



**University of Ruhuna  
Faculty of Science  
Matara, Sri Lanka**

**Student Handbook - 2020**

**Bachelor of Science  
And  
Bachelor of Computer Science  
(General and Honours) Degree  
Programmes**

**2019/2020**

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# 1 Department of Computer Science

The Department of Computer Science of the University of Ruhuna was established in 1997 fulfilling a long-standing need of the University. The department presently offers course units of 30 credits (1/3 of the B.Sc. General Degree programme) in Computer Science for the B.Sc. General Degree programme for 120 students per batch.

The Department of Computer Science commenced Bachelor of Computer Science (BCS) Degree in 2010. The main aim of the degree programme is to prepare the undergraduates for a career in Computer Science and Information Technology, which is one of the major driving forces of the economic development of Sri Lanka. This degree programme will cover all aspects of Computer Science including modern computer languages and systems.

## 1.1 Research Areas

- Text Mining and Text Classification Data Mining, Rule Extraction and Knowledge Representation Applications of Machine Learning Techniques
- Parallel computing: developing dynamic load balancing algorithms on homogeneous and heterogeneous clusters of workstations
- Intelligent Information Retrieval: Pattern Recognition, Fuzzy clustering, Data Mining/ Web Mining, Conceptual Indexing and Similarity Search in text data, Context Based Clustering
- Conceptual Modelling, Process Modelling and Process Patterns, Formal Specification of Processes, e-Commerce Standardization, Service Oriented Computing, Business Rule Modeling
- Network Monitoring and Acquiring and Managing Information
- E-commerce information systems development, Model-drivers design, Goal, Business & service Modelling
- Computational Geometry, Computer Graphics programming, Design and Analysis of Algorithms, Graph Theory
- Computational Systems Biology, Bioinformatics, Modelling and Simulation, Neural Computing, stochastic modelling
- Embedded Systems, reconfigurable computing, Bioinformatics
- Knowledge Representation, Ontology, Semantic Web, Ontology Engineering, Mobile Applications

## 1.2 Head of the Department

### Dr. W.A. Indika

B.Sc. (Kelaniya, S.L.), M.Sc. (Kelaniya, S.L.), PhD (UCSC, S.L.)

## 1.3 Members of Academic Staff

Designation	Name	Specialization
<b>Senior Lecturer</b>	Mr. S. A. S. Lorensuhewa B.Sc. (Colombo, SL) M.Sc. (Zhejiang, China)	Computer Applications, Text Mining and Text Classification Data Mining, Rule Extraction and Knowledge Representation, Applications of Machine Learning Techniques
	Dr. W. A. Indika B.Sc. (Kelaniya, S.L.) M.Sc. (Kelaniya, S.L.) PhD (UCSC, S.L)	Knowledge Representation, Ontology, Semantic Web, Ontology Engineering, Mobile Applications
	Dr. J. A. Jeewanie B.Sc. (Kelaniya, SL) M.Sc. (Keele, UK) Ph.D (Tilburg, Netherland)	Conceptual Modelling, Process Mining, Service-oriented Computing, Value Oriented Service Identification, Model driven Business-IT alignment methods
	Dr. Tharaka Ilayperuma B.Sc. (Kelaniya, SL) Ph.L (Sweden) Ph.D. (Sweden)	Business Modelling, Goal Modelling and Service Modelling for the purpose of Information systems development
	Dr. Thusangi Wannige B.Sc.(Colombo, SL) MPhil (Colombo, SL) Ph.D (Lincoln, New Zealand)	Computational Systems Biology, Bioinformatics, Modelling and simulation, computer vision
	Ms. T.D. Gilmini Geethika B.Sc.(Hons)(Peradeniya, SL) MSc (UCSC, SL) M.Phil (USJP, SL)	Knowledge Engineering, Business Process Modeling and Ontology Business Rule Modeling with Application to Problems in Healthcare Domain
	Dr. S. M. Vidanagamachchi B.Sc. in Comp. Sci. (UCSC, SL) Ph.D. in Comp. Eng. (P'deniya, S.L.)	Embedded Systems, Reconfigurable Computing, Machine Learning, Bioinformatics
	Dr. P.N. Hameed B.Sc. (Hons) in Comp. Sci. (P'deniya, S.L.) Ph.D. (Melbourne, Australia)	Bioinformatics, Data mining and Machine Learning, Biomedical Informatics, Image processing, Computer Vision
	Dr. M. K. S. Madushika B.Sc. in Engineering (Peradeniya, S.L.) Ph.D. (QUT, Australia)	Artificial Intelligence, Deep Learning, Computer Vision, Neural Networks, Image Processing
	Mr. K.R. Wijeweera B.Sc. (P'deniya, SL) M.Phil. (P'deniya, SL)	Computational Geometry
<b>Lecturer</b>	Ms. M. A. L. Kalyani B.Sc. (Colombo, SL) Ph.L. (Uppsala, Sweden)	Static and dynamic Load Balancing algorithms MPI implementations, Grid Computing

Designation	Name	Specialization
<b>Lecturer</b>	Dr. W. A. Mohotti B.Sc. IT (Moratuwa, SL) M.Sc. in IT (Moratuwa, SL) Ph.D. (QUT, Australia)	Data Mining and Machine Learning, Text Clustering, Outlier Detection, and Cluster Evolution, Social Media Analytics
	Dr. D. W. C. P. Kumari B. Sc. in Comp. Sci. (UCSC, SL) M.Phil. (UCSC, SL) PhD (QUT, Australia) (On Leave)	Information Security, Process Analytics, Mathematical Modelling, Event log analysis Data Structure & Algorithms Evolutionary Algorithms Data Mining, Text Mining
	Mr. K. D. C. G. Kapugama BCS (Ruhuna, SL) Reading for PhD (Monash, Australia) (On Leave)	
	Mr. P. D. T. Chathuranga BCS (Ruhuna, SL)	Natural Language Processing, Sentiment Analysis, Text Mining, Machine Learning
	Mr. L.L. Gihan Chathuranga B.Sc (Sabaragamuwa, S.L)	Machine Learning, Artificial Neural Networks, Artificial Intelligence, Data mining
	Ms. H.D. Supuni Shashikala B.Sc. (UWU, S.L.), Reading for M.Sc. (Peradeniya, S.L.)	Machine Learning, Feature Extraction, Deep Learning
<b>Probationary Lecturer</b>		

