

GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY



STUDENT HANDBOOK

FACULTY OF COMPUTING

DEPARTMENT OF COMPUTATIONAL MATHEMATICS

INTAKE 42

GENERAL SIR JOHN KOTELAWALA
DEFENCE UNIVERSITY
FACULTY OF COMPUTING

STUDENT HANDBOOK

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BSc HONS IN DATA SCIENCE AND BUSINESS
ANALYTICS

DEAN- FACULTY OF COMPUTING
DEPARTMENT OF COMPUTATIONAL
MATHEMATICS

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Vision

To be a university nationally and internationally known for its unique ability to engage both undergraduate and graduate students in distinctive and interdisciplinary defense related higher education that best serves the tri-services, the state sector and society at large.

Mission

To ensure a high-quality, learner-centered educational experience through undergraduate, graduate, and professional programs along with high quality research across many disciplines in the field of defense, in both residential and non-residential settings in the campus.

Message of the Dean



The Faculty of Computing (FOC) of General Sir John Kotelawala Defence University (KDU) was established in 2015. The Faculty of Computing of KDU is the first ever Computing faculty in the Sri Lankan university system. FOC offers a wide spectrum of Computing degrees designed based on internationally recognized benchmarks. As per the UGC circular 995, FOC has designed its degrees as per the guidelines published by Association of Computing machinery/Institute of Electronic and Electrical Engineering (ACM/IEEE). Faculty of Computing offers degrees in Information Technology, Information Systems, Computer Science, Computer Engineering, Software Engineering and Data Science & Big Data Analytics.

FOC provides the opportunity to the students in any stream to undertake Information Technology and Information Systems degrees. Students who are from physical science stream will have the opportunity to follow Computer Science, Computer Engineering, Software Engineering and Data Science & Big Data Analytics degrees. Faculty of Computing comprises with four departments, namely, Department of Information Technology, Department of Computer Science, Department of Computer Engineering and Department of Computational mathematics.

There are around 800 students studying in the faculty at the moment. Computing is a domain which traces the pulse of every aspect in modern real life and having a high tendency of a rapid growth. At present, highly skilled professionals are required by the society more than ever before. The ultimate goal of Faculty of Computing is to generate leaders who are professionally competent in serving for the needs of Military, computing industry as well as to the whole nation. We train our students to face challenges with positive attitude and we groom them to apply their technical and theoretical knowledge for the betterment of the societal needs. We are committed to be in the forefront of providing quality education to produce graduates of high caliber who could deliver smart and sustainable computing solutions. The faculty is blessed with a very skillful and a devoted staff who are immensely contributing to every bit of success of the faculty. The intention of the faculty is to bring an honor to the whole university via becoming the best Computing faculty in Sri Lanka and one of the best in South Asia producing excellent Computing Professionals to the nation.

Dr Pradeep Kalansooriya (Dr. Eng)

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1 General Information

1.1 The University

General Sir John Kotelawala Defence University (KDU) was initially established as the “General Sir John Kotelawala Defence Academy” by the Parliamentary Act No 68 of 1981 and subsequently it was elevated to university status by the Amendment Act No 27 of 1988, thereby empowering it to award Bachelors’ and Postgraduate degrees in Defense Studies.

KDU is a member of the Association of Commonwealth Universities (United Kingdom) and maintains necessary standards for educating and grooming officer cadets to meet the challenges of modern defense management.

KDU is now open for civil students who wish to continue their higher studies in the fields of Engineering, Law, Management, Social Sciences and IT.

Officers with exceptional performance in reputed universities/institutions can pursue postgraduate studies in accordance with the requirements of the service to which they belong. Civil professionals are also offered a place at postgraduate studies to excel in and study a post-graduate degree in their related field of expertise.

1.2 Faculty of Computing

In 2015, the Faculty of Computing (FOC) of General Sir John Kotelawala Defence University was established with the dawn of the Southern Campus of KDU at Sooriyawewa. This is the first ever Computing Faculty in the Sri Lankan State University System dedicated to offer the widest spectrum of computing degrees under one umbrella of Computing, and all the computing degrees offered by FOC have been benchmarked with ACM/IEEE international standards.

FOC comprises four departments catering for teaching and research in theoretical foundations of the field of computing, engineering of computer hardware and software, mathematical and statistical requirements of computing, and technological and social aspects of computing. FOC strives to build students’ enthusiasm, intellectual capacity, and active involvement in research from the day one of their undergraduate studies. FOC at KDU is the only Computing Faculty in the State University System that offers the widest spectrum of Computing Degrees for students of all streams of G.C.E (A/L) except Technology Stream.

1.3 Academic Departments

1.3.1 Department of Information Technology

Department of Information Technology is the oldest department of the Faculty of Computing. This department offers more applications/ practicals oriented IT courses, and courses on organizational behavior, business and management. The department offers two degrees, namely BSc (Hons) in Information Technology and BSc (Hons) in Information Systems targeting candidates from all streams of G.C.E (A/L) except Technology Stream. Courses in the first two years are common to both degree programs and specialization in either IT or in IS begins from the third year. These two degree programs produce graduates with two different skills, namely, more technically oriented professionals (IT) and more management/business oriented professionals (IS) with technical knowledge.

1.3.2 Department of Computer Science

The Department of Computer Science has been established on 1st of January 2015 with the objective of producing Computer Science professionals of international standard and to fulfill the requirements of booming IT industry and develop researchers. It offers courses related to Scientific and Theoretical aspects of computing and enables introducing new courses on emerging trends in computing with an emphasis on the developments in Artificial Intelligence.

The Department of Computer Science is proud to offer two major computing courses including BSc (Hons) in Computer Science and BSc (Hons) in Software Engineering. These programs are targeting Science students from G.C.E (A/L). This department offers a large percentage of computing courses for BSc (Hons) in Computer Engineering, BSc (Hons) in Information Technology and BSc (Hons) in Information Systems as well. The department engages in a wide spectrum of research in broad areas of Theoretical Computing and Artificial Intelligence. This department also envisages strengthening the faculty wise research culture.

1.3.3 Department of Computer Engineering

Department of Computer Engineering is one of the newly established department of the Faculty of Computing. This department offers the degree of BSc (Hons) in Computer Engineering. This degree program provides students with an appropriate understanding of Software Technologies and Applications, Software Engineering, Network Technologies, Web Technologies, Leadership and Industrial Knowledge.

