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நகர திட்டமிடல், நீர் வழங்கல் மற்றும் உயர் கல்வி அமைச்சு
உயர் கல்விப் பிரிவு
MINISTRY OF CITY PLANNING, WATER SUPPLY & HIGHER EDUCATION
HIGHER EDUCATION DIVISION

uf.a wxlh எனது இல. My No. **HE/NS/03/285** Tfí wxlh உமது இல. Your No. oskh திகதி Date 28 / 02/2019

Non-State Higher Education Circular No. 02/2019

The Chief Executive Officer
Degree Awarding Non-State Higher Education Institutes

Offer Bridging Programme for Computing Disciplines Recognized by the Ministry

1. The Degree Awarding Non-State Higher Education Institutes are recognized to award degrees in computing disciplines.

2. However, it is noted that students from all streams of GCE A/L are not allowed to follow few major areas of computing degrees. The long felt need has been brought to the notice by the Standing Committee on Accreditation and Quality Assurance (SCAQA) and a Technical Advisory Committee (TAC) was appointed to develop the appropriate curriculum.

3. The curriculum prepared by the TAC has been recommended by the 51st SCAQA and it has been decided that Degree Awarding Non State Higher Education Institutes should adhere and offer the Bridging Programme for all degree Programme in Computing Disciplines, if enrolling students from G.C.E A/L all streams.

4. Copy of the approved curriculum for Bridging Programme is attached herewith for your compliance as referred above.

5. Further, as per the directive of the Sectoral Oversight Committee – Sub Committee on Higher Education vide letter No.CO/8/6/EDU-SUB-HE dated 18.01.2019, it has been directed to stop admission of students those who have not followed science stream for GCE A/L, to BSc programme in computing discipline, without getting through the bridging programme.

6. Hence, as per para 3 above you are hereby informed to offer the bridging course to the students admitted from the 2019 September intake onwards please.

Yours sincerely,

M. M. P. K. Mayadunne
Secretary / Specified Authority

CC: File No: HE/NS/03/285

A Bridging Program for Computing Disciplines

1. Introduction

As per revised UGC Circular 995, students following all streams at AL are allowed to follow any of the Computing streams as per IEEE/ACM Computing Curricula, namely, Computer Engineering, Computer Science, Software Engineering, Information Technology and Information Systems. However, it was observed that only the students following Physical Sciences stream at A/L and to some extent those who follow the subjects Physics and Mathematics with other subject combinations would have the necessary mathematical knowledge and skills required to follow Computer Engineering, Computer Science and Software Engineering.

It was also noted that the student following Arts and Commerce streams at the Advanced Level students in Sinhala stream will also require a refresher course in English and Communication Skills as well as a refresher course in Computational Thinking. These courses will provide the students with necessary 21st Century Skills such as basic literacies, Problem Solving, Critical Thinking, Teamwork, Communication, Collaboration, Lifelong learning, ethics and societal responsibility.

2. Eligibility to follow Computing Degree

The Eligibility to follow these subjects were agreed upon as follows:

<table>
<tr><th>Major areas (sub-disciplines) of Computing</th><th>Physical Science</th><th>Biological Sciences</th><th>Commerce/ Management</th><th>Technology</th><th>Arts</th><th>Any other subject combination with Maths and Physics</th></tr>
<tr><td>Computer Engineering</td><td rowspan="5">Allowed</td><td colspan="4">Not Allowed</td><td rowspan="5">Allowed</td></tr>
<tr><td>Computer Science</td><td colspan="4">Allowed for those who pass the Bridging mathematics course (Foundational Mathematics I) with 70% or more marks</td></tr>
<tr><td>Software Engineering</td><td colspan="4" rowspan="3">Allowed for those obtain a pass in Bridging mathematics course with 50% or above (Foundational Mathematics I)</td></tr>
<tr><td>Information Technology</td></tr>
<tr><td>Information Systems</td></tr>
</table>

3. Curriculum for the Bridging Course to follow Computing Degree

Accordingly, the following Curriculum is proposed as a Bridging Course for students who are interested in pursuing a career in Computing but have not followed the Physical Sciences stream at the A/Ls or have not taken a subject combination that includes Mathematics and Physics.

Curricular of Bridging Course

1. Foundation Mathematics (60 direct contact hours – 04 Credits)
2. Computational Thinking (60 (30T+30P) direct contact hours -03 Credits)
3. English and Communication Skills (30 direct contact hours – 02 Credits)

The course is to be delivered within a period of 3-4 months.

4. Detailed Course Specifications

Course Title	**Foundational Mathematics I**	
For whom:	Students who have completed A/L in non-Physical Science Streams	
Learning Outcomes	At the end of this course the students would : Be proficient in foundations of mathematics that is required to continue to higher studies in Computing Skills in applying mathematical concepts for problem solving	
No of SLQF Credits	4	
Total no of hours	60 contact hours 200 Notional Hours	
Key Topics	1	Review of Basic Algebra: Expansion, factorization, Simplications, solving equations • Addition, Subtraction, Multiplication and Division of Algebraic fractions. • Equations with algebraic fractions, simultaneous equations, quadratic equations • Factoring polynomials
	2	Sets and Relations • Representation of Set • Classification of Sets