## 1.4 Members of the Academic Support Staff

Academic Supportive Staff Members	
Designation	Name
<b>Programmer Cum Systems Analyst</b>	Mr. H. G. U. Harankahadeniya Mr. B. H. Saranapala Mr. A. P. Luwishewa
<b>Instructor in Computer Technology</b>	Ms. P. B. N. K. De Silva Mr. U. V. Malawara Arachchi Ms. W.P. Priyanthi Mr. R. Wickramaratne Mr. C.L. Wimalaratne Ms. G.K. Mabula Mr. L.W. Wellakkage Mr. G.M.T. Ranjana Mrs. W. K. Shajith Miss. H. G. S. Priyangani

## 1.5 Course Units in Computer Science for B.Sc. (General) Degree

### Level I - Semester I

**COM1111: Basic Concepts of Information Technology (15 lecture hrs.)** Overview of Computer System, Function of Computer System, Input/Output Peripherals, Computer Storages, Systems Software, Data type and Data representation, Computer Arithmetic, Application software, Computer and Communication, The Internet, Computer security and Maintenances, Ethical use of computer

**Evaluation Method : End Semester Examination**

**COM112δ: Programming Techniques (30 lecture hrs. & 22.5 practical hrs.)** Introduction to programming Languages, Statements, Expressions, Keywords and Comments, Variables, Constant and Data types, Operators, Selective Statements, Iterative Statements, Jump Statements, Arrays, Introduction to Java, Streams Practical using Java/C  
**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**COM113α: Internet Services and Web Development (15 lecture hrs. & 22.5 practical hrs.)** Introduction to the Internet, Communication over Internet, The World Wide Web, HTML & XHTML, Cascading Style Sheets, Client Side Scripting Java Script Practical oriented  
**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

### **Level I - Semester II**

**COM121δ: Data Structures and Algorithms (30 lecture hrs. & 22.5 practical hrs.)** Introduction to Data Structures, Stacks, Queues and Lists, Trees, Graphs, Running Time of an Algorithm, Sorting Algorithms, Searching Algorithms. Practical using Java/C  
**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**COM122δ: File organization & DBMS (30 lecture hrs. & 22.5 practical hrs.)**  
**File Organization:** Introduction to file organization, Storage devices, Record structure and design, Data transferring times, Traditional file organizations (File, Sequential, Indexed, Indexed-sequential and Hashed Files), Accessing the physical files, Need for a database approach and its objectives. **Database Management Systems:** Motivation for database management systems, History of data models, DBMS architecture, ER model concepts, Relational model concepts, ER-to-relational mapping, Functional dependencies and normalization process, Relational algebra, Relational calculus, Data manipulation using SQL, Data views and security, Introduction to data administration and database administration, Introduction to new concepts an database system. Practical using Oracle or MS Access  
**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

### **Level II - Semester I**

**COM212δ: Object Oriented System Development (30 lecture hrs. & 22.5 practical hrs.)** Introduction to System Development environment, The Object paradigm, Objectory S/W development process, Object Oriented Modelling using UML, Use case diagrams, Class diagram, Interaction diagram, Class declaration, Method implementation, Information hiding and Access modifiers, Class Hierarchy (inheritance), Polymorphism, Packages and Data abstraction. Practical using Rational Rose and OO Programming using Java/C++  
**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and the 30% from the practical paper)**

**COM213α: Operating Systems (15 lecture hrs. & 22.5 practical hrs.)** Introduction, Process Management, CPU Scheduling, Deadlocks, Memory Management, File-System Implementation, I/O Systems. Practical oriented

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**COM2141: Computer Architecture (15 lecture hrs.)** Number Systems, Boolean Algebra & K'maps, Logic Gates, Circuits Design, Memory Architecture, CPU Architecture, Instruction Cycle, Instruction set.

**Evaluation Method: End Semester Examination**

## **Level II - Semester II**

**COM221δ: Data Communications and Computer Networks (30 lecture hrs. & 22.5 practical hrs.)** Introduction, Data Communication, Reference Model, Local Area Network, Wide Area Network with Internetworking, Binding Protocol Address, Routing, Digital telephony, Domain Name Service, IP Telephony, Dynamic Host Configuration Protocol, Introduction to Network Security, Wireless Communication, Future of Network

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**COM222δ: Multimedia Technologies (30 lecture hrs. & 22.5 practical hrs.)** Introduction to Multimedia and Hypermedia Technology, Multimedia Basics, What is Digital Media, Multimedia Hardware and Software, Multimedia Data types (Building Blocks) and File types, Animations Basics, Audio and Video Basics, Multimedia Compression Techniques and Standards, Multimedia Authoring Environments, Multimedia System Design Overview, Multimedia on the Internet, Multimedia Communication Systems, Multimedia Operating Systems, Multimedia Storage, Multimedia Databases and Retrieval, Issues of Multimedia and Future Development.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

## **Level III - Semester I**

**COM311δ: Internet Programming and Web Technologies (30 lecture hrs. & 22.5 practical hrs.)** Introduction to the Internet, Web servers, Web designing and designing issues, Delivering Multimedia over web pages, Client Side Programming, Client-server side Programming, Server Side Programming, Databases and the web, Extensible markup Language, Web Security.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**COM312δ: System and Network Administration (30 lecture hrs. & 22.5 practical hrs.)** Overview of Linux System, Linux shell commands and environment, Basic Unix shell programming, Disks and Other storage media, Overview of the directory tree, Booting and shutting down, Rootly power, Essential tasks of the system administrator, User Account