1.3.4 Department of Computational Mathematics

Department of Computational Mathematics is a recently established department of the Faculty of Computing. The department offers courses in three specific subject areas, namely, Mathematics & Statistics, Computational Intelligence and Theory of Computing. The courses primarily provide Mathematics and Statistics knowledge required for the degrees offered by the Faculty of Computing.

2 General Regulations

2.1 Admission Requirement

The durations of the degree program and the minimum requirements to enter the BScHons (DBA) degree programme at KDU are as follows:

Table 1: Degree Program and Selection Criteria

Degree Programs	Duration	G.C.E (As/L) - Stream
BScHons in Data Science and Business Analytics	Military: 04 1/2 Years Civil: 04 Years	Physical Science

- The candidate should have a minimum of a Credit (C) Pass in Combined Mathematics and a minimum of two Simple (S) Pass in any two of the subjects of Chemistry/Physics/Higher Mathematics/ICT at the G.C.E. (A/L) Examination in Physical Science stream

or

Candidate should have a minimum of a Credit (C) Pass in Combined Mathematics and a minimum of two Simple (D) Pass in any two of the subjects of Chemistry/Physics/Higher Mathematics/ICT at the G.C.E. (A/L) (E.g. Cambridge, Edexcel) Examination.

- A minimum of a Credit (C) Pass for English Language at G.C.E (Ordinary Level) Examination.
- A pass mark (marks 30 and above) for the Common General Test.

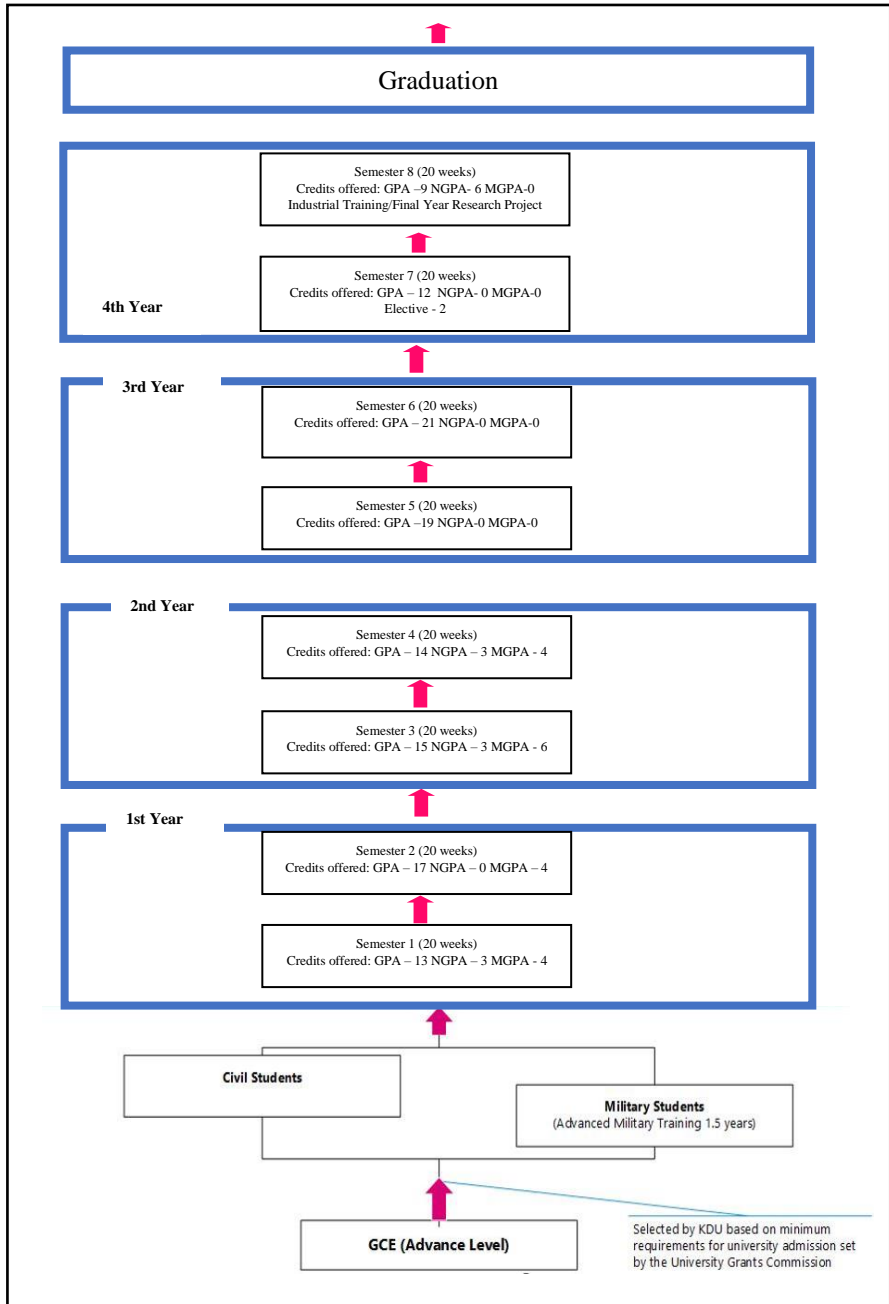
The Following additional requirements are to be fulfilled by those applying as military students.

- Be a citizen of Sri Lanka.
- Be not less than 18 years and not more than 22 years of age on the closing date of applications.
- Be unmarried.
- Have a body weight not less than 50 kg (110 lbs).
- Have an unexpanded chest not less than 81.25 cm (32”).
- Have a height not less than

Table 2 Minimum Height Requirement

	Army	Navy	Air Force
Male	165.1 cm (5'5")	167.6 cm (5'.6")	167.6 cm (5'.6")
Female	152.4 cm (5'3")	160.0 cm (5'.3")	162.5 cm (5'.4")

2.2 Course Structure



3 Structure of the Curriculum and Courses

BScHons in Data Science and Business Analytics degree programme is fulltime, and conducted in a semester based system. Officer Cadets enlisted to follow the degree programmes shall, in addition, complete a compulsory period of Advanced Military Training in the respective Military Academies, as prescribed. Each semester of each academic year includes a minimum of fifteen (15) weeks for teaching, followed by minimum one (01) week for study leave prior to the End Semester Examination. After enlisting the students, prior to the commencement of academic studies, an orientation programme is conducted to prepare the students for effective learning in academic and military subject modules. The duration of a degree programme shall be calculated from the date of its commencement. The academic year shall commence from January in each calendar year.

