



MSC IN COMPUTER SCIENCE

2018 INTAKE



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
UNIVERSITY OF MORATUWA

SPECIALIZATIONS

The MSc in Computer Science (MSc in CS) postgraduate degree program is designed to provide practicing professionals with a greater depth of technical knowledge as well as exposure to emerging and niche areas.

The following specializations within the MSc in CS program allow students to concentrate on an area of study that interests them:

- Cloud Computing
- Computer Networks
- Data Science , Engineering and Analytics
- Information Systems Management
- Mobile Computing
- Parallel Computing
- Security Engineering
- Software Architecture

Details of the specializations are as follows:

- **Cloud Computing**

Cloud computing has transformed the way we host and run applications, enabling us to acquire vast, scalable computing and storage resources as and when needed. As every computing device and application now having a cloud backend, there is a huge demand for professionals that can design and develop cloud-enabled applications as well as integrate and manage cloud services. This specialization is targeted towards preparing cross-skilled cloud architects, engineers, and developers to address this rising demand. Areas of study under the specialization include cloud technologies, cloud and client side software development, distributed systems, as well as fundamentals of cloud systems, information security, and networking.

- **Computer Networks**

This specialization focuses on the design, operation, and management of computer networks and for those who intend to become senior systems engineers, network operations center (NOC) managers, and network design and performance engineers. The specialization is designed to provide specialized knowledge and skills in wired/wireless networks, routing, switching, systems engineering, and network security, design, and management, as well as recent and emerging topics including cloud-based systems, software-defined networking, and content concentric networking.

- **Data Science, Engineering, and Analytics**

The exponential growth of the data accumulated by the mankind has resulted in the phenomenon commonly referred to as Big Data – large, complex data sets that are impossible to comprehend for humans. This specialization explores the unique challenges and opportunities presented by Big Data. Areas of study under the specialization include data mining, information retrieval, concepts and techniques of machine learning, and the emerging disciplines of data science and business intelligence. This specialization is useful for professional who would like to embark on a career as data scientists or data mining experts as well as professionals who would like to be equipped with the knowledge to work as software engineers on endeavors related to Big Data.

- **Information Systems Management**

This specialization focuses on the design, operation, and management of large scale information systems and is intended for those who are planning to become senior IT managers, IT project managers and senior IT consultants. The specialization is designed to provide specialized knowledge and skills in the areas of information systems management, software engineering, IT project management, socio-technical analysis of ICT and future trends for digital enablement.

- **Mobile Computing**

The advancements in computing and communication technologies have fueled an exponential growth in the use of mobile computing and the consumer market is converging to mobile computing technology at a rate faster than any other technology in the history. This disruptive growth has already become a trillion Dollar business and the computing industry from leading global players to small local businesses are preparing for this wonderful paradigm shift. The mobile computing specialization is targeted towards preparing mobile computing architects required to drive the next generation, context-aware ubiquitous applications, which will be the frontier of the mobile computing and consumers. The core of the specialization explores topics such as context awareness, ubiquitous computing, Internet of things, wireless networks, mobile clouds and Cloudlets, innovative user interaction techniques, and developing next generation mobile applications.

- **Parallel Computing**

We live in the era in which the performance of computing does not improve automatically as used to be and described by the Moore's Law. Now the way to improve performance is by using several processing elements in parallel, be it smart phones or high-end computer servers. As a result, parallel computing has become ever more relevant to a wide range of computing professionals. This specialization explores the challenges and opportunities presented by all forms of parallel computation. Areas of study under the specialization include study of parallel architectures (ranging from multi-core CPUs and performance accelerators such as many-core GPUs to heterogeneous clusters and massively parallel systems), concurrency, parallel programming models and techniques, and performance engineering.

- **Security Engineering**

The security of information, software, networks, and systems is one of the most critical requirements in computing, irrespective of whether it is organizational, governmental, research, or commercial. This specialization is for those who intend to become security architects in software engineering, security specialists in systems integration, and information security engineers. The specialization has been designed to match the industry requirement in specialized knowledge and skills in cryptographic techniques, secure software development, network security, vulnerability assessment, and information security management.

- **Software Architecture**

This specialization focuses on the concepts and techniques that lead to superior software architectures and software systems. It explores areas of study such as software architecture styles and patterns, enterprise software architectures, quality engineering, requirements engineering, and distributed computing. The specialization is equally useful for professionals who would like to embark on a career as software architects as well as professionals who would like to become highly productive software engineers.