Management, File Protection, Managing Packages, X windows system, Backup and Restore, Performance Analysis, Setting up printer server, Monitoring and Managing Networks, Setting up File Servers, Electronic Mail system

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**COM3b36: Computer Project (15 lecture hrs. & 60 practical hrs.)** Students are assigned one large project or number of smaller projects to work on. These software projects are evaluated at a presentation and by a project report

**Evaluation Method: Product demonstration, Project presentation, Individual contribution, Report writing, Quiz, Attendance**

**COM3b52: PC Hardware and Networking (15 lecture hrs. & 45 practical hrs.)**

*Op for students who have passed the ICT2b13 (CCIT) examination;* PC Hardware architecture, Clocked digital logic, Motherboards, CPUs, Memory Technologies, Disk Storage, Expansion Cards, Resolutions and system requirements, Monitor size, dot pitch and refresh rates, Maintenance/Cleaning/ Repairing Hardware Tools, Preventive Maintenance & Computer Safety, Cleaning A PC externally and internally, Assemble PC system, Diagnosing & Troubleshooting, Introduction to Computer Network, Components of Computer Network, Network Connectivity Devices, Network topologies, LAN, MAN, WAN, Intranets, Extranets, Setting Up a Computer Network System and Network Administrator, Internetworking

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

### **Level III - Semester II**

**COM3252: E-Commerce and Professional Practices in IT (30 lecture hrs.)** *Op for all students;* Introduction and Brief history, Overview of eCommerce components, Ecommerce models and concepts, E-Business Strategies, Impact of electronic commerce on business strategy, Social Impact of Computing, Professional and ethical responsibilities, Intellectual property rights, Ethics and Codes of Professional Conduct, Other Issues

**Evaluation Method: End Semester Examination**

**COM3212: Advanced Software Engineering Concepts (30 lecture hrs.)** *Target Group: Student following computer science as a subject (Optional Unit);* Need for Software Engineering, problems of software development, Software Process: The need for a software process. The waterfall model, prototyping approach, spiral model, evolutionary development model, rapid application development model, incremental development, Requirement analysis and specification: Requirement engineering, analysis.

**Evaluation Method: End Semester Examination**

**COM323α: Visual Programming (15 lecture hrs. & 22.5 practical hrs.)** *Op for all students* Introduction: Application development environments, command line environments, Graphical user environments. Integrated Development tools, Visual tools, Object Based / Object oriented / Event-driven programming and programming in the Windows environment at design time, run time and break time, User Interfaces: SDI, MDI Applications, Introduction to DLL s, Active X and other technologies, predefined object methods



& functions, Menus and toolbars, Common Dialog Controls etc., Data Types, Programming control Structures, data structures and sub programs: Debugging, Error and exception handling, Database programming, Building Web applications

**Evaluation Method: End Semester Examination**

**COM3266: Internet Services and Protocols (30 Lecture hrs. & 22.5 practical hrs.)** *Target Group: Student following computer science as a subject (Optional Unit)*

Introduction, the Internet, Internet protocols and Application services, Transport Protocols (TCP, UDP), Client Server computing, Packet and Protocol level Analysis, Email Service, SMTP, POP3, INAP protocols, Email server and User Agent Configuration, World Wide Web, HTTP protocol and Web Server Configuration, Web caching, Proxy Servers and Cookies, Load Balancing and Proxy Server Configuration, Telnet, SSH and File Transfer Protocol, FTP server configuration, Voice over IP communication VOIP server configuration, Domain Name Service, DNS configuration, Server Performance and Tuning.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

## **1.6 ICT Course units of Bachelor of Science (General) Degree**

The department conducts a Computer Literacy Course (ICT1b13/CLC) for all the students, in the B.Sc. degree programme, who do not follow Computer Science as a subject.

Based on their performance of the ICT1b13 course unit, a limited number of students are selected to follow an advanced course in Information Technology (ICT2b13/CCIT). The students who pass ICT1b13 and ICT2b13 course units are awarded certificates by the department.

**ICT1b13: Computer Literacy Course (CLC) (30 Lecture hours & 60 practical hours)** Basic concepts of software and hardware, Windows operating system, Computer Programming: Programming using C, Word Processing, Spreadsheet Applications, Database management, Presentation Applications.

**Note:** According to the examination criteria stated in this handbook, students who do not follow computer science as one of the subjects for their degree programme must pass the examinations of Computer Literacy Course (ICT1b13) in order to release the final results of the B.Sc. Degree.

**Evaluation Method: End Semester Examination**

**ICT2b13: Certificate Course in Information Technology (CCIT) (30 Lecture hours & 60 practical hours)** Windows based rapid application development, Database management, Linux Operating System and X-Windows, Networked Computing Systems, Internet Services and Web Development.

**Evaluation Method: End Semester Examination**

## **1.7 Bachelor of Computer Science (General) Degree**

The Bachelor of Computer Science (BCS) degree program is an outcome of an enormous effort of the staff of the Department of Computer Science. One of the prime objectives of this degree programme is to prepare the undergraduates for a career in Computer Science and Information Technology, which is one of the major driving forces of the economic development of Sri Lanka. Students admitted to the program will pursue a full-scale Computer

Science programme of three years leading to the degree of Bachelor of Computer Science (General). Based on the performance, a limited number of students will be selected to study an extra year leading to the degree of Bachelor of Computer Science (Honours). One of the prime objectives of the Honours degree is to offer in-depth knowledge in selected areas of computer science for those who wish to pursue an academic and/or research careers.

### **1.7.1 Course units for Bachelor of Computer Science (General) Degree (BCS)**

Each student admitted to BCS degree program is expected to follow the following course units during their first second and third years (six semesters). The curriculum of BCS degree consists of compulsory course units as well as elective /optional course units. All courses offered during the first three semesters in level I and level II are compulsory part of the BCS curriculum. Latter part of level II and both semesters of level III in BCS degree curriculum are mainly consist of optional courses. In addition to the elective optional courses, a limited number of compulsory courses are offered during this period. The availability of the optional course units will be announced at the beginning of the each semester.