3.1 BScHons in Data Science and Business Analytics

BScHons in Data Science and Business Analytics degree programme provides students with the required knowledge and experience of Computer Science, Mathematics and Statistics, Management, and Communication in English that is needed in many branches of science such as, Data Science, Medicine, Engineering, and Business.

The computer science subject area intends to deliver a broad overview of the general field of computer science concepts, theories and tools required to support students in pursuing a data science degree programme. The Mathematics and Statistics subject area is a main part in the data science degree curriculum and intends to provide the fundamentals of mathematical and statistical concepts that are essential in data science. Application of Management is intended to cover three perspectives: financial, operational, and strategic perspectives, which have been developed in order to enhance the students' strategic thinking and application abilities. Communication in English is intended to equip students with the skills to communicate effectively with a variety of audiences through oral, written, and visual modes. This degree program of KDU has been designed in accordance with ACM/IEEE international guidelines.

3.2 Career Opportunities

As the demand for qualified, talented graduates in data science increases rapidly and a substantial need for data science jobs in the next decade arises in fields such as Data Science, Medicine, Statistical Consulting and Policy Planning with job satisfaction and high earnings. The amount of data produced and collected every day has the

potential for big impact, but it requires people capable of working with both computers and numbers to translate that information into actionable insights. Along with the immense amount of big data being generated today comes an increasing need for trained data scientists and statisticians who can gather, analyze and interpret that data.

To start a successful career in data science, it is required to have hard skill sets like analysis, machine learning, statistics, neural networks, etc. and you must be a problem solver, critical thinker, and a good storyteller to excel in data science. The graduates from these programme is guaranteed with white collar employment in a thriving and prospering industry that is highly sought after in both domestic and international job market. The career opportunities include Data Analysts, Data Engineers, Database Administrators, Data Scientists, Business Analysts, Statisticians, Data and Analytics Managers. Moreover, a career path in this area can involve advanced graduate work, followed by a position in a research university or industrial R&D lab, or it can involve entrepreneurial activities.

3.3 Credit Ratings and Course Codes

3.3.1 BScHons in DSBA (Level 1)

The following table gives an overall summary of the course units entitled for the level one of the BScHons in Data Science and Business Analytics Degree Programs. The respective course units have been outlined in detail beneath the table.

Table 3: Level One DSBA course units

Level 1								
Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 1								
DS11011	Fundamentals of Data Science	C	1	-	-	13	3	4
DS11023	Probability and Statistics	C	3	-	-			
DS11032	Calculus I	C	2	-	-			
CS11012	Fundamentals of Programming	C	2	-	-			
CS11021	Programming Laboratory	C	1	-	-			
CS11042	Fundamentals of Databases	C	2	-	-			
MF1122	Principles of Management	C	2	-	-			
LC1133	Introduction to Communication Skills	C	-	3	-			
MS1014	Military Studies	C	-	-	4			
Total for Semester 1						13	3	4

Semester 2								
DS12013	Discrete Mathematics for Data Science	C	3	-	-	17	0	4
DS12022	Linear Algebra I	C	2	-	-			
DS12033	Statistical Inference	C	3	-	-			
CS12052	Object Oriented Programming	C	2	-	-			
DS12042	Applied Statistical Computing	C	2	-	-			
MF1212	Business Economics	C	2		-			
LC1243	Fundamentals of Business Communication	C	3	-	-			
MS1024	Military Studies	C	-	-	4			
Total for Semester 2						17	0	4
Total for Level 1						30	3	8

3.3.1.1 Semester 01

Fundamentals of Data Science	DS11011
<i>This module aims to introduce the core principals and techniques of data science and to emphasize the importance of ethical considerations in data handling and analysis.</i>	
Credits 01	GPA - Compulsory

Probability and Statistics	DS11023
<i>This module aims to introduce probability and statistics to solve real world scenarios while working with data in their varied academic disciplines.</i>	
Credits 03	GPA - Compulsory

Calculus I	DS11032
<i>The module aims to facilitate students to understand the fundamentals of Calculus and apply techniques in Calculus to solve problems.</i>	
Credits 02	GPA-Compulsory

Fundamentals of Programming	CS11012
<i>This module aims to introduce fundamental programming concepts, applying programming concepts to solve real world problems. To provide a classroom environment that lets students be proficient in theoretical aspects of programming and methodologies.</i>	
Credits 02	GPA-Compulsory

Programming Laboratory	CS11021
<i>This module aims to gain hands on experience in laboratory environment to be proficient in programming concept.</i>	
Credits 01	GPA-Compulsory

Fundamentals of Databases	CS11042
<i>This module aims to cover fundamental concepts on Database Management Systems. After following this module, students are capable to implement a relational database for a well- defined problem, optimize the database and able to manipulate data.</i>	
Credits 02	GPA-Compulsory

Principles of Management	MF1122
<i>This module aims to provide a comprehensive understanding on managerial decision making, working environment culture, diversity management, ethics and social responsibility, and crafting business strategies and to enrich the knowledge on organizational structure, culture, communication, teamwork and emotional intelligence.</i>	

Credits 02	GPA-Compulsory
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Introduction to Communication Skills	LC1133
<i>This module aims to provide opportunities for students to analyse and practice basic communication skills needed in their field of study.</i>	
Credits 03	NGPA-Compulsory

3.3.1.2 Semester 02

Discrete Mathematics for Data Science	DS12013
<i>The module aims to provide knowledge about Number Theory, Boolean Algebra, Graph theory, Combinatory, and to apply those techniques in real world problems using computer software.</i>	
Credits 03	GPA-Compulsory

Linear Algebra I	DS12022
<i>This module aims to facilitate students to understand fundamentals of linear algebra and apply techniques in linear algebra to solve problems.</i>	
Credits 02	GPA-Compulsory

Statistical Inference	DS12033
<i>This module aims to provide knowledge about estimation, hypothesis testing, large sample results and to apply those statistical techniques in real world problems using statistical software.</i>	
Credits 03	GPA-Compulsory

