

GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY



STUDENT HANDBOOK

FACULTY OF COMPUTING

DEPARTMENT OF COMPUTER SCIENCE

GENERAL SIR JOHN KOTELAWALA
DEFENCE UNIVERSITY
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STUDENT HANDBOOK

BSC. (HONS) IN COMPUTER SCIENCE
BSC. (HONS) IN SOFTWARE ENGINEERING

DEAN- FACULTY OF COMPUTING
DEPARTMENT OF COMPUTER SCIENCE

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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 (except Technology 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 the 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. Asela Gunasekara

PhD(China), MPA (SL) , PgDip (SL), BSc(Hons) (UK), SMIEEE, MBCS

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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 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.

1.3.2 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.

1.3.3 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 programs and the minimum requirements to enter the Computing Programs at KDU are as follows:

Table 1: Degree Programs and Selection Criteria

Degree Programs	Duration	G.C.E (As/L) - Stream
BSc (Hons) in Computer Science (CS)	Military: 04 1/2 Years Civil: 04 Years	Maths
BSc (Hons) in Software Engineering (SE)	Military: 04 1/2 Years Civil: 04 Years	Maths
BSc (Hons) in Computer Engineering (CE)	Military: 04 1/2 Years Civil: 04 Years	Maths
BSc (Hons) in Information Technology (IT)	Military: 04 1/2 Years Civil: 04 Years	Biology / Maths / Commerce or Arts
BSc (Hons) in Information Systems (IS)	Military: 04 1/2 Years Civil: 04 Years	Biology / Maths / Commerce or Arts

- The candidate should have a minimum of three Simple (S) Passes at the G.C.E. (A/L) Examination in the relevant stream and be qualified for university admission.
- To follow the degree programs in Computer Science, Software Engineering and Computer Engineering candidates need to have followed Maths Stream or Mathematics, Physics and any one of the following subjects; Chemistry/ Higher Mathematics/ICT at the G.C.E (A/L).

- Those who have followed the G.C.E (A/L) Examination in Biology / Maths/ Commerce or Arts streams (except Technology) are eligible to apply for IT and IS Degree Programs.
- 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.

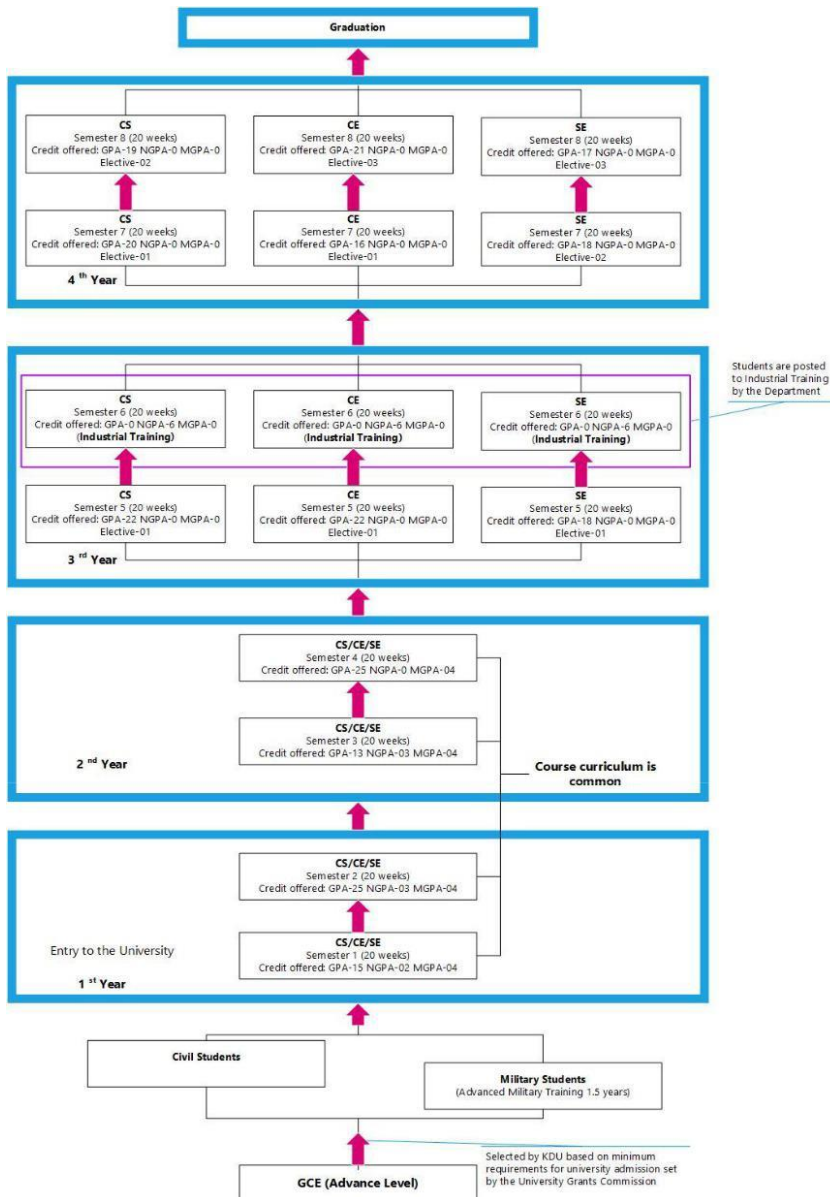
- Be a citizen of Sri Lanka.
- Be not less than 18 years and not more than 22 years of age on the closing date of applications.
- Be unmarried.
- Have a body weight not less than 50 kg (110 lbs).
- Have an unexpanded chest not less than 81.25 cm (32").
- Have a height not less than

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

BSc (Hons) in Computer Science and BSc (Hons) in Software Engineering



3 Structure of the Curriculum and Courses

3.1 Courses Offered by The Faculty of Computing

3.1.1 BSc (Hons) in Computer Science

The intention of formulating this program is to provide Computer Scientists to the tri-services and serve the growing demand for theoretically specialized graduates in the modern industry locally as well as internationally. This program has designed futuristically considering the needs of the industry and employability of the graduates produced. Our curriculums have been designed according to ACM/IEEE international standard. The courses in this program span a wide range, from its theoretical and algorithmic foundations to cutting-edge developments in Algorithms, Database, Artificial Intelligence, Networking and other exciting areas.

3.1.2 BSc (Hons) in Software Engineering

BSc (Hons) in Software Engineering program is concerned with the development and maintenance of software systems that behave reliably and efficiently. This program is different in character from other engineering disciplines due to both the intangible nature of software and the discontinuous nature of software operation. Courses of this program seek to integrate the principles of mathematics and computer science with the engineering practices developed for tangible, physical artifacts. Degree programs in Software Engineering have many courses. This program offers more about software reliability and maintenance and focuses more on techniques for developing and maintaining software that is correct from its inception. The curriculum has been designed according to ACM/IEEE international standard.

3.1.3 BSc (Hons) in Computer Engineering

BSc (Hons) in Computer Engineering Degree Program involves modeling, designing, implementation, testing, evaluation and integration of computer hardware and software to create computing systems. Computer Engineers use both hardware concepts from electrical engineering and system software concepts from Computer Science. Graduates will be well prepared to work in areas such as Digital Logic Design, Computer Organization/Architecture and Design, Algorithm Design and Analysis, Embedded Systems, Compilers, and Operating Systems. Elective options in the curriculum offer preparation in Software Engineering, Databases, Dependable Systems, Networking and Communications, VLSI, Graphics, Image Processing, Visualization, Artificial Intelligence, and Control Systems. Nearly all students in the Computer Engineering Program engage in collaborative research with faculty, through internships or independent study. These provide students have access to state-of-the-art facilities in computer engineering and computer vision such as those of the Laboratory for

Engineering Man/Machine Systems. This degree program of KDU has been designed in accordance with ACM/IEEE international guidelines.