### **Level I - Semester I**

**CSC1122: Computer Systems I (30 lecture hrs) (core)** Overview of Computer Systems, Evolution of Computers, Input and Output, Storage, Expansion Cards, System Interfaces, Instruction Sets, Addressing modes, Central Processing Unit, Instruction Cycle, Assembly Language

**Evaluation Method: End Semester Examination**

**CSC1113: Programming Techniques (30 lecture hrs & 45 practical hrs) (core)** Basic Programming concepts, Simple C program structure, Keywords, Data types, Variables & operators (arithmetic, relational, assessment and conditional), I/O statements, Arrays, Passing variables, Multi-dimensional arrays, Functions, Function prototypes, Recursion, Control structures, Looping ( while, do while, for), pointers, strings, Advanced data types, structures, pointers to structures, File I/O

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC113α Internet Services and Web Development (15 lecture hrs. & 22.5 practical hrs.) (core)** Introduction to the Internet, Communication over Internet, The World Wide Web, HTML & XHTML, Cascading Style Sheets, Client Side Scripting - Java Script.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC1142: System Analysis and Design (30 lecture hrs.) (core)** Introduction to Information System Environment. System Development Life Cycle. Introduction to Project management. Fact Finding Techniques. Requirements Analysis. System Modeling with Data Flow Diagrams.

**Evaluation Method: End Semester Examination**

**CSC1153: Laboratory Assignments (15 lecture hrs. & 90 practical hrs.) (core)** Common System utilities of Linux , Advanced System utilities of Linux , Office Applications in Windows, Office Applications in Linux, Word Processing using Latex, System utilities of Windows, Internet and Social Networking, Special Linux Tools, Computer Maintenance Tools, Assembling a Computer, Windows OS Installation & Applications, Linux Installation, Shell Scripting

**Evaluation Method: Practical Examination 30% and/or End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**AMT1126: Mathematical Foundation of CS (30 lecture hrs & 15 tutorial hrs) (core)** - refer Course unit details under Department of Mathematics

**MAT1126 Differential Equations (15 lecture hrs & 7 tutorial hrs) (core)** - refer Course unit details under Department of Mathematics

**MAT1136: Introductory Statistics (15 lecture hrs & 8 tutorial hrs) (core)** - refer Course unit details under Department of Mathematics

## **Level I - Semester II**

**CSC1213: Database Management Systems (30 lecture hrs. & 45 practical hrs.)** Introduction to DBMS, History of Data Models, Database System Concepts and Architecture, Database Design Process, The Entity-Relationship (ER) Model, Database Design - Mapping ERD to Relational, Logical Database Design-Normalization, Extended Entity Relationship Modeling, Logical Database Design-Mapping EERD to Relational, Data Manipulation using Relational Algebra & Relational calculus, Managing databases using SQL, Data views and security, Introduction to data administration and database administration. Practical using MS Access and Oracle.

**Evaluation Method : Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC1223: Data Structures and Algorithms (30 lecture hrs. & 45 practical hrs.) (core)** Introduction to Data Structures, Stacks, Queues and Lists, Trees, Graphs, Running Time of an Algorithm, Sorting Algorithms, Searching Algorithms.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC1233: Software Engineering (45 lecture hrs.) (core)** Introduction, Generic Framework Activities, Umbrella Activities, Layered Technology, CMMI, Process Assessment, Software Process Models Waterfall Model, Increment, Evolutionary, Specialized process models, SW Reuse , Unified Process UP workflows and work products, Predictive versus adaptive approaches to the SDLC, Existing Agile Methods, Requirement Analysis and Specification, Software Design, Principles of Design, Designing for reusability, adaptability and maintainability, design quality, Testing, Testing Methods, Test Strategies, static and dynamic testing,  $\alpha$  testing,  $\beta$  Testing, Acceptance Testing, Use of CASE tools in SW

Development, Software Matrices, Software Maintenance/ Social and ethical Issues.

**Evaluation Method: End Semester Examination**

**CSC1242: Object Oriented System Development (30 lecture hrs.) (core)** Introduction to Object-Oriented Paradigm. Basic Principles and Important Concepts in Object-orientation. Introduction to Unified Modeling Language (UML). Object-Oriented Systems Development with Unified Process (UP).

**Evaluation Method: End Semester Examination**

**CSC1251: Computer Laboratory (45 practical hrs.) (core)** 15 Practical sessions on Special topics in Computer Science

**Evaluation Method: Practical Examination 30% and/or End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**MAT1216: Algebra (30 lecture hrs & 15 tutorial hrs) (core)** - refer Course unit details under Department of Mathematics

**MAT1226: Calculus (30 lecture hrs & 15 tutorial hrs) (core)** - refer Course unit details under Department of Mathematics

## **Level II - Semester I**

**CSC2113: Data Communication and Computer Networks (30 lecture hrs. & 45 practical hrs.) (core)** Introduction, Data Communication, Reference Model, Local Area Network, Wide Area Network with Internetworking, Binding Protocol Address, Routing, Digital telephony, Domain Name Service, IP Telephony, Dynamic Host Configuration Protocol, Introduction to Network Security, Wireless Communication, Future of Network.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC2123: Object Oriented Programming (30 lecture hrs. & 45 practical hrs.) (core)** Fundamental of Object-oriented design, Encapsulation, polymorphism, classes and objects, information hiding, operator overloading, inheritance, overriding, delegation; Analyze problems: determine objects that are necessary to model the system, determine what attributes the objects need to have, determine what behaviors the objects need to exhibit, develop conceptual models, Modeling with UML, generate designs from the models, and implement the models.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC2133: Operating Systems (30 lecture hrs. & 45 practical hrs.) (core)** Operating-System Structures, Processes, Threads, CPU Scheduling, Process Synchronization, Deadlocks, Memory Management (Contiguous Allocation, Paging, segmentation, Virtual Memory), File System Implementation (Access Methods, Protection, Disk structure, Scheduling, Management and reliability), I/O Systems, Mass-Storage Systems, Security (Goals, Principles, Access Matrix, Threads)