Object Oriented Programming	CS12052
<i>This module aims to enable the student to tackle complex programming problems, making good use of the object-oriented programming paradigm to simplify the design and implementation process.</i>	
Credits 02	GPA-Compulsory

Applied Statistical Computing	DS12042
<i>This module aims to facilitate students to understand fundamentals of R software and apply techniques in R to solve real world problems.</i>	
Credits 02	GPA-Compulsory

Business Economics	MF1212
<i>This module aims to introduce students to core economic principles and how these could be used in a business environment to understand economic behaviour and aid decision-making.</i>	
Credits 02	GPA-Compulsory

Fundamentals of Business Communication	LC1243
<i>This module aims to provide opportunities for students to analyse different types of communication in business and practice business communication skills needed in their field of study.</i>	
Credits 03	GPA-Compulsory

3.3.2 BScHons in DSBA (Level 2)

The following table gives an overall summary of the course units entitled for the level two of the BScHons in Data Science and Business Analytics Degree Program. The respective course units have been outlined in detail beneath the table.

Table 4 Level Two DSBA course units

Level 2								
Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 3								
DS21012	Calculus II	C	2	-	-	15	3	6
DS21022	Linear Algebra II	C	2	-	-			
DS21033	Regression Analysis	C	3	-	-			
CS21063	Data Structures and Algorithms	C	3	-	-			
DS21042	Programming for Data Science	C	2	-	-			
MF2123	Accounting and Finance	C	3	-	-			
LC2353	Advanced Communication Skills	C	-	3	-			
MS2044	Military Studies	C	-	-	4			
MS3032	Strategic Defence Studies	C	-	-	2			
Total for Semester 3						15	3	6
Semester 4								
DS22012	Categorical Data Analysis	C	2	-	-	14	3	4
CS22032	Essentials of Artificial Intelligence	C	2	-	-			
DS22023	Data Mining and Data Warehousing	C	3	-	-			
SE22033	Software Engineering	C	3	-	-			
MF2222	Cost & Management Accounting	C	2	-	-			
DS22032	Business Intelligence and Analytics	C	2	-	-			
LC2463	Conversation Analysis	C	-	3	-			
MS2024	Military Studies	C	-	-	4			
Total for Semester 4						14	3	4
Total for Level 2						29	6	10

3.3.2.1 Semester 03

Calculus II	DS21012
<i>This module aims to facilitate students to understand fundamentals of Calculus and apply techniques in two variable functions to solve problems.</i>	
Credits 02	GPA-Compulsory

Linear Algebra II	DS21022
<i>This module aims to facilitate students to understand fundamentals of linear algebra and apply techniques in linear algebra to solve problems.</i>	
Credits 02	GPA-Compulsory

Regression Analysis	DS21033
<i>The module aims to facilitate students to understand fundamentals of Correlation, simple and multiple linear regression and apply regression techniques in real world problems.</i>	
Credits 03	GPA-Compulsory

Data Structures and Algorithms	CS21063
<i>This module aims to provide the knowledge in various data structures, algorithms and their operations. Also, to investigate the running time of algorithms.</i>	
Credits 03	GPA-Compulsory

Programming for Data Science	DS21042
<i>This module aims to teach advanced python programming concepts and Python library packages for scientific computing, data visualizations and data manipulation and analysis.</i>	
Credits 02	GPA-Compulsory

Accounting & Finance	MF2123
<i>This module aims to develop learners, knowledge and understanding of the underlying principles and concepts of Financial Accounting and to enable them to apply accounting standards and it is expected to gain the ability of using accounting information as a tool in applying solutions for managerial problems, evaluating the financial performance, and interpreting the financial structure.</i>	
Credits 03	GPA-Compulsory

Advanced Communication Skills	LC2353
<i>This module is to provide opportunities for students to analyse different types of communication in business and practice business communication skills needed in their field of study.</i>	
Credits 03	NGPA-Compulsory

3.3.2.2 Semester 04

Categorical Data Analysis	DS22012
<i>This module aims to facilitate students to understand one dimensional, two dimensional and multidimensional categorical data and improve the knowledge of descriptive and inferential statistical methods for analysing categorical data.</i>	
Credits 02	GPA-Compulsory

Essentials of Artificial Intelligence	CS22032
<i>The module aims to give students an introduction to the theory, techniques and tools to create Artificial Intelligence based systems.</i>	
Credits 02	GPA-Compulsory

Data Mining and Data Warehousing	DS22023
<i>This module aims to provide the knowledge on various data mining techniques, including classification, clustering, association rule mining, and anomaly detection with emphasis on the importance of data preprocessing, including data cleaning, normalization, and transformation. Also, this module aims to provide the principles of designing, implementing, and managing a data warehouse and to explore data integration and data quality issues.</i>	
Credits 03	GPA-Compulsory

Software Engineering	SE22033
<i>The module aims to deliver fundamental concepts and principles in software engineering. To lay down the foundation for applying these concepts and principles to analyse, design, develop, test and maintenance of computer systems handling big data and its data models.</i>	
Credits 03	GPA-Compulsory

Cost & Management Accounting	MF 2222
<i>This module aims to provide knowledge on ascertainment of cost, fixation of selling price, proper recording and presentation of cost data to management for measuring efficiency and for cost control and cost reduction, ascertaining the profit of each activity, assisting management in decision making and determination of break-even point.</i>	
Credits 02	GPA-Compulsory

Business Intelligence and Analytics	DS22032
<i>This module aims to provide students with a comprehensive understanding of business intelligence (BI) and analytics, enabling them to harness the power of data to drive strategic decision-making in organizations. Also, the module aims to develop the skills necessary for collecting, analyzing, and interpreting data to gain actionable insights for improving business performance.</i>	
Credits 02	GPA-Compulsory

Conversation Analysis	LC2463
<i>This module aims to provide opportunities for students to analyse different types of communication in business and practice business communication skills needed in their field of study.</i>	
Credits 03	NGPA-Compulsory

3.3.3 BScHons in DSBA (Level 3)

The following table gives an overall summary of the course units entitled for the level three of the BScHons in Data Science and Business Analysis Degree Program. The respective course units have been outlined in detail beneath the table.