3.1.4 BSc (Hons) in Information Technology

Bachelor of Science Honours in Information Technology Degree -BSc Hons (IT) at KDU has been designed in accordance with ACM/IEEE international guidelines. BSc Hons (IT) Degree program provides students with an appropriate understanding of Software Technologies and Applications, Software Engineering, Network Technologies, Web Technologies, and Industrial Knowledge. Further, they must understand the concepts and processes for achieving organizational goals with Information Technology. In addition to sound technical knowledge and organizational understanding, they must possess thinking skills, the ability to analyze business problems, communication skills, and teamwork skills in face-to-face and virtual settings.

3.1.5 BSc (Hons) in Information Systems

Bachelor of Science Honours in Information Systems Degree – BSc Hons (IS) program at KDU has been designed in accordance with ACM/IEEE international guidelines. BSc Hons (IS) degree program provides students with an appropriate understanding of Foundations of Information Systems, Data & Information Management, Enterprise Architecture, Project Management, IT Infrastructure, Systems Analysis & Design, and IS Strategies. Further, they must understand concepts and processes for achieving organizational goals with Information Systems. In addition to sound technical knowledge and organizational understanding, they must understand, analyze and make use of the fundamental concepts related to organizational processes and systems, thereby apply various tools and techniques on how vast amount of data collected by modern organizations can be used to review, redesign, and improve processes

3.2 Career Opportunities

3.2.1 Computer Science

Computer Science offers a foundation that permits graduates to adapt to new technologies and new ideas. This Computer Science degree opens up a variety of doors in the exciting world of technology. It was the only substantive computing discipline that focused explicitly on software development when academic computing degree programs were emerged. Mainly institutions such as software companies, research institutions offer career opportunities to graduates in Computer Science. Apart from that Computer Science graduates are capable of applying any government job opportunity where the basic requirement is a Bachelor's program. Also, graduates are encouraged for higher studies to pursue careers in academic field.

Computer Science is often central to much scientific research. This research requires not just domain experts, but also people with deep knowledge of computer Science who are able to develop algorithms and complex applications to facilitate scientific research. General Science, Robotics, Geology, Health and Medicine, Environmental Science, Sociology, Biology, Astronomy, Human Assistance, Music, Art, Literature, Linguistics and Sports are some areas available for the Computer Science graduates who are interested in applying their computer science expertise.

Career opportunities for the students who are following this course occur in a wide variety of settings including large or small computer services companies, and large organizations of all kinds (Industry, Government, Banking, Healthcare, etc.).

The work of computer scientists falls into three categories: designing and implementing software; devising new ways to use computers; and developing effective ways to solve computing problems. Career opportunities in the category of designing and implementing software include aspects of web development, interface design, security issues, mobile computing, and so on. In devising new ways to use computers entails the innovation in the application of computer science. 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 activity. The category, developing effective ways to solve computing problems refers to the application or development of computer science theory and knowledge of algorithms to ensure the best possible solutions for computationally intensive problems. As a practical matter, a career path in the development of new computer science theory typically requires graduate work to the Ph.D. level, followed by a position in a research university or an industrial R&D laboratory.

3.2.2 Software Engineering

Software engineering graduates need adequate understanding of the field of software engineering, including scientific theories, analytical techniques and design mechanisms. The need for software developers/ Engineers is gradually rising, which is highly competitive both nationally and internationally, in industry and education/ Research sector. Mainly institutions such as software companies, research institutions offer career opportunities to graduates in software engineering. Apart from that software engineering graduates are capable of applying any government job opportunity where the basic requirement is a Bachelor's program. Also, graduates are encouraged for higher studies to pursue careers in academic field.

Software Engineering gives you knowledge and practical skills in the development of software systems of high quality, and software solutions for various researches, which is invaluable for software architects, project managers, technical specialists' scientists and other professionals. This research requires not just domain experts, but also people with deep knowledge of software engineering who are able to design and develop software solutions and complex applications to facilitate scientific research. General Science, Robotics, Geology, Health and Medicine, Environmental Science, Sociology, Biology, Astronomy, Human Assistance, Music, Art, Literature, Linguistics, Education, Banking and finance, Business and economics, Administration and Sports are some areas available for the software engineering graduates who are interested in applying their software engineering expertise.

Career opportunities for the students who are following this course occur in a wide variety of settings including large or small computer services, software development companies, and large organizations of all kinds (Industry, Government, Banking, Healthcare, Education etc.)

The work of software engineering falls into three categories: planning and designing software solutions; developing and implementing software systems; and testing, troubleshooting and quality assuring software systems. Career opportunities in the category of planning and designing software include aspects of initial steps of development of a software system including gathering requirements, business analysis, and initial design documentations and so on. A career path in this area can involve advanced intellectual graduate work, followed by a position in a research university or industrial R&D lab, or it can involve entrepreneurial activity. The category, developing and implementing software systems refers to the application or development of software engineering basic theory and knowledge of algorithms to ensure the best possible solutions for computationally intensive problems. As a practical matter, a career path in the development of new software systems typically requires graduate work, followed by a position in a research university or an industrial R&D laboratory.

3.3 Credit Ratings and Course Codes

3.3.1 BSc (Hons) in CS and BSc (Hons) in SE (Level 1)

The following table gives an overall summary of the course units entitled for the level one of the BSc (Hons) in Computer Science and BSc (Hons) in Software Engineering Degree Programs. The respective course units have been outlined in detail beneath the table.

Table 3 Level one CS SE course units

Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 01								
CS1012	Fundamentals of Programming	C	2	-	-	17	4	4
CS1101	Programming Laboratory*	C	1	-	-			
CS1022	Foundation of Computer Science	C	2	-	-			
CS1032	Computer Systems Architecture	C	2	-	-			
CS1043	Fundamentals of Databases	C	3	-	-			
CS1052	Fundamentals of Visual Computing	C	2	-	-			
CM1033	Probability and Statistics	C	3	-	-			
CM1012	Engineering Mathematics	C	2	-	-			
DL1132	English: Basic Study Skills for CS/SE/CE	C	-	2	-			
LS1052	Leadership Training	C	-	2	-			
MS1014	Military Studies I	M	-	-	4			
Total for Semester 1						17	4	4
Semester 02								
CS1062	Developments in Mathematics and Sciences	C	2	-	-	18	2	4
CS1073	Object Oriented Programming I	C	3	-	-			
CS1082	Web Development	C	2	-	-			
CS1092	Computer Networks I	C	2	-	-			
CM1052	Discrete Mathematics	C	2	-	-			
COE1993	Group Project in Hardware	C	3	-	-			
EE1102	Fundamentals of Electrical Engineering	C	2	-	-			
ET1102	Basic Electronics	C	2	-	-			
DL2142	English: Advance Study Skills for CS/SE/CE	C	-	2	-			
MS1024	Military Studies II	M	-	-	4			
Total for Semester 2						18	2	4

3.3.1.1 Semester 01

Fundamentals of Computer Programming

CS1012

In this course, the student will gain a broad understanding of computer programming. The student will acquire introductory skills in problem analysis, solution design, and program construction Through Theory and practical programming activities. This course guides the process of creating simple C++ programs to advanced features. Topics covered include Introduction to computer programming, generations of computer languages, program design and development process, problem definition, pseudo-code, flowcharting, coding, testing, and debugging Sequence, selection, loops and array processing.

Credits 02

GPA-Compulsory

Programming Laboratory

CS1101

This module aims to cover concepts related to computer systems, such as hardware, software and provide the fundamental information required to grasp the various functions of computers by discussing computer hardware related subjects and their various uses.

Credits 01

GPA-Compulsory

Foundation of Computer Science

CS1022

The course introduces the theoretical foundations of computer science. These form the basis for a more complete understanding of the proficiency in computer science. On completion of this course, students should be able to understand what a computer system is, learn standard methods of input and learn how to measure drive performance.

Credits 02

GPA-Compulsory

Computer Systems Architecture

CS1032

This course provides an understanding of the design of computer systems and components. Processor design, instruction set design, and addressing; control structures; memory management, caches, and memory hierarchies.

Credits 02

GPA-Compulsory

Fundamentals of Databases**CS1043**

The course deals with data models and database systems and has been designed to enable the theoretical basis of databases and be able to apply that knowledge in developing and using relational databases. The lectures are organized around the database design lifecycle.