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC2143: Computer Graphics and Image Processing (30 lecture hrs. & 45 practical hrs.) (core)** Introduction, Applications, , Graphics terminologies, Graphics I/O devices, Scan conversion : Scan converting lines, Line Drawing Algorithms, Scan converting circles, Mid Point Circle Algorithm, Scan Line Polygon filling Algorithm, Boundary & Flood Fill Algorithm, 2D Transformation Geometric Transformations, Coordinate Transformations, Composite Transformations, Homogeneous Coordinates, 2D Viewing & Clipping Window-to-viewport Mapping , point clipping, Line clipping, Introduction to Digital Image Processing, examples of image processing; Brief review of 2D linear system theory, probability and random variables, Color fundamentals, color models; Image Enhancement: Gray-level transform, histogram processing, arithmetic/logic operation, Spatial filtering, 2D Fourier transform, Frequency domain smoothing, sharpening, Image degradation model, Noise models, restoration using spatial filtering with noise only degradation, Morphological image processing, point, line and edge detection.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**AMT2126: Computational Mathematics (30 lecture hrs & 15 tutorial hrs) (core)**  
- refer Course unit details under Department of Mathematics

**MAT2116: Linear Algebra I (30 lecture hrs & 15 tutorial hrs) (core) (core)** -  
refer Course unit details under Department of Mathematics

**PHY2112: Electronics (30 lecture hrs) (core)** - refer Course unit details under Department of Physics

## **Level II - Semester II**

**CSC2213: Rapid Application Development (30 lecture hrs. & 45 practical hrs.) (core)** Introduction to Rapid Application Development (RAD), Core issues in RAD, Estimation, Scheduling Teamwork, Best practices in RAD, Introduction to Software Design with Patterns, Gang of four Catalog Creational Design Patterns, Structural Design Patterns, Behavioral Design Patterns, Content Management Systems (CMS)

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC2233: Internet Programming (30 lecture hrs. & 45 practical hrs.) (core)** Introduction, Server side scripting introduction, variables, control structures, operations, Arrays: 1D, 2D, Indexed, Associative, PHP Functions, String Manipulation, Forms and Databases, Sessions and Cookies, Web Designing Process, XML, AJAX and JQuery, Object Oriented Programming in PHP.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC2242: Advanced Database Management (30 lecture hrs.) (core)** Introductory knowledge in advanced database concepts, Storage and file structures, Index, Query processing and optimization, access control for secure databases, transaction management and serializability, Concurrency control, Interaction of transaction management with storage: especially buffering, Database efficiency and tuning, writing constraints, stored procedures and triggers in SQL.

**Evaluation Method: Continuous Assessment and/or End Semester Examination**

**CSC2252: Project Management (30 lecture hrs.) (core)** Introduction to Project Management, Project Management Process for a Project, Project Scope management, Project Time management, Project Cost management, Project Quality management, Project Communication management, Project Risk management, Group Assignment Evaluation, Project HR management, Project Procurement management, Project Integration management.

**Evaluation Method: End Semester Examination**

**CSC2263: Multimedia and Video Production (30 lecture hrs. & 45 practical hrs.) (Optional)** Multimedia Basics, Key Multimedia Elements, Images, Video, Audio, Animation, Multimedia Databases and Retrieval, Multimedia Authoring, Multimedia Compression Techniques and Standards.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC2222: Computer System II (30 lecture hrs.) (core)** A top-level view of computer function and interconnection, Cache memory, Internal memory and External memory technology, Operating system support, Computer Arithmetic, Instruction sets, Processor structure and Functions, RISC Architecture, Parallel Processing, Multicore computers.

**Evaluation Method: Continuous Assessment and/or End Semester Examination**

**CSC2272: Data and Network Security (30 lecture hrs.) (Optional)** This course provides comprehensive knowledge in security requirements and cryptographic solutions in computer applications & networks.

**Evaluation Method: End Semester Examination**

**MAT2256: Mathematical Statistics I (core)** - refer course unit details under Department of Mathematics

**PHY2222: Electronics (optional)** - refer course unit details under Department of Physics.

**FSC224α: Physical Fitness and Health Management (optional)** refer Course unit details under FSC course units.

## **Level III - Semester I**

**CSC3113: Group Projects (120 practical hrs.)(core)** The objective of this course is to design and implement a system using programming and other skills acquired. The students will carry out group project and submit a dissertation. The students will also make a presentation of the project and face for a viva.

**Evaluation Method: Product demonstration, Project presentation, Individual contribution, Report writing, Attendance**

**CSC3122: e-Commerce and Professional Practice (30 lecture hrs.) (Optional)**

Introduction to E-Commerce and E-Business. E-Commerce Business Models. Business Strategies. Business and IT Alignment. Value-Oriented E-Business Modeling. Building e-Commerce Systems. Ethical Issues.

**Evaluation Method: End Semester Examination**

**CSC3132: Data Warehousing and Data mining (30 lecture hrs.) (Optional)**

Concept of data mining, concept of data warehousing with special emphasis on architecture and design, Data Pre-processing, classification and prediction, clustering, association rules, decision trees.

