stream to GCE Advanced Level in 2013 were to Human Resource Development in areas of Technology at Upper Secondary and Higher Education levels for technological and economic advancement, "Vocationalise" part of upper secondary education for students to enter Employment and/or Technical and Vocational Education and to reduce the proportion of students entering higher education for Arts and Humanities.

Module offered for GCE Advanced Level under Technology stream are; Science for Technology, One subject out of - Biosystems Technology - Engineering Technology, One optional subject out of Economics, Accountancy, Mathematics, English, Art, ICT, Business Science, Geography, Communication and Media Studies, Home Economics, Agriculture Science. The most popular options are English, ICT and Agriculture Science. There are five-degree programmes offered by the state universities in Sri Lanka so far; Bachelor of Engineering Technology (BET), Bachelor of Bio-systems Technology (BBST), and Bachelor of Information Communication Technology (BICT).

The standing committee on Technology Education at the University Grant Commission (UGC) played the vital role in designing technology study programmes. The composition committee; Member as Chairman, Deans of Technology Faculties, Representatives from Institution of Engineers Sri Lanka (IESL), National Biotechnology Industry Association (NBIA) and Computer Society of Sri Lanka (CSSL). The role of the Standing Committee on Technology Education at the UGC are identification of the matters pertaining to the establishment of faculties, departments, study programmes, quality assurance, accreditation and staffing, and infrastructure facilities.

The UGC policies on Technology Degrees;

1. 4-year Professional degrees at SLQF Level 6. must comply with the Qualification Descriptor, Level Descriptor and the Volume of Learning (120 credits)

2. Technology degrees are to be Accredited by respective Professional Body Engineering Technology – IESL - Sydney Accord Information Communication Technology - CSSL - Seoul Accord Biosystems Technology -National Biotechnology Industry Association (NBIA) with Sri Lanka Accreditation Board (SLAB) – ISO 17067.

Engineering Technology degree programmes offered by the Technology Faculties of the State Universities; University of Colombo - Instrumentation and Automation, University of Sri Jayawardenapura - Energy and Environment, Polymer Processing, Automobile, Mechatronics, Construction and Building Services, Geo-technology, University of Kelaniya - Materials and Process, Automation and Robotics, Sustainable Technologies, University of Ruhuna - Electro-mechanical, Wayamba University of Sri Lanka – Construction, Electro-technology, Mechanical and Manufacturing, Materials and Nano Technology, Rajarata University of Sri Lanka – Materials, Electrical and Electronics, University of Jaffna – Construction, Automobile, Electro-technology, Sabaragamuwa University of Sri Lanka and Uva Wellassa University of Sri Lanka Mechanical stream.

The Basis for design of Engineering Technology degree programmes is the International Engineering Alliance (IEA) Graduate Outcomes Exemplar Statements and Professional Competencies relevant to Sydney Accord. Accord programme profile includes knowledge profile and graduate attribute profile whereas common range and contextual definitions includes range of problem solving and range of Engineering activities.

The general definition of the role of Technologist (Proposed) is Managing and maintaining applications of current and developing technologies in the fields of Engineering Technology and Biosystems Technology in accordance with respective recognized principles with professional responsibility and undertake functions involving design, development, planning, manufacture, construction and operation of products or systems and providing related services. Role of Engineer (Extract from Engineering Service Minute) identified as implementation of the processes of investigation, planning, designing, construction, maintenance, operations, research and other sequential tasks in accordance with the recognized principles of engineering with professional responsibility which are relevant to the role of engineering entrusted to the Head of the Department and the management of guidelines and strategies relevant to them shall be performed by the holders of posts in Engineering Service. Engineering related occupations at the present structure are; Engineer, Engineering Diploma holder, Engineering Technician and in the future structure; Engineer, Engineering Technologist, Engineering Diploma Holder, Engineering Technician.

The Employment focus of Technology Graduates are; private and public Industry

sector - small and medium industry sector (Primary Focus), large industry sector, government sector - services where any graduate can apply, self – employment and foreign employment.