Credits 03

GPA-Compulsory

Fundamentals of Visual Computing**CS1052**

The course is designed to teach students the fundamentals of building vector graphics, animations, applications, games, and interactive content with Flash Professionals for e-Learning, web industry and multimedia development.

Credits 02

GPA-Compulsory

Probability and Statistics**CM1033**

This is a foundation course in probability and statistics. The focus of this course is to help students to work with data and apply the basic concepts in their varied academic disciplines. Applications of Bayes's theorem and basic concepts of probability, making a stem plot and calculating a correlation to choosing and carrying out a significance test will be discussed descriptively in this course.

Credits 03

GPA-Compulsory

Engineering Mathematics**CM1012**

Provide learners with the knowledge of methods and techniques of Matrix and Determinants, Vector Calculus, Complex Numbers Probability and Statistics, and Graph theory, so that they gain the ability to use that knowledge to analyze problems in the fields of Engineering Sciences.

Credits 02

GPA-Compulsory

English: Basic Study Skills for CS/SE/CE**DL1132**

This course emphasizes academic support to promote success for students with limited proficiency in English who are taking content courses with native English speakers. Students review content material from their other classes and learn techniques and study skills appropriate to their language ability and the materials they are working with. Students pay particular attention to literacy, comprehension, and composition skills in preparation for tests. Students continue to develop their English by improving language skills in reading/writing/listening/speaking as well as increasing the vocabulary used in the different content areas. Students are encouraged to continue to develop skills in English.

Credits 02

NGPA-Compulsory

3.3.1.2 Semester 02

Developments in Mathematics and Sciences

CS1062

The course is designed to teach students the basic fundamentals of development in mathematics and science in practical settings. This course covers all the fundamental branches of development in mathematics and science.

Credits 02

GPA-Compulsory

Object Oriented Programming I

CS1073

To introduce object-oriented programming concepts, identify real-world problems where object-oriented concepts can be applied, find a solution to the problem identified using OOP concepts. Topics covered including class and Objects, inheritance, packages and data abstraction. In addition, course guides the process of creating Advance Java application including OOP concepts.

Credits 03

GPA-Compulsory

Web Development

CS1082

This course introduces World Wide Web Consortium (W3C) standard markup language and services of the Internet. Upon completion, students should be able to create hand-coded web site with mark-up language, and effectively use and understand the function of related technologies.

Credits 02

GPA-Compulsory

Computer Networks I

CS1092

The course is designed to teach students to introduce fundamental networking concepts and technologies. The online course materials will assist students in developing the skills necessary to plan and implement small networks across a range of applications.

Credits 02

GPA-Compulsory

Discrete Mathematics

CM1052

The purpose of this course is to understand and utilize the mathematical branches graph theory and combinatorics for computer science. In particular, this class is meant to introduce graphs, trees, recurrence relations, counting, with an emphasis on applications in computer science.

Credits 02

GPA-Compulsory

Group Project in Hardware**COE1993**

To build enthusiasm with computing students in the first year so that students pick energy and momentum throughout. Hands -on laboratory experience with more advanced features of Arduino systems and to enhance their programing skills through exploratory lab exercises and final project.

Credits 03

GPA-Compulsory

Fundamentals of Electrical Engineering**EE1102**

Introduction to the theory and analysis of electrical circuits; basic circuit elements including the operational amplifier; circuit theorems; dc circuits; forced and natural responses of simple circuits; sinusoidal steady state analysis and the use of a standard computer-aided circuit analysis program. Consideration is given to power, energy, impedance, phasors, frequency response and their use in circuit design.

Credits 02

GPA-Compulsory

Basic Electronics**ET1102**

The course provides the students with the knowledge of basic Electronic engineering principles and their usage in practice

Credits 02

GPA-Compulsory

English: Basic Study Skills for CS/SE/CE**DL2142**

This course emphasizes academic support to promote success for students with limited proficiency in English who are taking content courses with native English speakers. Students review content material from their other classes and learn techniques and study skills appropriate to their language ability and the materials they are working with. Students pay particular attention to literacy, comprehension, and composition skills in preparation for tests. Students continue to develop their English by improving language skills in reading/writing/listening/speaking as well as increasing the vocabulary used in the different content areas. Students are encouraged to continue to develop skills in English.

Credits 02

NGPA-Compulsory

3.3.2 BSc (Hons) in CS and BSc (Hons) in SE (Level 2)

The following table gives an overall summary of the course units entitled for the level two of the BSc (Hons) in Computer Science and BSc (Hons) in Software Engineering Degree Programs. The respective course units have been outlined in detail beneath the table.

Table 4 Level two CS SE course units

Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 03								
CS2013	Data Structures and Algorithms I	C	3	-	-	16	3	6
CS2022	Operating Systems	C	2	-	-			
CS2032	Object Oriented Programming II	C	2	-	-			
CS2042	Computer Networks II	C	2	-	-			
CS2052	Requirements Engineering	C	2	-	-			
EE2122	Electronics Systems	C	2	-	-			
CM2013	Calculus and Numerical Methods	C	3	-	-			
MF2113	Principles of Management	C	-	3	-			
MS3032	Strategic Defence Studies	M	-		2			
DL3152	Writing and Speaking Skills	C						
MS2044	Military Studies III	M	-	-	4			
Total for Semester 3						16	3	6
Semester 04								
CS2062	Data Structures and Algorithms II	C	2	-	-	18	0	4
CS2072	Advanced Computer Architecture and Organization	C	2	-	-			
CS2082	Artificial Intelligence	C	2	-	-			
SE2013	Software Project Management	C	3	-	-			
SE2022	Software Process Engineering	C	2	-	-			
CM2032	Statistical Distributions and Inference	C	2	-	-			
EE2222	Computer Interfacing and Microprocessors	C	2	-	-			
CS2993	Group Project in Software Development	C	3	-	-			
DL4162	Research Writing Skills							
MS2024	Military Studies IV	M	-	-	4			
Total for Semester 4						18	0	4

3.3.2.1 Semester 03

Data Structures and Algorithms I

CS2013

In this course, the student will gain a knowledge in various data structures, their computer representations and associated algorithms and to investigate the running time of an algorithm. The course will cover fundamentals concepts of Abstract data types, Stack, Queues, and Link List with algorithm analysis.

Credits 03

GPA-Compulsory

Operating Systems

CS2022

Operating systems are an essential part of any computer system. Operating systems vary significantly, but their fundamental principles remain the same. In this course, the students will be introduced to the basic concepts of operating systems, see how they manage resources such as memory, peripherals, and schedule CPU time, learn how to use the system call interface and how to create processes and synchronize them, learn how applications communicate, understand the memory hierarchy and see how virtual memory is managed, understand how files are managed and stored, and much more.

Credits 02

GPA-Compulsory

Object Oriented Programming II

CS2032

In this course, the student will gain a broad understanding of advanced concepts in Object Oriented Programming. The course course will cover OOP concepts including Encapsulation, Inheritance, Polymorphism, Overloading and Overriding and various application and techniques on OOP with Threads, GUI programming and Database connectivity.

Credits 02

GPA-Compulsory

Computer Networks II

CS2042

Computer Network Systems part II is designed to the focus of on learning the architecture, components, and operations of routers and switches in a small network. In this course, Students will learn how to configure a router and a switch for basic functionality (This syllabus aligned with CCNA Curricular)

Credits 02

GPA-Compulsory

Requirements Engineering**CS2052**

The course will discuss concepts for systematically establishing, defining and managing the requirements for a large, complex, changing and software-intensive systems, from technical, organizational and management perspectives. The course will consider the past, present and future paradigms and methodologies in requirements engineering

Credits 02

GPA-Compulsory

Electronics Systems**EE2122**

The course is designed to teach students the basic fundamentals of electronic systems in practical settings. This course covers all the fundamental branches of electronic systems.

Credits 02

GPA-Compulsory

Calculus and Numerical Methods**CM2013**

The course is designed to teach students the propositional logic and predicate logic and quantifiers, direct proofs and indirect proofs, sets and relations, functions and their behaviors and mathematical sequences.

