UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREES OF MASTER OF COMPUTER SCIENCE AND MASTER OF SCIENCE IN COMPUTER SCIENCE

BY-LAWS

of the

Degrees of Master of Computer Science and Master of Science in Computer Science

By-Laws made by the University of Colombo under section 135 of the Universities Act No.16 of 1978 as amended subsequently and under section 13 of the University of Colombo School of Computing Ordinance No. 01 of 2002 as amended subsequently.

BY-LAWS

Whereas the University of Colombo has been conducting the programmes leading to the Degrees of Master of Computer Science and Master of Science in Computer Science since 2008 under its Master of Computer Science By-Laws No. 8 of 2008;

Whereas the said By-Laws have subsequently been amended by the University in 2009 and the said Degree programmes have been conducted in terms of the said By-laws as amended since 2009 and that students have been registered under the said amended By-Laws whose registration is still in operation;

Whereas the University Grants Commission has published Qualifications Framework norms, duration, credit values, etc. of different levels of academic qualification and has impressed upon the University to revise the existing programmes to bring them in line with the requirements in the published Qualifications Framework and the Institute of Electrical and Electronics Engineers (IEEE) Curriculum Guidelines;

Whereas it has become necessary to revise and revamp the programme leading to the Degrees of Master of Computer Science and Master of Science in Computer Science to bring them on par with the requirements laid down in the Sri Lanka Qualifications Framework as updated and published by the University Grants Commission in 2015;

Whereas it is also important to take cognizance that the sphere of Computer Science is a fast developing and changing one which requires constant innovation, updating and modernizing of the curriculum,

including its syllabi and method of learning & teaching, if the would-be Degree holders are of relevance and of use to the profession and industry, and as such, the innovation and updating may have to take place on an annual basis facilitating the Degree holders to be up-to-date in skills & knowledge to respond to contemporary needs of the profession and industry;

Whereas a new batch of students has been admitted to the University under the newly formulated curriculum which has already been approved by the Academic Syndicate and the Board of Management of the University of Colombo School of Computing and the Senate and the Council of the University of Colombo in terms of which approval the students have been following the said revamped and revised programme leading to the Degrees of Master of Computer Science and Master of Science in Computer Science; and,

Whereas it has become necessary to enact By-Laws to prescribe the revised and revamped curriculum, and other provisions including those relating to procedural and substantive aspects of the Degrees Programme,

The Council of the University of Colombo on the recommendation of the Senate and the Board of Management and Academic Syndicate of the University of Colombo School of Computing enacts the following By-Laws:

1. (1) These By-Laws may be cited as the Master of Computer Science and Master of Science in Computer Science By-Laws No 9 of 2018.

(2) These By-Laws shall be deemed to have come into operation with effect from January 2017.

PART I- GENERAL

Award of Degrees

2. Subject to these By-Laws, a student may be awarded the Degree of Master of Computer Science (hereinafter sometimes referred to as "the Masters Degree") or the Degree of Master of Science in Computer Science (hereinafter sometimes referred to as "the Master of Science Degree") as the case may be if he/she has

a) been a registered student of the University of Colombo School of Computing (hereinafter referred to as the School) for the relevant period prescribed by these By-Laws;

b) completed thereafter, to the satisfaction of the Vice-Chancellor, the relevant Programme of Study, as prescribed by these By-Laws, and/or other Regulations and/or Rules of the University and/or School;

c) satisfied the relevant Board of Examiners in different forms of Examinations and Assessments including written examinations, practical examinations, oral examinations, assignments, seminars, group projects, individual projects, individual research projects, dissertations, thesis, oral defense of dissertations/thesis etc., as may be prescribed by these By-Laws and/or any other By-Laws, and/or Regulations and/or Rules of the University and/or the School;

d) paid all prescribed relevant fees including library fee, registration fee, course fee, supervision fee, examination fee and all other payable dues to the School;

e) completed the relevant requirements for the award of the Masters Degree or Master of Science Degree as the case may be within a period of four (4) academic years including the first academic year of registration, subject to the provisions of these By-Laws; and,

f) fulfilled all other relevant requirements prescribed by these By-Laws and/or other relevant Regulations and/or Rules of the University and/or School.

Administration of the Programmes

3. The School shall be in charge of the administration and general direction of both the Degree Programmes, viz., the Masters Degree and the Master of Science Degree, (hereinafter sometimes referred to as "the Masters Degree Programme" and "the Master of Science Degree Programme" as the case may be).

Eligibility for Admission to the Masters Degree/Master of Science Degree Programme

4. (1) No person shall be eligible to be admitted to the Masters Degree Programme unless he/she satisfies the minimum requirements specified in the following paragraphs:

a) A Bachelors Degree in Computing from a University or Institution recognized by the University Grants Commission and/or the University of Colombo; OR

b) Any other academic or professional qualification deemed equivalent to a Bachelors Degree in Computing by the Senate of the University of Colombo on the recommendation of the School. Each application under this category shall be considered on a case-by-case basis.

(2) A student shall not be eligible to be registered for the Master of Science Degree Programme unless he/she satisfies the relevant requirements prescribed in the Regulations.

Application for Admission to the Masters Degree Programme.