The Outcome Based Education (OBE) Framework are as follows

- Objectives - What is the overall purpose of your programme?
- Graduate Attributes - What does the profession, industry and society want from your graduates?
- Programme Outcomes - What will your graduates be able to do to demonstrate their Graduate Attributes?
- Module Los - What will students learn on individual modules contributing to Pos?
- Curriculum - What? When? How? Learning activities and assessments.
- The Programme Outcomes of Engineering Technology Degree programmes
- IESL Manual specifies programme outcomes in generic form
- Ability to apply knowledge of basic science and engineering fundamentals
- Ability to communicate effectively, not only with engineers but also with the community at large
- In-depth technical competence in at least one engineering discipline
- Ability to undertake problem identification, formulation and solution
- Ability to utilise a systems approach to design and operational performance
- Ability to function effectively as an individual and in multi-disciplinary and multi-cultural teams, with the capacity to be a leader or manager as well as an effective team member
- Understanding of the social, cultural, global and environmental responsibilities of the professional engineer, and the need for sustainable development
- Understanding of the principles of sustainable design and development
- Understanding of professional and ethical responsibilities and commitment to them
- Expectation of the need to undertake lifelong learning, and capacity to do so.

The criteria for Accreditation of Degrees basically includes demonstration of attainment of Graduate Attributes through; the structure of the academic programme, the curriculum components and syllabi, laboratory, design, field and project work, and industrial training, the academic staff and students, teaching facilities such as classrooms, study areas, the library, computing and IT facilities and the general infrastructure, and quality management systems. Structure of the Academic Programme can be described as; Mathematics, Basic Sciences and Computing – 18 Credits, Engineering Sciences and

Engineering Design – 72 Credits and Complementary Studies - 18 Credits.

Also, explicit mapping of module learning outcomes to the programme outcomes must be undertaken to demonstrate the attainment of graduate attributes. The curriculum and assessment must be focused on an outcomes-based approach (OBE) and not an input approach. Furthermore, the future of Technology Education intends to manage the introduction of new technology graduates to the industry, consolidation of existing degree programmes and curriculum reviews, diversification of specializations to cater emerging labour market needs, offer of postgraduate programmes and applied research work.

Now when you talk in terms of sustainable development you also have to talk of rule of law. The next question of everyone need to have a life without being subjected to be any kind of impediments. Civil liberty have to be respected another person is to have the freedom to do all our activities. The freedom activities engaging that we like there can be an overriding force that comes upon us. Under the concept of individual freedom and civil liberty and to ensure rule of law in the country. So, you can see while there is a nexus which sustainability and national security to strive on national security.

In order to ensure national security and state that would be take sometimes by the state or executive actions can include upon. So there is certain tension between national security and fundamental rights for civil liberty. So how do we balance it? what does the balancing act? This is really engage that attention of courts over the years but if you take how country grapple with the tension between human rights and national security you should see the political factors and strength of the nation that has grappled with it. Now if you look at USA, the previous years you could see they have the system of ejection that called Co-option and ejection, for instances if you take Guantanamo Bay in Cuba where detainees are questioned and tortured. In this case one judge even saying Geneva Conventions has to be jeticion. Now see how those judgements and those countries, these things are rendered legal.

For instances the randism in USA they can suspect somebody for terrorist activity and taking and call it undisclosed destruction. That was tested in Supreme Court in USA they said national security concern that is a legal measure that has to be promoted. Can we do it in our country? You would have look at recently and see the point that I'm trying to make this well. The national security and human rights are sides of the same coin in a country like Sri Lanka. You also have to pay attention to protect national security and human rights through Universal Declaration of Human Rights and then the constitution. People cannot enjoy full human rights when there is insurgency situation or when country is danger. I don't want to take examples but you could see how other countries also alert us. Sometimes I'm talking national security for instances the year of 2019 the horrible year that even take place. We experience a lot of alerts coming from assisting countries and we were alerted to the dangers that was awaiting us. So now when those countries have coordinated in a time mutual assistance to help Sri Lanka by giving us leads has to what is hidden. To ensure that

this freedom that we enjoy even our own constitution says that these kinds of things has to be restricted.