Table 5 Level Three DSBA course units

Level 3								
Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 5								
CS31142	Advanced Database Management Systems	C	2	-	-	19	0	0
CS31153	Machine Learning	C	3	-	-			
DS31012	Multivariate Data Analysis	C	2	-	-			
CS31162	Computer Networks	C	2	-	-			
DS31023	Research Methodology	C	3	-	-			
DS31032	Bayesian Data Analysis	C	2	-	-			

DS31042	Professional Practices and IT Law	C	2						
MF3113	Operations Research	C	3	-	-				
DS32993	Group Project in Applied Data Analytics (Carried out throughout sem 5 and sem 6)	C	-	-	-				
Total for Semester 5							19	0	0
Semester 6									
DS32013	Big Data Analytics	C	3	-	-	21	0	0	
DS32023	Time Series Analysis	C	3	-	-				
DS32993	Group Project in Applied Data Analytics (Carried out throughout sem 5 and sem 6)	C	3	-	-				
MF3212	Operation Management	C	2	-	-				
CS32122	Cloud Computing	C	2	-	-				
CS32132	Cyber Security	C	2	-	-				
CS32143	Deep Learning	C	3	-	-				
LC3673	Discourse Communication	C	3	-	-				
Total for Semester 6							21	0	0
Total for Level 3							40	0	0

3.3.3.1 Semester 05

Advanced Database Management Systems	CS31142
<i>This module aims at furthering database systems concepts through adding complexity and a more hands-on approach</i>	
Credits 02	GPA-Compulsory

Machine Learning	CS31153
<i>This module aims to provide a broad introduction to machine learning and statistical pattern recognition.</i>	
Credits 03	GPA-Compulsory

Multivariate Data Analysis	DS31012
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This module aims to teach techniques and theoretical concepts related to multivariate data analysis with deeper knowledge of multivariate statistics and inference, both in theory and applications.

Credits 02

GPA-Compulsory

Computer Networks

CS31162

The module aims to teach students to introduce fundamental networking concepts and technologies. Also, will assist students in developing the skills necessary to plan and implement small networks across a range of applications.

Credits 02

GPA-Compulsory

Research Methodology

DS31023

This module aims to discuss the research concepts, methodologies and available tools to do research.

Credits 03

GPA-Compulsory

Bayesian Data Analysis

DS31032

This module aims to facilitate students to understand fundamentals of Bayesian theory and modern computational methods for Bayesian inference.

Credits 02

GPA-Compulsory

Professional Practices and IT Law

DS31042

This module aims to introduce students to social, legal and ethical aspects of the professional world. The module starts with emphasizing the importance of values, beliefs, attitudes and character to one's career in the professional world. They will analyze scenarios that allow them to critically analyze a real-world issue from

social, legal, and ethical angles to make informed decisions. They will learn to respect and embrace different opinions by understanding the availability of different world views.	
Credits 02	GPA-Compulsory

Operations Research	MF3113
<i>This module aims to provide knowledge of essential tools of operations research to facilitate them to make managerial decisions scientifically.</i>	
Credits 03	GPA-Compulsory

3.3.3.2 Semester 06

Big Data Analytics	DS32013
<i>This module aims to provide a balanced view of the theory and practice on big data analytics, allowing students to develop a variety of big data analytics knowledge and skills.</i>	
Credits 03	GPA-Compulsory

Time Series Analysis	DS32023
<i>This module aims to facilitate students to understand fundamentals of time series and apply techniques in time series and financial time series to solve real world problems.</i>	
Credits 03	GPA-Compulsory

Group Project in Applied Data Analytics	DS32993
<i>The module aims to provide hands-on experience on real-time data science activities by applying the techniques learned throughout the programme, including the technical skills of analysis, design and implementation.</i>	
Credits 03	GPA-Compulsory

Operation Management	MF3212
<i>This module aims to provide a general introduction to Operations and Process Management and explains how the Operations function fits within the organization overall. The module also explores how actors outside the core Operations function have a role in, and engage in the management of processes.</i>	
Credits 02	GPA-Compulsory

Cloud Computing	CS32122
<i>This module aims to investigate cloud computing models, techniques, and architectures which enables information, software, and other shared resources to be provisioned over the network as services in an on-demand manner.</i>	
Credits 02	GPA-Compulsory

Cyber Security	CS32132
<i>This module aims to introduce the various aspects of cyber security which is an essential component in safeguarding one's electronic devices, systems, data, and other necessary components in the modern – day world.</i>	
Credits 02	GPA-Compulsory

Deep Learning	CS32143
<i>This module aims to provide a broad introduction to deep learning algorithms with pattern recognition. The topics includes build convolutional networks for image recognition, recurrent networks for sequence generation, auto-encoder for efficiently compress and encode data, generative adversarial networks for image generation, and learn how to deploy models accessible from a website.</i>	
Credits 03	GPA-Compulsory

Discourse Communication	LC3673
<i>This module aims to provide opportunities for students to analyse different types of communication in business and practice business communication skills needed in their field of study.</i>	
Credits 03	GPA-Compulsory

3.3.4 BScHons in DSBA (Level 4)

The following table gives an overall summary of the course units entitled for the level four of the BScHons in Information Technology Degree Program. The respective course units have been outlined in detail beneath the table.

Table 6 Level Four DSBA course units

Level 4								
Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 7								
CS41172	Image Processing and Computer Vision	C	2	-	-	12 (Including one elective)	0	0
DS41012	Data Management and Governance	C	2	-	-			
SE41052	Project Management for Data Science	C	2	-	-			
CS41142	Natural Language Processing	C	2	-	-			
CS41052	Semantic Web and Ontology	E	2	-	-			
DS41022	Spatial Data Analysis	E		-	-			
DS41032	Emerging Trends in Data Science	E		-	-			
CS41182	Parallel Computing	E		-	-			
CS41152	Information Security	E		-	-			
MF 4122	Strategic Business Analysis	C	2	-	-			
DS42999	Individual Research Project * (carried throughout sem7 and sem8)	C	-	-	-			
Total for Semester 7						12	0	0
Semester 8								
DS42999	Individual Research Project * (carried throughout sem7 and sem8)	C	9	-	-	9	6	0
DS42986	Industrial Training	C	-	6	-			