**Evaluation Method: Continuous Assessment and/or End Semester Examination**

**CSC3133: Network and System Administration (30 lecture hrs. & 45 practical hrs.) (Optional)**

Overview of Linux System, Linux shell commands and environment, Basic Unix shell programming, Disks and Other storage media, Overview of the directory tree, Booting and shutting down, Rootly power, Essential tasks of the system administrator, User Account Management, File Protection, Managing Packages, X windows system, Backup and Restore, Performance Analysis, Setting up printer server, Monitoring and Managing Networks, Setting up File Servers, Electronic Mail system.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC3142: Internet Services and Protocols (15 lecture hrs. & 45 practical hrs.) (Optional)**

Introduction, the Internet, Internet protocols and Application services, Transport Protocols (TCP, UDP), Client Server computing, Packet and Protocol level Analysis, Email Service, SMTP, POP3, IMAP protocols, Email server and User Agent Configuration, World Wide Web, HTTP protocol and Web Server Configuration, Web caching, Proxy Servers and Cookies, Load Balancing and Proxy Server Configuration, Telnet, SSH and File Transfer Protocol, FTP server configuration, Voice over IP communication VOIP server configuration, Domain Name Service, DNS configuration, Server Performance and Tuning

**Evaluation Method: End Semester Examination**

**CSC3152: Geographic Information Systems (15 lecture hrs. & 45 practical hrs.) (Optional)**

Introduction to GIS, GIS Data, Data Quality Issues, Basic GIS Operations, Spatial Modeling and Analysis, GIS Modeling, GIS Organization and Management, GIS Applications.

**Evaluation Method: Practical Examination 30% and End Semester Examination 70% (Student must obtain at least 35% from the theory paper and 30% from the practical paper)**

**CSC3162: Research Methods (30 lecture hrs.) (Optional)**

teach the fundamentals of Scientific Writing.

This course aims to

**Evaluation Method: End Semester Examination**

**CSC3172 Distributed Systems (30 lecture hrs.) (Optional)** Introduction, Communication and Synchronization in distributed systems, Processes and processors in Distributed systems, Distributed file systems, Distributed shared memory(DSM), Peer-Peer systems, security, Distributed systems in Practice, Cloud computing.

**Evaluation Method: End Semester Examination**

**FSC3122:Accounting(30 lecture hrs) (Optional)** - refer course unit details under FSC course units.

**FSC3112 Management(30 lecture hrs.) (Optional)** - refer course unit details under FSC course units.

**MAT3136: Mathematical Statistics II (30 lecture hrs & 15 tutorial hrs) (Optional)** refer course unit details under Department of Mathematics

## Level III - Semester II

**CSC3216: Industrial Training (3 months)(Core)** This training helps the students to get experience on issues related to industry. At the end of the training, the students should make a presentation of their findings and submit a report.

**Evaluation Method: Dairy, Report, Presentation**

## 1.8 Bachelor of Computer Science (Honours) Degree

A limited number of students are selected to follow the Bachelor of Computer Science (Honours) degree programme after completion of three academic years of Bachelor of computer science (General Degree Programme). The selection of students is done according to their academic performance during Level I, Level II and Level III of the BCS (General) degree programme.

### 1.8.1 Criteria for Selection to the BCS (Honours) Degree Programme

1. The Department of Computer Science shall determine the number of students to be admitted each year.
2. A student shall be eligible to apply if he/she has fulfilled the following requirements at the completion of the Level III of the Bachelor of Computer Science (General) Degree:
  - (a) A minimum of 90 credits,
  - (b) grades of B- or better for 80% of Computer Science course units,
  - (c) grades of C or better from theory aggregating to a minimum of 60% credits from Mathematics course units,
  - (d) grade C or better for Industry Based Project/Industry Placement course unit and the Group project
  - (e) Pass English Proficiency Level I & Level II
  - (f) a GPA of 2.5 or more

The Grade point Average (GPA) is calculated as follows:

$$\text{GPA} = \frac{\sum (\text{Grade Point Value for a Course Unit}) \times (\text{Number of credits of that Course Unit})}{\text{Total number of credits}}$$



3. The selection of a student shall be determined by the department of Computer Science in an interview and shall be based on the following:
  - (a) performance of the student in core course units of Bachelor Computer Science (General) Degree Examination and
  - (b) the general aptitude and application of the student.
4. The decision of the Dean of the Faculty shall be final and conclusive.

### 1.8.2 Course Units of BCS (Honours) Degree Programme

#### Semester I

Code	Name of Course Unit	No of Credits	Core/optional
CSC 4112	Research Seminar	2	Core
CSC 4122	Research Methodology	2	Core
CSC 4133	Neural networks	3	Core
CSC 4046	Individual Research project	6	Core
CSC 4152	Enterprise Modeling	2	Core
CSC 4162	Data mining for Business Intelligence	2	Core
CSC 4172	High Performance Computing	2	Core
CSC 4182	Bioinformatics	2	Core
Total Credits for Semester I		21	

#### Semester II

Code	Name of Course Unit	No of Credits	Core/optional
CSC 4212	Compiler Design	2	Core
CSC 4222	Service Oriented Computing	2	Core
CSC 4232	Formal Methods and Software Verification	2	Optional
CSC 4242	Artificial Intelligence	2	Core
CSC 4262	Selected Topics	2	Optional
Total Credits for Semester II		10	

### Bachelor of Computer Science (Honours) Degree - Semester I

**CSC 4112: Research Seminar** Research Seminar introduces the process of academic research and allows the students to open their mind to problem-solving strategies based upon formal inquiry and the detailed research of others. It will also include participating in discussions and giving presentations.

Evaluation Method: Continuous Assessment

**CSC 4122: Research Methodology** This course will provide an opportunity for students to advance their understanding of research through critical exploration of research language, ethics, and approaches.

Introduction, Scientific Research, Reading and recording, Critiquing research papers, Mind mapping and Concept Mapping, Planning and conducting research, The research process, Types of computing research, Computing research methods, Ethics and plagiarism, Research ethics, Minnesota ethics guidelines, Plagiarism, Data collection and analysis, Communicating research findings, Simple Latex for Academic Writing, Citation styles, Citation style guides, Planning and delivering oral presentations, Presentation Tips.