Credits 03

GPA-Compulsory

Principles of Management**MF2113**

To provide learners with an opportunity to identify and apply various theories/concepts in management. Utilizing the case method and self-assessment exercises, students will determine their own strengths and weaknesses as it relates to managing the workplaces effectively. Through the enhancement of managerial skills, knowledge and competencies, students will be able to reproduce them to become responsible and excellent managers in their respective services.

Credits 03

NGPA-Compulsory

Writing and Speaking Skills

DL3152

This module will provide students to enhance their English language (writing and speaking) competencies so that they can confidently engage in their academic studies in the medium of English in the present day working environments.

Credits 02

NGPA-Compulsory

3.3.2.2 Semester 04

Data Structures and Algorithms II

CS2062

The purpose of this course is to provide the knowledge in various data structures, their computer representations and associated algorithms and to investigate the running time of an algorithm. .

Credits 02

GPA-Compulsory

Advanced Computer Architecture and Organization

CS2072

The course is designed to teach students to examine the internal architecture and organization of the processor and the parallel organization.

Credits 02

GPA-Compulsory

Artificial Intelligence

CS2082

The course is designed to give students an introduction to the theories and algorithms used to create intelligent systems. Topics include search algorithms, logic, planning, knowledge representation, machine learning, and applications from areas such as computer vision, robotics, natural language processing, and expert systems. Programming assignments are an integral part of the course.

Credits 02

GPA-Compulsory

Software Project Management**SE2013**

This subject is to understand the process of management of the software development project. The content is aligned with the latest version of knowledge areas in the Institute of Project Management (IPM) Project Management Body of Knowledge (PMBOK). Successful completion of the subject will confidence the students to effectively initiate and manage software development projects in real-world.

Credits 03

GPA-Compulsory

Software Process Engineering**SE2022**

Engineering of the software development process including software life-cycle, maturity models, process programming, and process management. This course considers both theory and practice of engineering large, long-lived software systems, including process analysis, modeling, workflows, standards, process environments and tools, automation, and organizational context. Case studies illuminate the application of software process theory to engineering practice. Students will work in teams to analyze and develop software management plans and tools.

Credits 02

GPA-Compulsory

Statistical Distributions and Inference**CM2032**

The course is designed to teach students about Random Variable, Probability Mass Function, Bernoulli, Binomial, Hyper geometric, Geometric, Negative Binomial, Poisson distribution, Probability density function, Point estimation, Interval estimation and Hypothesis testing.

Credits 02

GPA-Compulsory

Computer Interfacing and Microprocessors**EE2222**

The course includes interfacing of microcomputers to peripherals or other computers for purposes of data acquisition, device monitoring and control, and other communications. The interfacing problem is considered at all levels including computer architecture, logic, timing, loading, protocols, and software laboratory for building and simulating designs.

Credits 02

GPA-Compulsory

Group Project in Software Development**CS2993**

This course provides the student with project experience to complement the studies of the software development process. Students work in small groups and participate in all the development phases (requirements analysis, design, construction, testing and documentation) of a nontrivial software system. As well, each group has to address the control of the development process by constructing and following a detailed software development management plan. This will also develop communication and writing skills of students with peers and supervisors.

Credits 03

GPA-Compulsory

Research Writing Skills**DL4162**

By completing this module, it will provide the students with the knowledge and skills necessary for conducting and documenting research in an academic and professional environment.

Credits 02

NGPA-Compulsory

3.3.3 BSc (Hons) in CS (Level 3)

The following table gives an overall summary of the course units entitled for the level three of the BSc (Hons) in Computer Science Degree Program. The respective course units have been outlined in detail beneath the table.

Table 5 Level three CS course units

Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 05								
CS3202	UX and UI Engineering	C	2	-	-	19 (Including 1 Elective)	0	0
CS3023	Advanced Databases and Big Data Analytics	C	3	-	-			
CS3032	Concurrent Programming	C	2	-	-			
CS3042	Image Processing and Computer Vision	C	2	-	-			
CS3052	Essentials of Computer Law	C	2	-	-			
CS3062	Research Methodology	C	2	-	-			
CS3072	Logic Programming	C	2	-	-			
CS3082	Mobile Computing	E	2	-	-			
CS3092	Computer and Network Security	E	2	-	-			
CS3102	Bioinformatics	E	2	-	-			
SE3042	Software Architecture and Design	C	2	-	-			
Total for Semester 5						19	0	0
Semester 06								
CS3112	Computer Graphics and Visualization	C	2	-	-	17 (Including 1 Elective)	0	0
CS3122	Automata Theory	C	2	-	-			
CS3132	High Performance Computing	C	2	-	-			
CS3142	Complex Systems and Agent Technology	C	2	-	-			
CS3152	Information Security	E	2	-	-			
CS3162	Social Aspects of Computing	C	2	-	-			
CS3172	Digital Forensics	E	2	-	-			
CS3182	Modeling and Simulation	E	2	-	-			
CS3192	Nature Inspired Computing	E	2	-	-			
CS3992	Independent Study	C	2	-	-			
CM3013	Operational Research	C	3	-	-			
COE3052	Microcontrollers and Embedded Systems	E	2	-	-			
Total for Semester 6						17	0	0

3.3.3.1 Semester 05

UX and UI Engineering

CS3202

This module teaches an integrative and cross-disciplinary approach to bring together a wide variety of topics together to the problem of developing quality user interaction designs to provide an introduction to the field of Human-Computer Interaction (HCI).

Credits 02

GPA-Compulsory

Advanced Databases and Big Data Analytics

CS3023

This course aims at furthering database systems concepts through adding complexity and a more hands-on approach. In particular this course will focus on query optimization, query evaluation, transaction processing and concurrency control techniques. Also, this course will focus on storage and file structures, indexing and hashing methods. Apart from that finally this course will be given a brief introduction on big data analytics.

Credits 03

GPA-Compulsory

Concurrent Programming

CS3032

Many challenges arise during the design and implementation of concurrent and distributed programs. The aim of this course is to understand those challenges, and to see techniques for tackling them. The main paradigm to be considered is message passing concurrency, where independent processes, with private variables, interact by passing messages.

Credits 02

GPA-Compulsory

Image Processing and Computer Vision

CS3042

The purpose of this course is to provide the knowledge in fundamentals on image processing & computer vision and educate how digital images are represented, manipulated, encoded and processed, with emphasis on algorithm design, implementation and performance evaluation.

Credits 02

GPA-Compulsory

Essentials of Computer Law

CS3052

The course is designed to enable students to learn and apply ethics in computing. Topics include Law of Contract, Sources of Law, Introduction to Information Technology Law, Principles of Commercial Law (The Law of Agency), Intellectual Property, Computer Crime.

Credits 02

GPA-Compulsory

Research Methodology**CS3062**

This course will provide an opportunity to the understanding of research through an exploration of computer-based research, ethics, and approaches. The course introduces the introduction of research, ethical principles and challenges, and the elements of the research process within quantitative, qualitative, and mixed methods approach. The course will cover Types of Research, Approach to do Research, Scientific Method, Milestone Approach and Reading and Writing.

Credits 02

GPA-Compulsory

Logic Programming**CS3072**

This course deals with logic programming paradigm and Prolog. We discuss the syntax and the semantics of Prolog, the working of a Prolog interpreter and various applications of Prolog. In particular, we consider the use of Prolog for database querying, parsing, meta-programming, and problem solving in AI. The programming assignments can be coded in SWI_Prolog or XSB.

Credits 02

GPA-Compulsory

Mobile Computing**CS3082**

This module offers extensive coverage of the legal, ethical, and social implications when dealing with technology in the current society and modern-day business environment.

Credits 02

GPA-Elective

Computer and Network Security**CS3092**

Security is now a core requirement when creating systems and software. This course covers fundamental issues and first principles of security and information assurance. The course will look at the security policies, models and mechanisms related to confidentiality, integrity, authentication, identification, and availability issues related to information and information systems.

Credits 02

GPA-Elective

Bioinformatics**CS3102**

The course is designed to introduce the field of bioinformatics to learn how to apply computer science in bio science environment. The course will cover computational gene hunting, sequencing, DNA arrays, sequence comparison, pattern discovery in DNA, genome rearrangements, molecular evolution and computational proteomics.