Total for Semester 8	9	6	0
Total for Level 4	21	6	0

3.3.4.1 Semester 07

Image Processing & Computer Vision	CS41172
<i>This module aims to Introduce a thorough grounding of the principles of computer vision and image processing and seeks to develop students' knowledge from basic image processing techniques to advanced computer vision and image analysis systems.</i>	
Credits 02	GPA-Compulsory

Data Management and Governance	CS41012
<i>This module aims to develop policies and procedures within organizations to support high-quality information provision to users, focusing on data security, administration, governance, and foundational data management concepts.</i>	
Credits 02	GPA-Compulsory

Project Management for Data Science	SE41052
<i>This module aims to equip students with advanced project management skills tailored to Data Science and Business Analytics projects. It focuses on applying project management principles to effectively plan, execute, and deliver complex projects, ensuring that students can manage all aspects from initiation to completion.</i>	
Credits 02	GPA-Compulsory

Natural Language Processing	CS41142
<i>This module aims to combine a critical introduction to key topics in theoretical linguistics with hands on practical experience of developing applications to process texts and access linguistic resources.</i>	
Credits 02	GPA-Compulsory

Semantic Web and Ontology	CS41052
<i>This module aims to provide the knowledge on the rationale behind Semantic web. They should be able to model and query domain knowledge as ontologies defined using standards such as RDF and OWL. Students should be able to apply the principles of ontological engineering to modelling exercises.</i>	
Credits 02	GPA-Compulsory

Spatial Data Analysis	DS41022
<i>This module aims to equip students with a fundamental understanding of spatial data concepts, including coordinates, projections, and their applications. By the end of the module, students should be proficient in acquiring, cleaning, and visualizing spatial data, and able to apply basic spatial analysis methods and geospatial statistics. Additionally, the module emphasizes ethical considerations in spatial data analytics, project-based application of learned skills, and effective communication of spatial insights within the context of data science workflows.</i>	
Credits 02	GPA-Compulsory

Emerging Trends in Data Science	DS41032
<i>The module aims to provide students with an opportunity to search for knowledge in areas of new trends in data science and it allows students to explore the emerging trends in a certain data science area.</i>	

Credits 02	GPA-Compulsory
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Parallel Computing	CS41182
<i>This module aims to introduce the field of parallel computing. The students will be taught how to design efficient parallel programs and how to use parallel computing techniques to solve scientific problems.</i>	
Credits 02	GPA-Compulsory

Information Security	CS41152
<i>This module aims to introduce the principles of network and operating system security through hands on exploration. Students learn how to harden an operating system as well as secure the network by implementing technologies such as firewalls, Virtual Private Networks (VPN), and Intrusion Detection Systems (IDS).</i>	
Credits 02	GPA-Compulsory

Strategic Business Analysis	MF 4122
<i>This module aims to provide the fundamentals of how to analyse and manage organizations strategically. Strategic management of organization is a complex undertaking which starts with the central question: why are some firms more profitable than others? The course will require you to examine this question by integrating from prior business courses, while simultaneously learning and applying new strategic management concepts, principles, frameworks and methodologies.</i>	
Credits 02	GPA-Compulsory

3.3.4.2 Semester 08

Individual Research Project	DS42999
<i>This module aims to give undergraduate students exposure to research undertaken individually and to achieve a specific objective within a fixed period and to achieve it independently. Additionally, this course allows undergraduate students to research on Data Science area with applying techniques learned throughout the degree programme, including the technical skills of data science and data analytics, computer modelling and implementation.</i>	
Credits 09	GPA-Compulsory

Industrial Training	DS42986
<i>Students with exposure to the industry to learn, work ethics, professional conduct, organization cultures & processes, self-evaluation and practice to solve industrial problem using the gained knowledge.</i>	
Credits 06	NGPA-Compulsory

The BScHons in Data Science and Business Analytics degree programme contains 120 GPA credits from core course units, 15 NGPA credits and 18 MGPA credits. The distribution of the academic credits in BScHons DSBA degree program are illustrated in the table below.

Table 7 GPA Summary

GPA Summary			
SEMESTER	GPA	NGPA	MGPA
Semester 1	13	3	4
Semester 2	17	-	4
Semester 3	15	3	6
Semester 4	14	3	4
Semester 5	19	-	-
Semester 6	21	-	-
Semester 7	12	-	-

Semester 8	9	6	-
Total	120	15	18

* For cadet officers there is a six months military training before entering to the degree programme and one year advanced military training on completion of the degree

4 Examinations

4.1 Examination Criteria

Each course of the program is assessed independently. The assessment has two components: Continuous Assessment (CA) and End Semester Written Examination (WE). The weightage of a component might change based on the nature of the course. The relevant percentages of assessment for a course are incorporated into the curriculum. In order to complete a course, the student has to earn a minimum of 35% of the allocated marks for each component and a total pass mark of 45% “C” grade.

The CA component includes laboratory work, tutorials, take home assignments, in class tests, case studies, quizzes, presentations, field visits and mid semester examinations. These are conducted during the semester.

4.2 Maximum Allowed Duration of Study

Table 10 Maximum Allowed Durations

Degree Program	Max. No. of years in which a degree can be completed
Computer Science	8
Software Engineering	8
Computer Engineering	8
Information Technology	8
Information Systems	8
Data Science and Business Analytics	8

The BoS (Senate)/ BOM (Council) on the recommendation of the Faculty Board of Faculty of Computing may grant permission to extend the duration of study beyond the maximum period allowed on medical grounds or under exceptional circumstances other than medical grounds on a case by case basis.

4.3 Description of Modules

The Programmes of Study consist of a combination of GPA, MGPA and NGPA Modules, defined as follows:

GPA Modules: GPA Modules are those that have GPA credits. Such Modules are considered in the calculation of Semester GPA (SGPA), Year GPA (YGPA) and Final GPA (FGPA).

NGPA Modules: NGPA Modules are those Modules that have Non GPA credits. Such Modules are not considered in the calculation of SGPA, YGPA and FGPA.

MGPA Modules: MGPA Modules are those Modules that have GPA credits for Military subject modules. MGPA Modules shall be considered, only for Officer Cadets, in the calculation of SGPA, YGPA and FGPA.

Core Modules: Core Modules are those Modules that are the core of the degree programme and shall be successfully completed by a student to graduate.

Elective Modules: Elective Modules are those Modules that need to be selected from a basket of modules that need to be successfully completed by a student to graduate.