COURSE MODULES AND PROGRAM STRUCTURE

The MSc in CS postgraduate degree program consists of compulsory modules, specialization-specific compulsory modules, elective modules, and a compulsory research project. The research project is expected to be in the area of specialization.

The program is structured as a six semester (two-year) degree program with each semester consisting of 14 weeks of academic activities. Lectures are held on One/Two weekdays from 5.30 PM to 7.30 PM in Colombo and on Saturdays in the University of Moratuwa. Lectures are also supplemented with online interactions via Moodle, Yammer, Google Hangout, Skype, Lync, etc.

In a typical study program arrangement, the first three semesters consist of taught course modules while the fourth semester is a mix of taught courses and research. The final two semesters are used for the research project and dissertation writing.

The following are the course modules of the program:

Code	Course Modules	Credits
CS5101	IT Project Management	3
CS5102	IT Policy and Planning	3
CS5103	Information Systems Management	3
CS5116	IT and Society	3
CS5202	Advanced Operating Systems	3
CS5203	Advanced Compilers	3
CS5212	Software Architecture Concepts	3
CS5213	Enterprise Software Architecture	3
CS5214	Principles of Operating Systems	1.5
CS5222	Software Process and Management	3
CS5223	Rapid Application Development	3
CS5224	Advanced Databases	3
CS5225	Parallel and Concurrent Programming	3
CS5226	Secure Program Development	3
CS5227	Data Mining	3

Code	Course Modules	Credits
CS5228	Principles of Software Design and Software Engineering	3
CS5229	Big Data Analytics Technologies	3
CS5230	Database Managements Systems	3
CS5242	Software Development on Cloud Platforms	3
CS5243	Client Side Application Development	3
CS5250	Human Computer Interaction	1.5
CS5251	Local-Language Computing	1.5
CS5252	Requirements Engineering	1.5
CS5253	Software Quality	1.5
CS5270	Many / Multi-Core Programming	3
CS5312	High Performance Computer Architecture	3
CS5313	Fault Tolerant Computing	3
CS5314	Embedded Systems	3
CS5341	Cloud Technologies and Systems	3
CS5401	System and Network Design	3
CS5404	Computer and Network Security	3
CS5405	Performance Modeling and Analysis	3
CS5406	Performance Engineering of Computer Systems	3
CS5414	Current Topics in Computer Networks	3
CS5422	Digital Communication	3
CS5423	Information Security Theory and Practice	3
CS5424	Cryptography Engineering	3
CS5425	Information Security and Cryptography	3
CS5426	e-Commerce	3
CS5429	Distributed Computing	3
CS5430	Mobile Computing	3
CS5431	System Audit and Vulnerability Assessment	3
CS5440	Wireless Access Networks	3
CS5441	Mobile and Ubiquitous Application Development	3
CS5442	Pervasive Computing	3
CS5450	System and Network Administration	3

Code	Course Modules	Credits
CS5451	Broadband Networks	1.5
CS5452	Wireless Networks	1.5
CS5453	Security Management	1.5
CS5454	Digital Forensics	1.5
CS5455	Networks and Protocols	1.5
CS5456	Security Management	3
CS5457	Legal Aspects of Computer Security	1.5
CS5460	Operating Systems Security	3
CS5461	Network Security	3
CS5462	Embedded Systems Security	3
CS5512	Advanced Image Processing	3
CS5513	Computer Vision	3
CS5612	Pattern Recognition	3
CS5613	Neural Networks	3
CS5614	Bio-Informatics	3
CS5615	Information Retrieval	3
CS5616	Natural Language Processing	3
CS5617	Data Science	3
CS5618	Business Intelligence	3
CS5619	Information Systems for Digital Society	3
CS5620	Information Systems Modelling and Design	3
CS5621	Machine Learning	3
CS5650	Statistical Analysis	1.5
CS5651	Statistical Inference	3
CS5701	Advanced Algorithms	3
CS5814	IT Law	3
CS5850	e-Learning	1.5
CS5912	Current Topics in Computer Science	3
CS5921	Independent Study 1	1
CS5922	Independent Study 2	1
CS5923	Directed Study 1	1.5

Code	Course Modules	Credits
CS5924	Directed Study 2	1.5
CS5925	Directed Study 3	1.5
CS5926	Directed Study 4	1.5

Students are required to earn 60 credits to graduate. 20 of those credits would come from the Research/Industry Projects. Four more credits would come from modules that prepare the students for the Research Project. That leaves 36 credits to be earned by taught modules. The combination of taught modules to be taken depends on the specialization. If you need any additional information regarding the specializations, course modules or the program structure, please contact the MSc in CS course coordinators through the contact details given on <http://postgrad.cse.mrt.ac.lk> website.