**Evaluation Method: Continuous Assessment**

**CSC 4133: Neural Networks (30 Lecture hours)** Introduction to Artificial Neural Networks, Multi-Layer Perceptrons, Back-Propagation Algorithm, ANNs using Tools, Pre-Processing Techniques, Feature Extraction & Selection algorithms, Naive Bayes Learning and Bayesian Belief Learning Models, Unsupervised Learning Methods, Learning Vector Quantization Methods, Self-Organizing and Neural Gas Algorithms, Hierarchical Learning Models, Combining Multiple Classifier Models, Measuring Classifier Performance.

**Evaluation Method: Continuous Assessment and/or End Semester Examination**

**CSC 4152: Enterprise Modelling (30 lecture hours)** Different Perspectives of Enterprise Modeling: Goal Modeling, Business Rules Modeling, Process Modeling, Business Modeling. Developing Goal Models, Business Rule Models and Business Models. Business work flow Modeling with Event Driven Process Chains (EPC), Work flow analysis with Petri nets. State of the art developments in Enterprise Modeling, Latest Research Trends, and Modeling Approaches.

**Evaluation Method: End Semester Examination**

**CSC 4162 - Data Mining for Business Intelligence (30 lecture hours)** *Prerequisite: CSC3132: Data Warehousing and Data Mining*

Introduction, Introduction to data mining, Introduction to Business Intelligence, The need of Business Intelligence, Business Intelligence Solutions, Data, Quality of Data, Unsupervised and supervised learning, Dimension Reduction, PCA Analysis, Association Rules, Naive Bayes Theorem, K- Nearest Neighbor Algorithm, Regression Analysis, Hierarchical Clustering, Evaluating Classification and Predictive Performance.

**Evaluation Method: Continuous Assessment 30% and End Semester Examination 70%**

**CSC 4172: High Performance Computing (30 Lecture hours)** Introduction to High Performance Computing, Performance Analysis, Serial performance optimization, Parallel Algorithm design methodologies, Parallel Programming Models, Programming with Distributed Memory, MPI, Programming with Shared Memory, OpenMP, Load balancing and Data Partitioning, Grids and Clouds, GPU computing.

**Evaluation Method: End Semester Examination**

**CSC 4182: Bioinformatics (30 Lecture hours)** Introduction to Bioinformatics, Archives and Information Retrieval, Pairwise sequence Alignments: Dot Plots, Simple Alignments. The Needleman and Wunsch Algorithm, BLAST algorithm, FASTA algorithm, Multiple sequence alignments: Introduction to multiple sequence alignments, Greedy approach, Star alignment approach and ClustalW algorithm, Hidden Markov models, Phylogenetic Trees: Introducing distance measures and distance based phylogenetic tree building algorithms UPGMA, NJ, introducing character-based measures and character based phylogenetic tree building algorithms: maximum parsimony and maximum likelihood. Protein and RNA Structure Prediction: Secondary Structure, Tertiary and Quaternary Structure, Tools for Modeling Protein Folding, Introduction to drug discovery and ligand docking algorithms, micro array data analysis.

**Evaluation Method : Continuous Assessment : 30% and End Semester Examination 70%**

**CSC 4046: Individual Research project** This course provides an opportunity for the students to work as an individual to produce a system. The students will carry out an

individual project and submit a dissertation. The students will also make a presentation of the project and face for a viva.

**Evaluation Method: Defend the Project Proposal 10%, Interim progress report 15%, Publication 15%, Final report/presentation 60%**

## **Bachelor of Computer Science (Honours) Degree - Semester II**

**CSC 4212: Compiler Design (30 Lecture hours)** Compiler Design Introduction, Phases of compiler, Lexical Analysis- Deterministic Finite Automata, Regular expressions, Lex & Flex (Lexical analyzer generator), Context Free Grammar- Derivative, Parse trees, Ambiguous grammar, EBNF, Top-Down Parsing - LL(1) parse table, Recursive decent parser, Bottom-up parsing - LR parsing, Yacc, Abstract syntax trees, Semantic Analyser.

**Evaluation Method: End Semester Examination**

**CSC 4222: Service Oriented Computing (30 Lecture hours)** The focus of this course is to understand service orientation of technology. The course will provide a deep understanding of Service Oriented Architecture (SOA) fundamentals from Application as well as Infrastructure perspective. The web Service architectures and standards will be discussed in this course unit. Introduction to Service Oriented Computing, Standards Bodies of SOC, Service Oriented Architecture, Traditional Vs Service Oriented Architecture, Service Classification, Enterprise service Bus, Web Services, Web service stack, Introduction to SOAP, WSDL, Introduction to BP4WS, Service management and governance, Introduction to Cloud Computing.

**Evaluation Method: End Semester Examination**

**CSC 4232: Formal Methods and Software Verification (30 Lecture hours)** Review of Sets, Relations, Functions and Related Matters, Review of Propositional Logic, and Logical Arguments, Introduction to Predicate Calculus, Concepts of programming language and Proof of Correctness, Hoare Logic, Formal Methods, Use of Z-Notation for various aspects of Program constructs and Verification.

**Evaluation Method: End Semester Examination**

**CSC 4242: Artificial Intelligence (30 Lecture hours) (Core)** Introduction to AI Techniques, State and State Space, Agents, Search algorithms, Hill Climbing and Genetic algorithms, Heuristic Search Techniques, Resolution and Theorem Proving, First Order logic, Propositional logic, Game playing, Minimax Theorem and Alpha-Beta Pruning, Natural Language Processing, Deep learning and computer vision.

**Evaluation Method: Continuous Assessment and/or End Semester Examination**

**CSC 4262: Selected Topics (30 Lecture hours)** This course provides students with a understanding of different new concepts related to Computer Science. The detailed contents may be changed from year to year depending on the current trends and available expertise.