		• Subsets • Power Set • Universal Set • Venn Diagram • Cartesian Product of two sets • Binary Relation • Reflexive relations • Symmetric relations
	3	Matrix Algebra • Matrix operations • The inverse of a matrix • Characterizations of invertible matrices • Introduction to determinants
	4	Functions • Classification of functions • Graphical representation of functions • Composition of functions • Domain, codomain and range • Inverse of a function
	5	Logarithms • The laws of logarithms • Standard bases 10 and e • Using logarithms to solve equations • Inverse operations

	6	Differentiation: Limits, Derivatives Critical Points
		• Definition of the derivative
		• Differentiating a combination of functions
		  • The sum or difference rule
		  • The product rule
		  • The quotient rule
		  • The chain rule
		• Differentiating elementary functions
		  • The power rule
		  • Trigonometric functions
		  • Exponential and natural logarithm functions
		• Partial Differentiation

	7	Integration and its applications • Definition of the integral

		• The fundamental theorem of calculus • Definite and indefinite integrals • Indefinite integrals of elementary functions • Substitution • Integration by parts
	8	Introduction to Statistic and Probability • Analyzing categorical data • Displaying and comparing quantitative data • Summarizing quantitative data • Modeling data distributions • Exploring bivariate numerical data • Basic theoretical probability • Probability using sample space • Basic set operations • Experimental probability • Significance tests (hypothesis testing)
	9	Coordinate Geometry and Trigonometry • Basic shapes of geometry • Distance; degree-measure of an angle • Congruence of triangles; parallel lines • Euclidean geometry • Cartesian coordinates; applications • Circles; their basic properties • Trigonometry; cosine and sine; addition formulae • Vector and complex-number methods • Trigonometric functions in calculus
References		

Course Title		**Computational Thinking and 21st Century Skills**
For whom:		Students who have enrolled in the Bridging Course
Learning Outcomes		At the end of this course the students would have: A wholesome understanding of societal and ethical responsibilities Understand the importance of variety of literacies required for work life such as Financial, ICT, Environment, Information Understand how to use logical and critical thinking to solve problems by following a structured methodology
No of SLQF Credits		3 credits
Total no of hours		60 (30 Theoretical and 30 Practical)

Key Topics	1	**Logical thinking, Critical Thinking and Problem Solving**
		• Problem Solving
		  ○ Identify the problem
		  ○ Define the final target
		  ○ Identify different solutions
		  ○ Evaluate solution and identify the most suitable
		  ○ Implement the solution
		  ○ Test the solution
		• Problem Decomposition: How to break down a problem in to a set of more manageable sub-problems
		• Pattern Recognition: Identify different patterns visible in data
		• Abstraction: Identifying the general principles of the data
		• Algorithm Design: Developing the step by step instructions for solving this and similar problems
		  ○ Tools for describing a solution
		  ■ Flowcharts
		  ■ Pseudo Code
		  ○ Implementing an algorithm in a Programming Language

	2	**Creativity and Innovation** • Building blocks of innovation • Processes and methods of creative problem solving: observation, definition, representation, evaluation and decision making • Creative and innovative thinking styles

		• Practical examples of creativity and innovation

	3	**Information and Data Literacy**
		• Working with Data
		  ○ Identifying data needs related to a problem
		  ○ Plan how to gather the necessary data
		  ○ Analyzing and Interpreting the data
		  ○ Presenting findings using appropriate tools

	4	ICT Literacy • Hardware and software • Programming languages • CASE tools • Computer networks including the Internet
	5	Technical Literacy • Basics of Interpersonal communication • Computer application tools : word processing, spread sheeting, presentation tools, graphics and images
	6	Financial Literacy • Basic business operation • Bookkeeping, payroll, accounts, ledgers • Money management, credit and debt management • Planning saving and investing •
References		

Course Title		**Communication Skills**
For whom:		Students who have enrolled in the Bridging Course
Learning Outcomes		At the end of this course the students would have: Be able to Communicate technical and engineering issues effectively with professional groups and the society at large Be able to read, interpret and summaries various types of documents Be able to prepare concise and logical reports of various types Summarize and present different types of information using appropriate tools and technologies
No of SLQF Credits		2
Total no of direct contact hours		30
Key Topics	1	Work related communication • Corporate etiquette • Effective emailing • Effective Face-to-Face Conversations • Effective phone communications • Preparing an outstanding CV/ resume • Handling Meetings • Use of Social media • Ethics in Communications

	2	Developing Reading and Writing Skills
		• Developing Reading Skills
		  ○ Preparation during pre-reading
		  ○ Effective Reading
		  ■ Identify the key concepts
		  ○ Post Reading
		  ■ Make a summary (textual or visual, e.g: mind map)
		• Effective Writing
		  ○ Understand the reader
		  ○ Structuring your document
		  ○ Using appropriate writing style and words
		  ○ Formatting the document

	3	Effective Communication and Presentation Skills • Public speaking skills • Impromptu speeches • Critical Thinking: Reseraching the facts • Structuring your presentations • Tools for making effective presentations • Using the right voice and body language in presentations
References		

Prepared By:

Names of the Technical Advisory Committee

Chairman- Prof. M.M.N.Najim
Vice Chancellor, University of South Eastern

Member- Prof. N. D Kodikkara,
University of Colombo School of Computing

Member- Dr. Ajith Madurapperuma,
Open University of Sri Lanka

Member- Dr. L. S. K. Udugama,
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Member- Mr. Chaminda Rathnayake,
National School of Business Management Ltd.