



# **MSc IN COMPUTER SCIENCE**

**2017 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, 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:

| <b>Code</b> | <b>Course Modules</b>               | <b>Credits</b> |
|-------------|-------------------------------------|----------------|
| CS5701      | Advanced Algorithms                 | 3              |
| CS5203      | Advanced Compilers                  | 3              |
| CS5224      | Advanced Databases                  | 3              |
| CS5512      | Advanced Image Processing           | 3              |
| CS5202      | Advanced Operating Systems          | 3              |
| CS5614      | Bio-Informatics                     | 3              |
| CS5451      | Broadband Networks                  | 1.5            |
| CS5618      | Business Intelligence               | 3              |
| CS5243      | Client Side Application Development | 3              |
| CS5341      | Cloud Technologies and Systems      | 3              |
| CS5404      | Computer and Network Security       | 3              |
| CS5513      | Computer Vision                     | 3              |
| CS5424      | Cryptography Engineering            | 3              |
| CS5414      | Current Topics in Computer Networks | 3              |
| CS5912      | Current Topics in Computer Science  | 3              |

| <b>Code</b> | <b>Course Modules</b>                         | <b>Credits</b> |
|-------------|---|----------------|
| CS5227      | Data Mining                                   | 3              |
| CS5617      | Data Science                                  | 3              |
| CS5422      | Digital Communication                         | 3              |
| CS5454      | Digital Forensics                             | 1.5            |
| CS5923      | Directed Study 1                              | 1.5            |
| CS5924      | Directed Study 2                              | 1.5            |
| CS5925      | Directed Study 3                              | 1.5            |
| CS5926      | Directed Study 4                              | 1.5            |
| CS5429      | Distributed Computing                         | 3              |
| CS5426      | e-Commerce                                    | 3              |
| CS5850      | e-Learning                                    | 1.5            |
| CS5314      | Embedded Systems                              | 3              |
| CS5462      | Embedded Systems Security                     | 3              |
| CS5213      | Enterprise Software Architecture              | 3              |
| CS5313      | Fault Tolerant Computing                      | 3              |
| CS5312      | High Performance Computer Architecture        | 3              |
| CS5250      | Human Computer Interaction                    | 1.5            |
| CS5921      | Independent Study 1                           | 1              |
| CS5922      | Independent Study 2                           | 1              |
| CS5615      | Information Retrieval                         | 3              |
| CS5425      | Information Security and Cryptography         | 3              |
| CS5423      | Information Security Theory and Practice      | 3              |
| CS5103      | Information Systems Management                | 3              |
| CS5116      | IT and Society                                | 3              |
| CS5814      | IT Law  | 3              |
| CS5102      | IT Policy and Planning                        | 3              |
| CS5101      | IT Project Management                         | 3              |
| CS5457      | Legal Aspects of Computer Security            | 1.5            |
| CS5251      | Local-Language Computing                      | 1.5            |
| CS5270      | Many / Multi-Core Programming                 | 3              |
| CS5441      | Mobile and Ubiquitous Application Development | 3              |



| <b>Code</b> | <b>Course Modules</b>                                  | <b>Credits</b> |
|-------------|--|----------------|
| CS5430      | Mobile Computing                                       | 3              |
| CS5616      | Natural Language Processing                            | 3              |
| CS5461      | Network Security                                       | 3              |
| CS5455      | Networks and Protocols                                 | 1.5            |
| CS5613      | Neural Networks  | 3              |
| CS5460      | Operating Systems Security                             | 3              |
| CS5225      | Parallel and Concurrent Programming                    | 3              |
| CS5612      | Pattern Recognition                                    | 3              |
| CS5406      | Performance Engineering of Computer Systems            | 3              |
| CS5405      | Performance Modeling and Analysis                      | 3              |
| CS5442      | Pervasive Computing                                    | 3              |
| CS5214      | Principles of Operating Systems                        | 1.5            |
| CS5228      | Principles of Software Design and Software Engineering | 3              |
| CS5223      | Rapid Application Development                          | 3              |
| CS5252      | Requirements Engineering                               | 1.5            |
| CS5226      | Secure Program Development                             | 3              |
| CS5453      | Security Management                                    | 1.5            |
| CS5456      | Security Management                                    | 3              |
| CS5212      | Software Architecture Concepts                         | 3              |
| CS5242      | Software Development on Cloud Platforms                | 3              |
| CS5222      | Software Process and Management                        | 3              |
| CS5253      | Software Quality                                       | 1.5            |
| CS5650      | Statistical Analysis                                   | 1.5            |
| CS5450      | System and Network Administration                      | 3              |
| CS5401      | System and Network Design                              | 3              |
| CS5431      | System Audit and Vulnerability Assessment              | 3              |
| CS5440      | Wireless Access Networks                               | 3              |
| CS5452      | Wireless Networks                                      | 1.5            |
| CS5902      | Research Seminar                                       | 1              |
| CS5999      | PG Dip Project   | 3              |
| CS6997      | MSc Research Project                                   | 20             |

Students are required to earn 60 credits to graduate. 20 of those credits would come from the Research Projects and 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

## **Ms. Vishaka Nanayakkara**

BSc Eng Hons (Moratuwa), Tech Licentiate (Chalmers),  
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

## **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)

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. 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. Malaka Walpola**

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

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

### **Mr. Nalin Karunasinghe**

BSc Eng Hons (Moratuwa), MEng (NUS), AMIE (SL)

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

**Dr. Srinath Perera**

BSc Eng Hons (Moratuwa), MS (Indiana), PhD (Indiana)

Vice President - Research, WSO2

**Ms. Ravindi Jayasundara**

BSc (Colombo), MSc (Moratuwa)

Lecturer, Department of Mathematics, University of Moratuwa

## 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. 500,000/- (by 16<sup>th</sup> December 2016)  
OR
- First installment – Rs. 250,000/- (by 16<sup>th</sup> December 2016)
- Second installment – Rs. 200,000/- (by 01<sup>st</sup> August 2017)
- Third installment – Rs. 50,000/- (by 01<sup>st</sup> March 2018)

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. 1,000/- 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. 1,000/- obtainable at any Bank of Ceylon branch by paying Rs. 1,000/- 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. Print the completed application and then sign it.
3. Arrange for Letters of Recommendation.

You are required to provide **two (02)** Letters of Recommendation. 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 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. Submit printed and signed Application with a copy of the application processing fee receipt, transcript, degree certificate, and NIC.

Send the completed application by registered post to:

MSc Course Coordinator,  
Dept. of Computer Science and Engineering,  
University of Moratuwa,  
Katubedda,  
Moratuwa 10400.

Or

Hand in the completed application to:

MSc Course Assistant  
Dept. of Computer Science and Engineering,  
University of Moratuwa

Signed 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.

5. 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 "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
  - 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

[postgrad.cse.mrt.ac.lk](http://postgrad.cse.mrt.ac.lk)