**Evaluation Method: Continuous Assessment and/or End Semester Examination**

## **1.9 Examinations - BCS Degree Programmes**

### **Bachelor of Computer Science (General) Degree**

The Bachelor of Computer Science (General) Degree will include six semesters during which students will have to follow Compulsory Course Units (CCU) offered by respective depart-

ments and elective or optional Course Units (OCU). The Bachelor of Computer Science (General) Degree Examination will consist of end of semester examinations for theory and practical Course Units.

### **Bachelor of Computer Science (Honours) Degree**

The duration of the Honours degree programme is four academic years (eight semesters) inclusive of Level I, II and III of the BCS (General) degree.

During the four academic years of the degree programme, a student shall complete course units aggregating to 120 credits with at least 30 credits from the fourth academic year of the Bachelor of Computer Science (Honours) Degree courses.

The Honours degree consists of examinations at the end of each semester or at the end of course unit for research project.

#### **1.9.1 Attendance**

To be eligible to sit for an examination of a theory or practical course unit, there should minimum attendance of 80%. If a student fails to meet this requirement for a particular course unit, he or she will be considered to have failed in that course unit (see section 14.3.1 for further details).

#### **1.9.2 Examination Criteria**

##### **Evaluation Methods**

- Theory examination (written/oral)
- Practical examination
- Continuous assessment
- Assignment
- Report
- Presentation

##### **Grading System**

Awarding of grades for course units will be done according to the grading system given in the Table in section 14.2

##### **Pass in a Course Unit**

- A candidate who obtains grade C or better for a Course Unit will be considered to have passed in that Course Unit.
- If a student fails to complete a Course Unit, grade of E will be given unless an acceptable reason is produced. In the event of given reason is accepted by the Senate on the recommendation of the Faculty Board, he/she will be considered as sitting for the first time in a subsequent attempt for that course unit.

- A student who obtains a C- or lower grade in a particular Course Unit, may re-sit the examination in respect of that Course Unit for the purpose of improving its grade within the stipulated period. The highest grade a student can obtain is C, which is in this instance equivalent to GPA 2.0. In the event a student obtains a lower grade, he/she will be entitled to the previous grade. Repeat candidates are not entitled to attend the lectures/practical classes of the Course Unit in which he/she has failed.

## Verification of Marks

See section 14.2.5 for details.

### 1.9.3 Bachelor of Computer Science (General) Degree Requirements

A candidate shall be eligible for the conferment of the Bachelor of Computer Science (General) Degree after the successful completion of all requirements within a maximum period of five academic years from the date of entry to the University of Ruhuna as specified below.

A student shall be deemed to have passed the Bachelor of Computer Science (General) Degree Examination if he/she has obtained

- a minimum of 90 credits
- grades of C or better aggregating to a minimum of 60% credits of Computer Science CCUs
- grades of C or better aggregating to a minimum of 60% credits of Mathematics CCUs
- grades of C or better aggregating to a minimum of 60% credits of OCUs
- a grade C or better for Industry Based Project/Industry Placement course unit
- Grade Point Average (GPA) of 2.00 or more.

GPA will be calculated as follows:

$$\text{GPA} = \frac{\sum (\text{Grade Point Value for a Course Unit}) \times (\text{Number of credits of that Course Unit})}{\text{Total number of credits}}$$

## Award of Honours

A student who has satisfied conditions given above is eligible for an award of an Honours degree if he/she completes the requirements indicated below within three academic years from the date of first registered securing grades of C or better aggregating to a minimum of 75 credits.

### (1) First Class:

First Class Honours will be awarded if he/she obtains

- a minimum Overall Average of 3.70 and
- grades of A in Course Units aggregating to a minimum of 40 credits

### (2) Second Class (Upper Division):

Second Class (Upper Division) Honours will be awarded if he/she obtains

- a minimum Overall Average of 3.30 and

(ii) grades B or better in Course Units aggregating to a minimum of 40 credits.

**(3) Second Class (Lower Division):**

Second Class (Lower Division) Honours will be awarded if he/she obtains

- (i) a minimum Overall Average of 3.00 and
- (ii) grades of B or better in Course Units aggregating to a minimum of 40 credits.

**Other Requirements**

In addition to the examination criteria stated above, the candidate have to pass in English proficiency Level I and Level II examinations in order to release the final results of the Bachelor of Computer Science degree.

**1.9.4 Minimum Requirement for the Completion of the Bachelor of Computer Science (Honours) Degree**

A student shall be deemed to have passed the Bachelor of Computer Science (Honours) Degree Examination if he/she has obtained following:

- (a) A minimum of 120 credits with at least 30 credits from the fourth academic year of Bachelor of Computer Science (Honours) degree course units,
- (b) An overall minimum Grade Point Average (GPA) of 2.5 for all course units followed throughout the four academic years of the degree programme and
- (c) A grade not inferior to C for the fourth year Individual Research Project.
- (d) Grade of C or better to a minimum of 70% credits from the fourth year course units

**Award of Honours**

A student who has fulfilled all the conditions given above shall be awarded Honours, if he/she fulfills the following additional requirements within four academic years from the date of first registration (it shall be within the power of the Senate to declare for some specified reason that a student is eligible for the award of the Honours at a subsequent occasion) securing grades of C or better aggregating to a minimum of 25 credits from Bachelor of Computer Science (Honours) Degree Course Units.

**(i) First Class Honours**

- (a) A minimum GPA of 3.70 for Honours Degree Course Units,
- (b) A minimum GPA of 3.70 for all course units, and
- (c) Grades of A or better for Honours Degree Course Units aggregating to a minimum of 15 credits

**(ii) Second Class (Upper Division)**

- (a) A minimum GPA of 3.30 for Honours Degree Course Units,
- (b) A minimum GPA of 3.30 for all course units, and
- (c) Grades of A- or better for Honours Degree Course Units aggregating to a minimum of 12 credits

(iii) Second Class (Lower Division)

- (a) A minimum GPA of 3.00 for Honours Degree Course Units, and
- (b) A minimum GPA of 3.00 for all course units