Credits 02

GPA-Elective

Software Architecture and Design**SE3042**

The course is designed to educate students on software architectures in depth and the principles, techniques and tools for creating, developing and evaluating software architectures.

Credits 02

GPA-Compulsory

3.3.3.2 Semester 06**Computer Graphics and Visualization****CS3112**

The objective of the course is to introduce theoretical methods for two-dimensional and three-dimensional graphics with applications to visualization techniques. The following topics will be discussed: Raster graphics, geometric transformations, viewing models, projections, parametric curves and surfaces, colour theory, visible surface / line determination, illumination and shading.

Credits 02

GPA-Compulsory

Automata Theory**CS3122**

The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine. Not only do they form basic models of computation, they are also the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc.

Credits 02

GPA-Compulsory

High Performance Computing

CS3132

The objective of this course is to develop high performing computing (HPC) systems and study how multicore processing units and multithreading help build power-aware HPC systems. Special attention is given to parallel computer architectures and parallel programming. Topics include Computer architecture, Parallel processing, Parallelism, Concurrency, Parallel programming: OpenMP, Open MPI, GPU/CUDA, Introduction to GPU/CUDA programming model, Parallel algorithms for GPU/CUDA programming, Developing parallel solutions for complex problems and Power-aware high-performance computing systems.

Credits 02

GPA-Compulsory

Complex Systems and Agent Technology

CS3142

The course is designed to give students an introduction to the theories and methods used to create multi agent systems using intelligent agents. Topics include Introduction to AI, Intelligent Agents, Types of Agents, Agent Communication, Architecture of the Agents, Multi agent systems developments frameworks and application of the MAS. Programming assignments are an integral part of the course.

Credits 02

GPA-Compulsory

Information Security

CS3152

Security is now a core requirement when creating systems and software. This course covers fundamental issues and first principles of security and information assurance. The course will look at the security policies, models and mechanisms related to confidentiality, integrity, authentication, identification, and availability issues related to information and information systems. Other topics covered include basics of cryptography (e.g., digital signatures), risk management, security assurance and secure design principles, as well as internet security.

Credits 02

GPA-Elective

Social Aspects of Computing

CS3162

This course is intended to introduce people to the wider social implications of computing technology. Topics include how computer use affects social and work relationships and the uses of computers in society. Students analyze scenarios that allow them to view ethical decision making as a crucial part of understanding the world of computing.

Credits 02

GPA –Compulsory

The purpose of this course is to provide a comprehensive understanding of digital forensics and investigation tools and techniques

Credits 02

GPA –Elective

Modeling and Simulation**CS3182**

The course will introduce the basic concepts of computation through modeling and simulation that are increasingly being used by architects, planners, and engineers to shorten design cycles, innovate new products, and evaluate designs and simulate the impacts of alternative approaches. The course focus on System definitions and classification, Basic Static and Dynamic System, Modeling Techniques, Introduction to Discrete Event Simulation, Applications of Discrete Event Simulation.

Credits 02

GPA –Elective

Nature Inspired Computing**CS3192**

This course is about algorithms that are inspired by naturally occurring phenomena and applying them to optimization, design and learning problems. The focus is on the process of abstracting algorithms from the observed phenomenon, their outcome analysis and comparison as well as their “science”. This will be done primarily through the lens of evolutionary computation, swarm intelligence (ant colony and particle-based methods) and neural networks.

Credits 02

GPA –Elective

Independent Study**CS3992**

This course is an opportunity for the student to engage in a research effort to develop research skills and techniques of an independent study in a subject area in which the supervisor and the student have a common interest.

Credits 02

GPA –Compulsory

Operational Research**CM3013**

Operational Research (OR) has many applications in science, engineering, economics, and industry and thus the ability to solve OR problems are crucial for both researchers and practitioners. Being able to solve the real-life problems and obtaining the right solution requires understanding and modeling the problem correctly and applying appropriate optimization tools and skills to solve the mathematical model. The goal of this course is to teach you to formulate, analyze, and solve mathematical models that represent real-world problems. We will also discuss how to use EXCEL and LINDO for solving optimization problems. In particular, we will cover linear programming, network flow problems, integer programs, nonlinear programs, dynamic programming and queuing models.

Credits 03

GPA –Compulsory

Microcontrollers and Embedded Systems**COE3052**

This module aims to introduces the fundamental concepts and theories associated with the discipline of artificial intelligence and provides the ability to analyse, understand, and create intelligent systems.

Credits 02

GPA –Elective

3.3.4 BSc (Hons) in CS (Level 4)

The following table gives an overall summary of the course units entitled for the level four of the BSc (Hons) in Computer Science Degree Program. The respective course units have been outlined in detail beneath the table.

Table 6 Level four CS course units

Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 07								
CS4012	Emerging Trends in Computing	C	2	-	-	14 (Including 2 Electives)	0	0
CS4022	Theory of Programing Languages	C	2	-	-			
CS4032	Natural Language Processing	C	2	-	-			
CS4042	Machine Learning	C	2	-	-			
SE4042	Software Quality Assurance	C	2					
CS4062	Artificial Cognitive Systems	E	2	-	-			
CS4072	Computability and Complexity	E	2	-	-			
CS4082	Semantic Web and Ontology	E	2	-	-			
CS4092	Distributed Systems	E	2	-	-			
CS4102	Computer Music	E	2	-	-			
COE4022	Advanced Operating Systems	E	2	-	-			
COE4042	Robotics and Automation	E	2	-	-			
SE4012	Formal Methods and Software Verification	E	2	-	-			
CM4012	Advanced Topics in Statistics	E	2	-	-			
CS4999	Individual Research Project (Final evaluation at Semester 8)	C	-	-	-			
Total for Semester 7						14	0	0
Semester 08								
CS4999	Individual Research Project (Conducted through Semester 7 and 8)	C	9	-	-	9	6	0
CS4986	Industrial Training	C	-	6	-			
Total for Semester 8						9	6	0

3.3.4.1 Semester 07

Emerging Trends in Computing

CS4012

The course is to provide students with an opportunity to search for knowledge in areas of new trends in computing and it allow students to explore the emerging trends in a certain computer science area. It is to allow a student to do lightweight research and explore the current trends in a certain computer science area. Topics include Introduction to Emerging Trends in Computing, Familiarizing with new trends, Continuing trends in computing, Programming progression, Agent Technology and Features of Agent.

Credits 02

GPA-Compulsory

Theory of Programing Languages

CS4022

This course is an in-depth investigation of the theory of programming languages. The course covers the fundamental tools used in the analysis and design of programming languages, including semantics, type theory, abstract interpretation, meta-programming, and partial evaluation. We will also consider their application to imperative, functional, and object-oriented languages.

Credits 02

GPA-Compulsory

Natural Language Processing

CS4032

This course combines a critical introduction to key topics in theoretical linguistics with hands-on practical experience of developing applications to process texts and access linguistic resources. The main topics covered are Accessing text corpora and lexical resources, Processing raw text, Categorizing and tagging, extracting information from text, Analyzing sentence structure.

Credits 02

GPA-Compulsory

Machine Learning

CS4042

This course provides a broad introduction to machine learning and statistical pattern recognition. Topics include: supervised learning (generative/discriminative learning, parametric/non-parametric learning, neural networks, support vector machines); unsupervised learning (clustering); reinforcement learning and adaptive control.

Credits 02

GPA-Compulsory

Software Quality Assurance**SE4042**

The module enables students to gain knowledge and understanding of the importance of software quality and software quality concepts in software development.

Credits 02

GPA-Compulsory

Artificial Cognitive Systems**CS4062**

To introduce the study and development of intelligent systems, including the correspondence with natural cognitive systems and the design of smart tools. .

Credits 02

GPA-Elective

Computability and Complexity**CS4072**

The course provides a challenging introduction to some of the central ideas of theoretical computer science. The main goal of the class is to promote the understanding of computation and its limits. The course will convey the proof techniques that are used to classify problems and it is intended that students learn how to apply them to classify unfamiliar problems for themselves.

Credits 02

GPA-Elective

Semantic Web and Ontology**CS4082**

The aim of this course is to teach the students the concepts, technologies and techniques underlying and making up the Semantic Web. The central focus is on creating ontologies as a form of information and knowledge organization in a Semantic Web / Linked Web of Data environment.