Note: Offering of a particular specialization, or a course module during a given academic year is subject to having the minimum number of registrations.

RESOURCE PERSONS

The MSc in CS postgraduate degree program is conducted by senior academics of the University of Moratuwa with research specializations in specific study areas complemented by specialists from the industry.

Prof. Gihan Dias

BSc Eng Hons (Moratuwa), MSc (UCSB), PhD (UCD), MIE(SL), CEng
Professor, Dept of Computer Science and Engineering, University of Moratuwa

Prof. Sanath Jayasena

BSc Eng Hons (Moratuwa), MSc (UIUC), PhD (UIUC), MIE(SL), CEng
Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Chathura De Silva

BSc Eng Hons (Moratuwa), MEng (NTU), PhD (NUS), MIE(SL), CEng
Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Shantha Fernando

BSc Eng Hons (Moratuwa), MPhil (Moratuwa), PhD (Delft), MIE(SL), MIEE (London), CEng
Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Chandana Gamage

BSc Eng Hons (Moratuwa), MEng (AIT), PhD (Monash), MIE(SL), CEng
Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Shehan Perera

BSc Hons (Colombo), MSc (NDSU), PhD (NDSU)
Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Ms. Vishaka Nanayakkara

BSc Eng Hons (Moratuwa), Tech Licentiate (Chalmers),
Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Rapti de Silva

BA Hons (Virginia), MSc (Virginia), PhD (Syracuse)

Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Dilum Bandara

BSc Eng Hons (Moratuwa), MS (CSU), PhD (CSU), AMIE(SL)

Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Charith Chitraranjan

BSc Eng. (Hons) (Moratuwa), MSc (NDSU), PhD (NDSU)

Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Kutila Gunasekera

PhD (Monash), MSc (Moratuwa), BSc Eng. (Hons) (Moratuwa)

Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Dulani Meedeniya

BSc Hons (Peradeniya), MSc (Moratuwa), PhD (St Andrews)

Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Indika Perera

BSc Eng Hons (Moratuwa), MBS (Colombo), MSc (Moratuwa), PhD (St Andrews), PGDBM (Colombo), MIE (SL), CEng

Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Surangika Ranathunga

BSc Eng Hons (Moratuwa), MSc (Moratuwa), PhD (Otago), AMIE(SL)

Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Uthayasanker Thayasivam

PhD (U. Georgia), BSc Eng. (Hons) (Moratuwa)

Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Dr. Malaka Walpola

BSc Eng Hons (Moratuwa), MS (FIU), PhD (FIU), AMIE (SL)

Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Mr. Nalin Karunasinghe

BSc Eng Hons (Moratuwa), MEng (NUS)

Senior Lecturer, Dept of Computer Science and Engineering, University of Moratuwa

Prof. Ranjith Perera

BSc Eng (Sri Lanka), Dip Ing (Aachen), Dr Ing (Aachen), MIE(SL), CEng

Professor, Dept of Electrical Engineering, University of Moratuwa

Dr. Prathibha Mahanamahewa

LLB Hons (Colombo), LLM Hons (Melbourne), PhD (Queensland), Attorney-at-Law

Senior Lecturer, Faculty of Law, University of Colombo

Mr. Chamara Disanayake

MSc (Moratuwa), BSc Eng. (Hons) (Moratuwa), MBS(Colombo), AMIE(SL)

Manager-Engineering, LK Domain Registry

ELIGIBILITY REQUIREMENTS

The MSc in CS postgraduate degree program requires a prospective candidate to fulfill the following eligibility criteria for course enrollment.

- The degree of BSc Engineering of the University of Moratuwa in a relevant field, as may be approved by the Senate;
OR
- Any other four-year degree in Engineering, Science or Technology from a recognized University, in a relevant field of specialization, as may be approved by the Senate;
OR
- Any other three-year degree in Engineering, Science or Technology from a recognized University, in a relevant field of specialization, and a minimum period of experience of one (01) year as may be approved by the Senate;
OR
- Any recognized category of membership of a recognized Professional Institute, obtained through an academic route, with a minimum period of experience of one (01) year as may be approved by the Senate.