Optional Modules: Optional Modules are those Modules that may be selected from modules offered, either to complete the minimum requirement of credits and/or to proceed further.

Compulsory Modules: Compulsory Modules are those that make the minimum combination of all core-modules, elective modules and any additional minimum optional modules required for a student to graduate.

Prescribed Course Units (PCU): Prescribed Course Units are compulsory Course Units which shall be completed with the minimum final pass mark of 50% (C+).

Prerequisite Course Units (PRCU): Prerequisite Course Units are mandatory requirements that a student shall complete before proceeding to the subsequent academic year.

4.4 Eligibility to sit an End Semester Examination

The eligibility requirement to sit an End Semester examination paper in a Course Unit, relevant to the field of study in a particular semester, as a first-time candidate, is an attendance record of not less than 80%. However, an attendance record of not less than 70% may be considered on valid medical grounds and/or due to any other valid reason by the Faculty Board for the purpose of calculating the required attendance.

A student who is eligible to sit for each and every examination pertaining to a particular subject or Course Unit shall sit for such examination at the first scheduled occasion.

A student who shall not meet the eligibility requirement stipulated above shall be considered as a repeat candidate, and the maximum grade that can be earned in a subsequent sitting for the relevant subject or Course Unit shall be limited to a ‘C’ grade.

4.5 Grading System

There are two categories of Academic Credits: GPA (Grade Point Average) and NGPA (Non-Grade Point Average). Each course in the curriculum is assigned with a credit value and its category. Only the GPA credits are considered when calculating SGPA (Semester Grade Point Average), YGPA (Year Grade Point Average) and FGPA (Final Grade Point Average).

Military courses offered to the military students are assigned with a credit value of a third category, called MGPA (Military Grade Point Average). Both GPA and MGPA credits are considered when calculating the SGPA, YGPA and FGPA of military students. A prescribed minimum MGPA credits, over and above the Academic Credits, must be earned by a military student to qualify for graduation. The following table describes the grade point values (GPV) dedicated for each grade.

Table 11: Details of Grades and GPVs

Final Marks	Grade	GPV
85 – 100	A+	4.00
75 – 84	A	4.00
70 – 74	A-	3.70
65 – 69	B+	3.30
60 – 64	B	3.00
55 – 59	B-	2.70
50 – 54	C+	2.30
45 – 49	C	2.00
40 – 44	C-	1.70
35 – 39	D+	1.30
ES <35	Ie	0.00
CA < 35	Ia	0.00
PBCA <35%	Ia	0.00
Both ES & CA < 35	Ib	0.00
Not eligible	Ne	0.00
Absent	Ab	0.00
Excused	Ex	

Ab = Absent for a course unit Ex = Excused on a valid reason

Pass Marks and Grades

The details of the grades and Grade Point Value (GPV) corresponding range of marks are described in the above table. Grading for MGPA courses are decided by the senate, considering the raw marks submitted by Military Training Academies and the pass mark of the respective Academies of the Army, Navy and Air Force. The semester Grade Point Average (SGPA) is calculated from GPV earned for individual courses in a semester as per the following formula,

$$SGPA = \frac{\sum[\text{GradePoint scored for Course Unit} \times \text{Credit value of Course Unit}]}{\text{Cumulative credit value of all GPA Course Units of the Semester}}$$

For the further information of YGPA and FGPA, refer the section 3.7 of the Faculty of Computing By-Laws.

4.6 Criteria for Completing a Semester

4.6.1 Passing a Semester

A student shall satisfy the following minimum requirements to successfully complete a semester:

- a. obtain a “C” grade or above for all Course Units, other than as specified in Faculty of Computing By-Laws. b,
- b. obtain not more than one “D+” or “C-” grade for a GPA Course Unit per semester subject.
- c. have no Failure grades or “Ex” for any of the course units in the relevant semester.

4.6.2 Re-sitting a Course Unit

- a. Re-sitting a Course Unit for which an Excuse has been granted would be on the same basis as a normal first attempt candidate.
- b. A charge shall be levied by the registry as approved by the BOM, for re-sitting a course unit.
- c. All the Course Units having grade “Ie” shall be completed by re-sitting the ES component.

- d. All the Course Units having grade “Ia” shall be completed by re-sitting the CA/PBCA component.
- e. All the Course Units having grade “Ib” shall be completed by re-sitting the both ES and CA/PBCA component.
- f. The earned CA mark in the first attempt would be carried over when re-sitting of the ES component.
- g. All NGPA Course Units having a grade less than “C” shall have to be repeated to obtain a pass grade.
- h. All GPA Course Units having a grade less than “C”, except those “weak passes” permitted (Faculty of Computing By-Laws), shall be repeated to obtain a pass grade.
- i. Any NGPA Course Unit having a grade “C” or higher may be repeated if desirous of upgrading the given grade.
- j. Any GPA Course Unit with a permitted “Weak Pass” may be repeated if desirous of upgrading the given grade up to a maximum of grade “C”.

4.6.3 Supplementary Examinations

A supplementary examination, for first and second semesters shall be held for the students who had attempted and failed at the first scheduled End Semester Examination.

To allow students to graduate without delay, a supplementary examination shall be held after the release of the results of the End Semester Examination of the last semester.

5 Discontinuing A Student

5.1 Discontinuation from the Degree

A student shall be deemed to have discontinued a degree programme at the University under any of the following conditions.

- a. When a student has been unable to complete the degree programme within the maximum period stipulated in Table 10.
- b. When a student has been determined to be unfit to continue his/her studies at the University by a competent medical board recommended by the University on account of an illness.
- c. Following punishment for an examination offence in terms of the provisions of the “Bylaws pertaining to the conduct of examinations” approved by the BOM.
- d. When a student has been absent for two continuous semesters without informing the faculty and getting its acceptance.

5.2 Poor Performance of Students

- a. A student will be allowed to progress through the semester being in the original batch whilst completing low performed academic course units through subsequent examinations during the maximum duration specified in Table 10.
- b. A warning shall be given to students who have failed to obtain a minimum SGPA of 2.0 at any stage of progression in the degree programme.
- c. A student who has failed to obtain a minimum YGPA of 1.30 shall not be able to proceed to the next academic year.
- d. Relegation of Officer-Cadets for poor performance in military subject modules shall be as prescribed.