Credits 02

GPA-Elective

Distributed Systems

CS4092

The objective of this course is to provide an in-depth overview of research topics in distributed systems enabling students to master the development skills in providing and constructing distributed services.

Credits 02

GPA-Elective

Computer Music

CS4102

The course will cover three key aspects of computer music: representation, creativity and analysis addressed through theory and practice. It will cover sound, music as organized sound, and specific applications (e.g. music information retrieval and musicology). Students will be strongly encouraged to explore both scientific and artistic aspects of the course through programming exercises to generate sound and music in contemporary visual or textual music and arts programming languages

Credits 02

GPA-Elective

Advanced Operating Systems

COE4022

The objective of this course is to study, learn and understand the main concepts of advanced operating systems: parallel processing systems, distributed systems, real time systems, network operating systems, open source operating systems and the hardware and software features that support these systems.

Credits 02

GPA-Elective

Robotics and Automation

COE4042

The course provides comprehensive knowledge of robotics in the design, analysis and control. It provides an understanding of the principles of operation of automated equipment with particular reference to industrial robots. It focuses on the knowledge needed to select and use such equipment effectively.

Credits 02

GPA-Elective

The aim of this course is to introduce the basic model checking techniques and tools for software verification.

Credits 02

GPA-Elective

Advanced Topics in Statistics**CM4012**

The Design and analysis of experiments subject affects student to improve the advanced statistical concepts. This course highly relates with the research activities in statistical field. It prepares student for perform experiments, gain results, perform statistical analysis and interpret the results manually and using statistical software.

Credits 02

GPA-Elective

Individual Research Project (Evaluate by semester 8)**CS4999**

The aim of this module is to provide the undergraduates an exposure to research undertaken individually and to achieve a specific objective within a fixed time and to achieve it independently. Additionally, this module allows undergraduates to conduct research in Information Systems, by applying techniques learned throughout the degree programme, including the technical skills of analysis, design and implementation.

Credits -

GPA-Compulsory

3.3.4.2 Semester 08

Industrial Training**CS4986**

This module exposes the students to the industry to learn from the industry, practice work ethics, adhere to professional conduct, learn about organization cultures & its processes, mater self-evaluation and practice to solve industrial problem using the gained knowledge.

Credits 06

NGPA -Compulsory

Individual Research Project**CS4999**

The aim of this module is to provide the undergraduates an exposure to research undertaken individually and to achieve a specific objective within a fixed time and to achieve it independently. Additionally, this module allows undergraduates to conduct research in Information Systems, by applying techniques learned throughout the degree programme, including the technical skills of analysis, design and implementation.

Credits 09

GPA-Compulsory

The BSc (Hons) in Computer Science degree programme contains 128 GPA credits from core course units, 15 NGPA credits and 18 MGPA credits. The distribution of the academic credits in BSc in CS degree program are illustrated in the table below.

Table 7 GPA Summary

GPA Summary			
SEMESTER	GPA	NGPA	MGPA
Semester 1	17	4	4
Semester 2	18	2	4
Semester 3	16	3	6
Semester 4	18	0	4
Semester 5	19	0	0
Semester 6	17	0	0
Semester 7	14	0	0
Semester 8	9	6	0
Total	128	15	18

3.3.5 BSc (Hons) in SE (Level 3)

The following table gives an overall summary of the course units entitled for the level three of the BSc (Hons) in Software Engineering Degree Program. The respective course units have been outlined in detail beneath the table.

Table 8 Level three SE course units

Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 05								
SE3012	Engineering Foundation for Software	C	2	-	-	17(Includin g 1 Electi ve)	0	0
SE3022	Software Modeling	C	2	-	-			
SE3032	Software Construction Technologies and Tools	C	2	-	-			
SE3042	Software Design and Architecture	C	2	-	-			
CS3012	Human Computer Interaction	C	2	-	-			
CS3052	Essentials of Computer law	C	2	-	-			
CS3023	Advanced database and Big Data Analytics	C	3	-	-			
CS3092	Computer & Network Security	E	2	-	-			
CS3042	Image Processing & Computer Vision	E	2	-	-			
CS3062	Research Methodology	C	2	-	-			
CS3072	Logic Programming	E	2	-	-			
CS3082	Mobile Computing	E	2	-	-			
Total for Semester 5						17	0	0
Semester 06								
SE3052	Engineering Economics for Software	C	2	-	-	18(Includin g 4 Electi ve)	0	0
SE3062	Software Verification and Validation	C	2	-	-			
SE3072	Software Process	C	2	-	-			
CS3162	Social Aspects of Computing	C	2	-	-			
SE3992	Independent Study	C	2	-	-			
CS3172	Digital Forensic	E	2	-	-			
CS3112	Computer Graphics & Visualization	E	2	-	-			
CS3122	Automata Theory	E	2	-	-			
CS3152	Information Security	E	2	-	-			
CS3132	High Performance Computing	E	2	-	-			
CS3142	Complex Systems and Agent Technology	E	2	-	-			
Total for Semester 6								

3.3.5.1 Semester 05

Engineering Foundation for Software

SE3012

The aim of this course is to provide an understanding on engineering foundation for software and to illustrate the concepts of the value engineering to evaluate the cost-effectiveness in terms of security, reliability, safety and performance of a product. Furthermore, this course describes applications of engineering sciences.

Credits 02

GPA-Compulsory

Software Modeling

SE3022

The aim of this course is to introduce the usage of modeling principles in modeling an application and to describe basic concepts of software modeling.

Credits 02

GPA-Compulsory

Software Construction Technologies and Tools

SE3032

The aim of this course is to provide an understanding on different software construction technologies and tools in software development.

Credits 02

GPA-Compulsory

Human Computer Interaction

CS3012

This course uses an integrative and cross-disciplinary approach to bring together a broad variety of topics together in relation to the problem of developing quality user interaction designs to provide an introduction to the field of HCI.

Credits 02

GPA-Compulsory

Essentials of Computer law**CS3052**

The course is designed to enable students to learn and apply ethics in computing. Topics include Law of Contract, Sources of Law, Introduction to Information Technology Law, Principles of Commercial Law (The Law of Agency), Intellectual Property, Computer Crimes.

Credits 02

GPA-Compulsory

Advanced database and Big Data Analytics**CS3023**

This course aims at furthering database systems concepts through adding complexity and a more hands-on approach. In particular, this course will focus on query optimization, query evaluation, transaction processing and concurrency control techniques. Also, this course will focus on storage, file structures, indexing and hashing methods. Apart from that, this course will give a brief introduction to big data analytics.

Credits 03

GPA-Compulsory

Computer & Network Security**CS3092**

Security is now a core requirement when creating systems and software. This course covers fundamental issues and first principles of security and information assurance. The course will look at the security policies, models and mechanisms related to confidentiality, integrity, authentication, identification, and availability issues related to information and information systems.

Credits 02

GPA-Elective

Image Processing & Computer Vision**CS3042**

This course introduces fundamental concepts and techniques for image processing and computer vision. Topics to be covered include: image acquisition and display using digital devices, properties of human visual perception, sampling and quantization, image enhancement, image restoration, twodimensional Fourier transforms, linear and nonlinear filtering, morphological operations, noise removal, image deblurring, edge detection, image registration and geometric transformation, image/video compression, video communication standards, video transport over the Internet and wireless networks, object recognition and image understanding.

Credits 02

GPA-Elective

Research Methodology**CS3062**

This course will provide an opportunity to the understanding of research through an exploration of computer-based research, ethics, and approaches. The course introduces the introduction of research, ethical principles and challenges, and the elements of the research process within quantitative, qualitative, and mixed methods approach. The course will cover Types of Research, Approach to do Research, Scientific Method, Milestone Approach and Reading and Writing.

Credits 02

GPA-Compulsory

Logic Programming**CS3072**

This course deals with logic programming paradigm and Prolog. We discuss the syntax and the semantics of Prolog, the working of a Prolog interpreter and various applications of Prolog. In particular, we consider the use of Prolog for database querying, parsing, meta-programming, and problem solving in AI. The programming assignments can be coded in SWI_Prolog or XSB.