SELECTION PROCESS

The selection to the MSc in CS postgraduate degree program is through an open competitive process. The applicant's educational qualifications, professional qualifications, commitment to advanced study, demonstrated aptitude for research, English language skills required for preparation of study/research outcomes and knowledge dissemination, and academic/professional references all contribute to the evaluation of a candidate. Following are the specific steps involved in the selection process:

1. Each applicant is evaluated for the conformity with the applicable eligibility criteria based on the information provided with the application. All applicants satisfying the eligibility criteria will be invited to a selection test.
2. The applicants who satisfied the eligibility criteria will appear for an online selection test of one-hour duration. The selection test consisting of multiple-choice, short-answer and similar questions will examine analytical skills, conceptual knowledge, and topic-specific knowledge in areas such as Programming, Data Structures and Algorithms, Operating Systems, Computer Systems and Organization, Software Engineering, Software Architecture, Theory of Computing, Databases, Artificial Intelligence, Networking, Computer Security, Professional Practice, and Management Information Systems. In addition, the candidates will be required to write a short essay (of less than 250 words) on a given topic. All applicants who are successful at the selection test will be invited to a selection interview.
3. The applicants who were successful at the selection test will face an interview of 5-10 minute duration by an interview panel of not less than three persons. The interview will ascertain the applicant's suitability and competency for the study program.
4. Based on the marks received by each applicant for the selection test and the selection interview, the applicants will be ranked and placed into a "Selected Candidates List" and a "Waiting List". After the completion of the selection process, all applicants will be informed of their application status. If an applicant from the Selected Candidates List fails to enroll in the study program within the stipulated period, that opportunity will be afforded to an applicant from the Waiting List.

COURSE FEE AND PAYMENT STRUCTURE

The course fee for the MSc in CS program can be paid in full at the commencement of the course or in installments during the course duration.

- Full Payment - Rs. 525,000/- (by 01st December 2017)
OR
- First installment – Rs. 275,000/- (by 01st December 2017)
- Second installment – Rs. 200,000/- (by 03st August 2018)
- Third installment – Rs. 50,000/- (by 08th March 2019)

Above course fee includes Annual Academic Registration Fees, Semester Examination Fees, a Library Deposit of Rs. 2,500/-, and government taxes (NBT at 2%). In the case of change of government taxes, the student will have to incur the additional tax amount.

HOW TO APPLY

1. Pay the application-processing fee.

The application processing fee of Rs. 2,000/- may be paid either to University Shroff (weekdays from 9.00 AM to 12.30 PM and 1.30 PM to 3.00 PM) or as a payin voucher of Rs. 2,000/- obtainable at any Bank of Ceylon branch by paying Rs. 2,000/- to the credit of "University of Moratuwa – A/C No. 306836".

2. Fill up the online application form at <http://postgrad.cse.mrt.ac.lk>. You need to attach all documents indicated in the application form. Once submit you will receive a PDF of the filled application.

Completed online application, all supplementary documents as indicated in the application form, a copy of the Application Processing Fee Receipt, and online Letters of Recommendation must reach the Department of CSE by the application deadline.

3. Arrange for Letters of Recommendation.

You are required to provide **two (02)** Letters of Recommendation which can be submitted online. We highly recommend obtaining one of the recommendations from a teacher of an institution you studied recently, and another from your current supervisor. Ensure that your Letters of Recommendation requests are communicated to the relevant recommender on time.

Request the recommender to use the same e-mail address that you used while filling up the application, and also request the recommender to use the official e-mail address whenever possible.

Once the online recommendation form is submitted, recommender will receive a confirmation e-mail with an attached PDF as a record. You will also receive a notification to the provided e-mail address.

4. Once your application is processed, you will be notified via e-mail whether you are invited for writing and selection tests and interviews or not. You may also receive e-mail notifications, if the selection committee has any queries about your application.
5. Keep the writing and selection tests and interview date blocked in your calendar. Also, promptly check e-mails and follow up on calls, especially within 1 week from the application deadline.
6. If you are invited to the selection test (usually will be informed within 1 week from the application deadline), prepare the following application pack and bring to the selection test:
 - Copy of completed and signed "Application Form"
 - Updated "Curriculum Vitae" of the applicant
 - Your National Identity Card (NIC), Driving License, or Passport
 - Original birth certificate
 - Original academic/professional certificates – specially degree certificate and transcript (both degree certificate and transcript are required)
 - Membership of professional institutes
 - Completed "Letter of Consent Form" from the employer (if applicable)
 - Letter of sponsorship (if applicable)
 - Copy of the application processing fee receipt
 - Any other documentation in support of your application
 - Invitation letter