6 Awards and Trophy

6.1.1 Criteria for Awarding Degrees

Following criteria are considered for awarding degrees,

- a. Following the programme in the specified field of study for the minimum stipulated period of time;
- b. Satisfactory completion of the academic requirements of all semesters of the Degree Programme;
- c. As stipulated in the respective Degree Programme Curriculum obtaining a minimum of GPA credits and a minimum of NGPA credits.
- d. Fulfilment of the criteria for completing the examinations within the maximum stipulated time period;
- e. Earning a GPA of not less than 2.00 for the entire degree programme;
- f. Not having more than 1 D+ or C- grades per semester in the entire programme.

A student shall be entitled to the award of the Hons Degree unless he/she has completed the above requirements (a – f) within four academic years.

6.1.2 Criteria for Awarding Classes

Awarding of classes shall be determined at the completion of all requirements for graduation within the minimum time period stipulated for the degree programme, except upon approvals granted by the BOM on the recommendation of the BOE for a valid and accepted reasons. The highest eligible Class shall be awarded based on the FGPA as in the following table.

Table 8 Criteria for Awarding Classes

<i>FGPA</i>	<i>Final Result</i>
FGPA \geq 3.70	First Class
3.30 \leq FGPA and FGPA $<$ 3.70	Second Class (Upper Division)
3.00 \leq FGPA and FGPA $<$ 3.30	Second Class (Lower Division)
2.00 \leq FGPA and FGPA $<$ 3.00	Pass

First Class

For the award of a First Class, a student shall:

- a. have received a FGPA of not less than 3.70 for the entire Degree Programme.
and
- b. not have received any failure grade at any time during the entire Degree Programme.
and
- c. not have carried over any weak passes for the entire Degree Programme at the time of finalizing the awarding of classes.

Second Class (Upper Division)

For the award of a Second Class (Upper Division), a student shall:

- a. have received a FGPA of not less than 3.30 for the entire Degree Programme
and
- b. not have received more than one failure grades at any time during the entire Degree Programme
and
- c. not have received any failure grade during the semesters 7 and 8
and
- d. not have carried over any incomplete or failure grades or weak passes for the entire Degree Programme at the time of finalizing the awarding of classes.

Second Class (Lower Division)

For the award of a Second Class (Lower Division), a student shall:

- a. have received a FGPA of not less than 3.00 for the entire Degree Programme.
and
- b. not have received more than two failure grades at any time during the Programme
and
- c. not have received any failure grade during the semesters 7 and 8
and
- d. not have carried over any incomplete or failure grades for the entire Degree Programme at the time of finalizing the awarding of classes.

6.1.3 Merit Awards

Students obtaining the highest GPA in Academic Studies shall be entitled for the respective Awards of merit. Awards to which students may be eligible on the recommendation of relevant authorities and the approval of the Board of Management are:

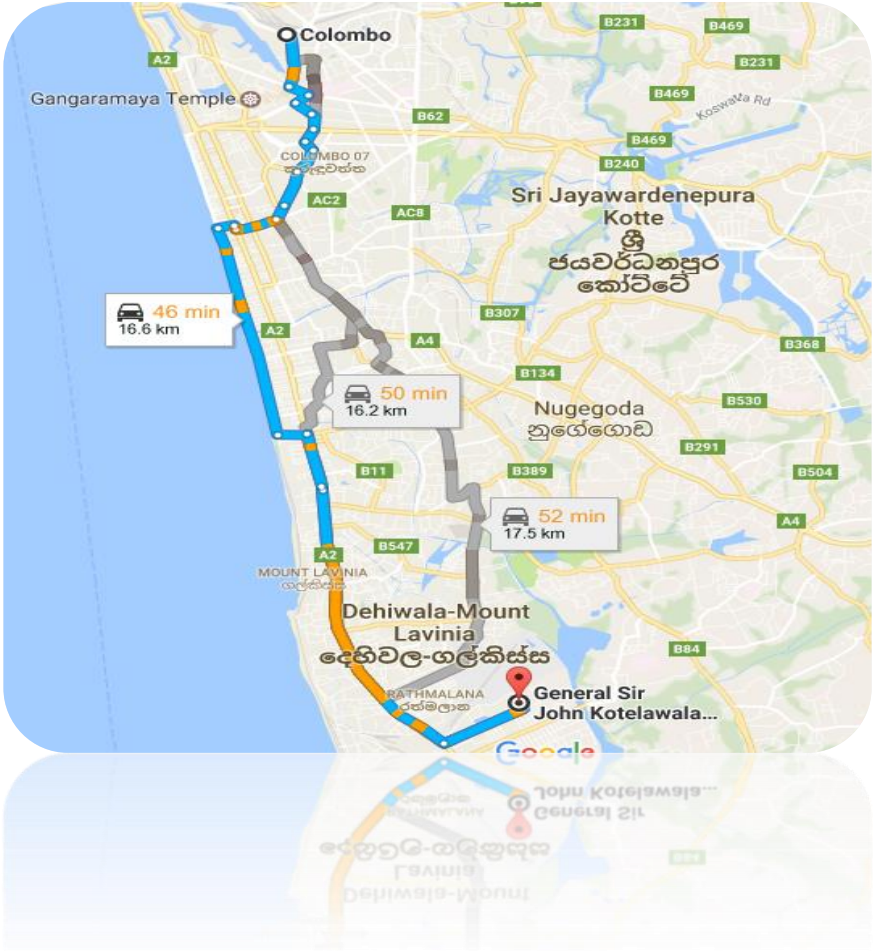
- a) Trophy for the Best Graduant in Computer Science.
- b) Trophy for the Best Graduant in Software Engineering.
- c) Trophy for the Best Graduant in Computer Engineering.
- d) Trophy for the Best Graduant in Information Technology.
- e) Trophy for the Best Graduant in Information Systems.
- f) Trophy for the Best Graduant in Data Science and Business Analytics.
- g) Trophy for the Best Overall Performance in Academic Studies Computing Stream.

6.1.4 Effective Date of the degree

- a. The effective date of the degree shall be reckoned as the last date of the completion of all requirements for the award of the degree.
- b. The degree will be valid and effective only after the results are confirmed by the Senate and approved by the BoM.

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