Credits 02

GPA-Elective

Mobile Computing**CS3082**

An introduction to mobile computing with a strong emphasis on application development for the Android operating system. Students will complete a major project with the goal of releasing an app on the Android Market place. Topics will include the Android development environment, user interfaces, audio, persistence, SQLite databases, location, sensors, and graphics.

Credits 02

GPA-Elective

Engineering Economics for Software

SE3052

Software Engineering Economics are about making decisions related to software engineering in a business context. Success of any software engineering project is partly dependent on effective business management. Software engineering economics provides a way to examine the attributes of software and software processes in a systematic way that relates them to economic measures. These can be weighted and analyzed when making decisions within the scope of a software engineering project and its organization. The essence of software engineering economics is aligning software technical decisions with the business goals of the organization. This course examines the key aspects of software engineering economics, including life cycle economics; risk and uncertainty; economic analysis methods and practical considerations, which tie concept and theory to contemporary software economic realities.

Credits 02

GPA-Compulsory

Software Verification and Validation

SE3062

The aim of this course is to provide thorough understanding on software verification and validation techniques. Furthermore, this will provide an understanding on applying various software testing techniques in an effective and efficient manner to undergraduates.

Credits 02

GPA-Compulsory

Software Process

SE3072

The aim of this course is to provide an understanding on Engineering of the software development process including software life-cycle, maturity models, process programming, and process management. This course considers both theory and practice of engineering large, long-lived software systems, including process analysis, modeling, workflows, standards, process environments and tools, automation, and organizational context. Case studies illuminate the application of software process theory to engineering practice. Students will work in teams to analyze and develop software management plans and tools.

Credits 02

GPA-Compulsory

Social Aspects of Computing**CS3162**

This course is intended to introduce people to the wider social implications of computing technology. Topics include how computer use affects social and work relationships and the uses of computers in society. Students analyze scenarios that allow them to view ethical decision making as a crucial part of understanding the world of computing.

Credits 02

GPA-Compulsory

Independent Study**SE3992**

This module objective is students to further study and practice all the theories and concepts that they have studied up to now, which will enable them to prepare for their final year project by enabling them to conduct an independent study on various research areas.

Credits 02

GPA-Compulsory

Computer Graphics & Visualization**CS3112**

The objective of the course is to introduce theoretical methods for two-dimensional and threedimensional graphics with applications to visualization techniques. The following topics will be discussed: Raster graphics, geometric transformations, viewing models, projections, parametric curves and surfaces, colour theory, visible surface / line determination, illumination and shading.

Credits 02

GPA-Elective

Automata Theory**CS3122**

The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine. Not only do they form basic models of computation, they are also the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc.

Credits 02

GPA –Elective

Information Security**CS3152**

Security is now a core requirement when creating systems and software. This course covers fundamental issues and first principles of security and information assurance. The course will look at the security policies, models and mechanisms related to confidentiality, integrity, authentication, identification, and availability issues related to information and information systems. Other topics covered include basics of cryptography (e.g., digital signatures), risk management, security assurance and secure design principles, as well as internet security.

Credits 02

GPA –Elective

High Performance Computing**CS3132**

The objective of this course is to develop high performing computing (HPC) systems and study how multicore processing units and multithreading help build power-aware HPC systems. Special attention is given to parallel computer architectures and parallel programming. Topics include Computer architecture, Parallel processing, Parallelism, Concurrency, Parallel programming: OpenMP, Open MPI, GPU/CUDA, Introduction to GPU/CUDA programming model, Parallel algorithms for GPU/CUDA programming, Developing parallel solutions for complex problems and Power-aware high-performance computing systems.

Credits 02

GPA –Elective

Digital Forensic**CS3172**

The purpose of this course is to provide a comprehensive understanding of digital forensics and investigation tools and techniques.

Credits 02

GPA–Elective

Complex Systems and Agent Technology**CS3142**

The course is designed to give students an introduction to the theories and methods used to create multi-agent systems using intelligent agents. Topics include: introduction to AI, intelligent agents, types of agents, agent communication, multi-agent systems and applications of MAS. Programming assignments are an integral part of the course.

Credits 02

GPA –Elective

3.3.6 BSc (Hons) in SE (Level 4)

The following table gives an overall summary of the course units entitled for the level four of the BSc (Hons) in Software Engineering Degree Program. The respective course units have been outlined in detail beneath the table.

Table 9 3 Level Four SE course units

Module Code	Module Name	Category	Credits			Norm		
			GPA	NGPA	MGPA	GPA	NGPA	MGPA
Semester 07								
SE4012	Formal Methods and Software verification	C	2	-	-	14 (Includ 4 Electi ves)	0	0
SE4022	Software Evolution	C	2	-	-			
SE4032	Software Quality	C	2	-	-			
CS4012	Emerging Trends in Computing	E	2	-	-			
CS4022	Theory of Programing Languages	E	2	-	-			
CS4032	Natural Language Processing	E	2	-	-			
CS4062	Artificial Cognitive Systems	E	2	-	-			
CS4052	Compilers Design	E	2	-	-			
CS4082	Semantic web & Ontology	E	2	-	-			
CS4092	Distributed Systems	E	2	-	-			
CM4012	Advanced topics in Statistics	E	2	-	-			
SE4999	Individual Research Project (4 Credits in S7)	C	-	-	-			
Total for Semester 7						14	0	0
Semester 08								
SE4999	Individual Research Project (5 credits in S7)	C	9	-	-	9	6	0
SE4996	Industrial Training	C	-	6	-			
Total for Semester 8						9	6	0

3.3.6.1 Semester 07

Formal Methods and Software verification

SE4012

This module aims to recognize the fundamental precepts and basics concepts of Information Systems acquisition management thereby recognizing the diverse, interrelated, and changing nature in the different disciplines of Information Systems acquisition management.

Credits 02

GPA-Compulsory

Software Evolution

SE4022

This module introduces the concepts of IS auditing that allows users to audit and investigate their respective systems which enables them to increase the overall efficiency and effectiveness of their operations. .

Credits 02

GPA-Compulsory

Software Quality

SE4032

This module covers learning about modelling and optimizing of business processes which will allow the students to get a correct understanding of Business Process Re-engineering. Furthermore, they will be able to identify the impact of BPR, learn how the overall business environment influences BPR and BPR practices for simple processes.

Credits 02

GPA-Compulsory

Emerging Trends in Computing

CS4012

This module emphasizes the concepts and practices of managing production and operations in contemporary organizations by introducing the field of production and operations management.

Credits 02

GPA-Elective

Theory of Programming Languages

CS4022

This module introduces enterprise analysis, design, planning, and implementation for the successful development and execution of strategy. Enterprise Architecture applies architecture principles and practices to guide organizations through the business, information, process, and technology changes necessary to execute their strategy

Credits 02

GPA-Elective

Natural Language Processing

CS4032

This module introduces a thorough grounding of the principles of computer vision and image processing and seeks to develop student's knowledge from basic image processing techniques to advanced computer vision and image analysis systems.

Credits 02

GPA-Elective

Artificial Cognitive Systems

CS4062

This module covers concepts and techniques for retrieving, exploring, visualizing, and analysing social network and social media data.

Credits 02

GPA-Elective

Compilers Design

CS4052

This module describes how emerging technologies are having an impact on everyday life and examines how new technologies that appear to be promising in the IT field.

Credits 02

GPA-Elective

Semantic web & Ontology

CS4082

This module provides a broad introduction to machine learning and statistical pattern recognition which enables machines to make smart decisions that makes expert systems possible. .

Credits 02

GPA-Elective

Distributed Systems**CS4092**

This module provides a broad introduction to machine learning and statistical pattern recognition which enables machines to make smart decisions that makes expert systems possible. .

Credits 02

GPA-Elective

Advanced topics in Statistics**CM4012**

This module provides a broad introduction to machine learning and statistical pattern recognition which enables machines to make smart decisions that makes expert systems possible. .

Credits 02

GPA-Elective

Individual Research Project (Evaluate by semester 8)**SE4999**

The aim of this module is to provide the undergraduates an exposure to research undertaken individually and to achieve a specific objective within a fixed time and to achieve it independently. Additionally, this module allows undergraduates to conduct research in Information Systems, by applying techniques learned throughout the degree programme, including the technical skills of analysis, design, and implementation.

Credits 04

GPA-Compulsory

3.3.6.2 Semester 08**Industrial Training****SE4999**

This module exposes the students to the industry to learn from the industry, practice work ethics, adhere to professional conduct, learn about organization cultures & its processes, mater self-evaluation and practice to solve industrial problem using the gained knowledge.

Credits 06

NGPA -Compulsory

Individual Research Project**SE4999**

The aim of this module is to provide the undergraduates an exposure to research undertaken individually and to achieve a specific objective within a fixed time and to achieve it independently. Additionally, this module allows undergraduates to conduct research in Information Systems, by applying techniques learned throughout the degree programme, including the technical skills of analysis, design, and implementation.

Credits 05

GPA-Compulsory

The Bsc (Hons) in Information Systems degree programme contains 127 GPA credits from core course units, 15 NGPA credits and 18 MGPA credits. The distribution of the academic credits in BSc in SE degree program are illustrated in the table below.

Table 40 GPA Summary

GPA Summary			
SEMESTER	GPA	NGPA	MGPA
Semester 1	17	4	4
Semester 2	18	2	4
Semester 3	16	3	6
Semester 4	18	0	4
Semester 5	17	0	0
Semester 6	18	0	0
Semester 7	14	0	0
Semester 8	9	6	0
Total	127	15	18

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 CA component is generally 30% and the WE component is 70% (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 11 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

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 Attendance

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.

4.4 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 12: Details of Grades and GPVs

Final Marks	Grade	GPV
85 – 100	A+	4.20
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,

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

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

4.5 Criteria for Completing a Semester

4.5.1 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.

4.5.2 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 under section **Error! Reference source not found.** (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'.

4.5.3 Supplementary Examinations

- a. Supplementary Examinations will not be held following the Semesters 1 to 6.
- b. To allow students to graduate without delay, a supplementary examination may be held at end of the 7th and 8th Semester to permit students to complete all incomplete Course Units in 7th and 8th Semesters.

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 of sixteen semesters.
- 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. Any student will be allowed to progress through the semester whilst being in the original batch whilst completing low performed academic course units through subsequent examinations during the maximum duration specified in clause **Error! Reference source not found.** (Faculty of Computing By-Laws).

- b. A warning shall be issued to students who have failed to obtain a minimum SGPA of 2.0 at any stage of progression of the degree.

5.3 Relegation

Procedure for relegation of officer-cadets for poor performance shall be according to the FDSS By-Law

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 13 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:

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 Overall Performance in Academic Studies Computing Stream.

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7.4 Department of Computational Mathematics



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Dr. GA Chandima N. Priyadarshani

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Co-Supervisor: Emeritus Prof. Robert G. Stuaite

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8.2 Registrar's Office

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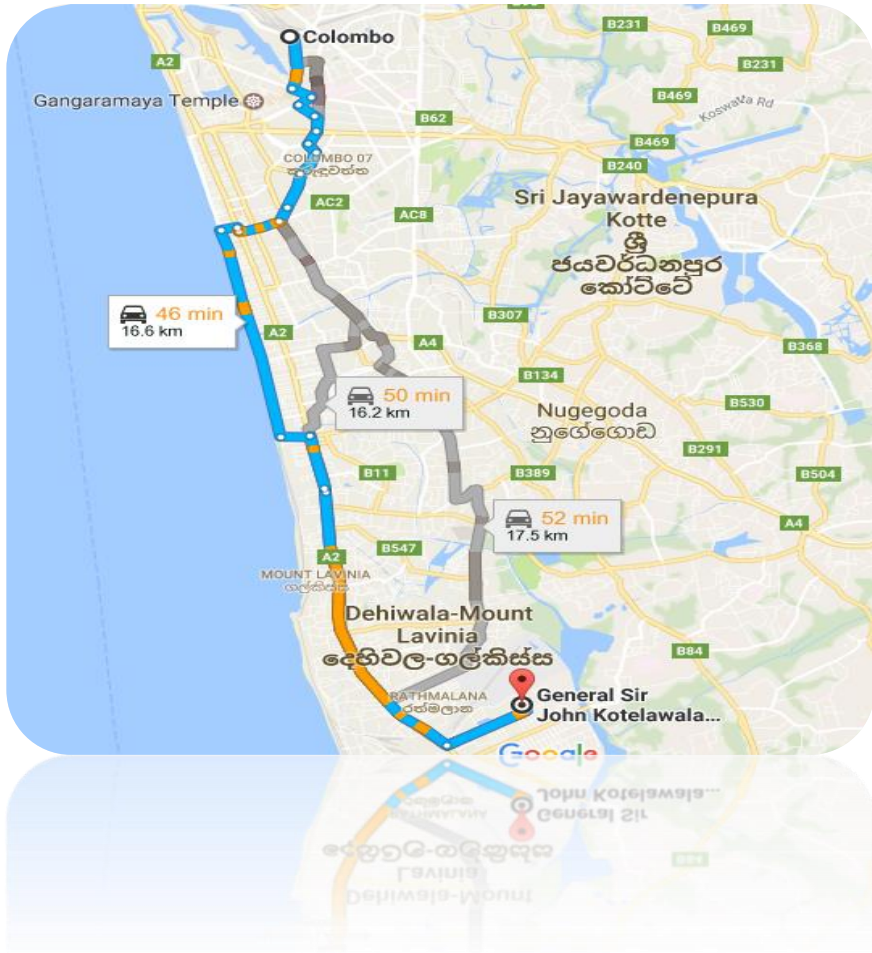
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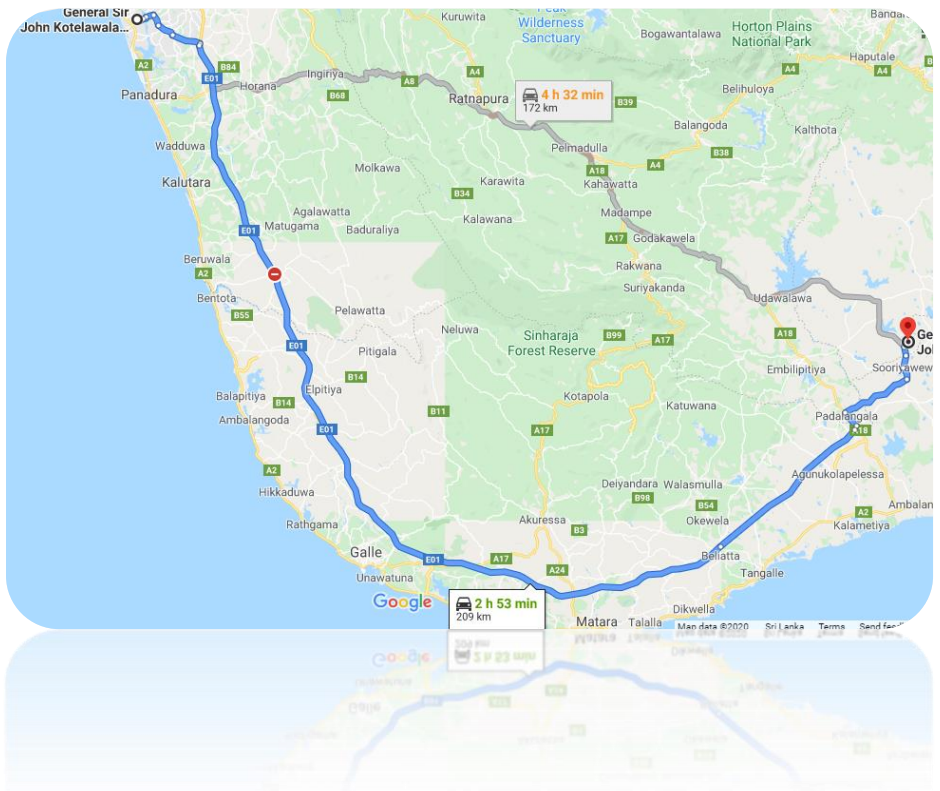
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