5. (1) Applications for admission of students to the Masters Degree Programme shall be called by an open advertisement published, on line or otherwise, by the Registrar under the authority of the School.

(2) Prospective applicants may be required to pay to the School the relevant application fee, application processing fee, selection test fee, selection interview fee and any other fees as shall be prescribed by Regulations and/or Rules of the University and/or School.

Registration for the Masters Degree Programme.

6. (1) A person whose application for admission to the Masters Degree Programme is accepted by the School shall take steps to register for the Masters Degree Programme not later than the nominated date and shall pay the prescribed fees including the library fee, registration fee, course fee, supervision fee, examination fee and any other fees to the School as prescribed by the Council on the recommendation of the School.

(2) He/ She shall be registered initially for the First and Second Semesters of the Academic Year of the Masters Degree Programme.

(3) (a) He/ She may be registered for the Third and Fourth Semesters of the Masters Degree Programme, when he/she completes the First and Second Semesters successfully and becomes eligible for such registration by fulfilling the relevant academic requirements prescribed by the provisions of these By-Laws and/or any relevant Regulations.

(b) He/ She may be registered for the Third, Fourth and Fifth Semesters of the Master of Science Degree Programme, when he/she completes the First and Second Semesters successfully and becomes eligible for such registration by fulfilling the relevant academic requirements prescribed by the provisions of these By-Laws and/or any relevant Regulations.

(4) When a student is registered for either of the Programmes, such registration shall be valid for one academic year from the first day of the commencement of the Semester.

(5) It shall be the duty and responsibility of the student to ensure that his/her registration continues to be valid.

(6) The registration shall be deemed to have lapsed at the end of its period of validity. A student whose registration has so lapsed may renew such registration for a further period by paying the prescribed renewal fees provided that he/she is eligible to be registered for the relevant Programme in terms of sub-section (7) of this section.

(7) (a) No registration for the degree of Mater of Computer Science shall remain in force beyond a maximum period of four academic years including the first period of registration. However, this maximum period of four (4) academic years may, under exceptional circumstances, be extended by an academic year subject to the approval of the Senate on the recommendation of the Academic Syndicate and the Board of Management. Each such application for renewal beyond the maximum period of four academic years under any exceptional circumstance shall be considered on a case-by-case basis.

(b) No registration for the degree of Mater of Science in Computer Science shall remain in force beyond a maximum period of five academic years including the first period of registration. However, this maximum period of five (5) academic years may, under exceptional circumstances, be extended by an academic year subject to the approval of the Senate on the recommendation of the Academic Syndicate and the Board of Management. Each such application for renewal beyond the maximum period of five academic years under any exceptional circumstance shall be considered on a case-by-case basis.

(8) Subject to sub-section (7) of this section, a student whose four academic year period or five academic year period as the case may be, has lapsed may make a written request to the School for a grace chance to complete his/her degree provided that he/she has shown a substantial progress in his/her studies in the previous Semesters. The School shall have the power to consider such requests on a case-by-case basis and recommend to the Senate for its approval.

(9) No person shall be entitled to a refund of any fee paid to the School on any ground whatsoever, except in the case that the number of students who have been so registered for the Programme is insufficient for the Programme to be financially viable. In such a case, the School shall refund to such student the fees which are already received by it on account of the completion of the registration procedure.

(10) A student who achieves a level not inferior to the level as prescribed by the relevant Regulations in the evaluations of the First and Second semesters may be eligible to follow the Degree of Master of Science in Computer Science Programme.

PART II- ACADEMIC PROGRAMME

7. (1) The Programmes leading to the award of the Masters Degree and the Master of Science Degree shall span respectively for two academic years consisting of four Semesters and for two and half academic years consisting of five semesters, as the case may be, of learning activities and assessments.

(2) The duration of each Semester shall be a continuous period of 15 weeks from its beginning. However, the Senate shall have the authority, on the recommendation of the School, to shorten or extend the duration of a Semester, under exceptional circumstances.

8. (1) The Programme shall include Course Work consisting of Theory and Practical components, an Individual Project and a Dissertation in the case of Masters Degree Programme and Research and Thesis in the case of Master of Science Degree Programme, its Oral Examination/ Defense and all other examinations prescribed by these By-Laws and/or Regulations and/or Rules.

(2) The Course Work shall consist of lectures, tutorials, practical classes and other assignments, as shall be prescribed by the Senate on the recommendation of the School.

The list of Courses, compulsory (Core) and/or optional (Elective), their syllabi and the number, structure and rubric of question papers in each Course shall be those set out under Regulations made by the Senate on the recommendation of the School from time to time. These may vary for the Masters Degree Programme and the Master of Science Degree Programme.

(3) Each Course shall carry a time-based Credit Value as specified under the Regulations and Rules.

(4) The School shall have the authority to offer Courses of different types, including Courses which are Compulsory as Core Courses and/or Courses which are Optional as Elective Courses.

(5) The Senate shall, on the recommendation of the School, have the power to change, amend, add to or delete from the Courses, their status as compulsory or optional, their syllabi as well as the number, structure and rubric of question papers in such Courses.

(6) Every student who is admitted to the Masters Degree Programme or the Master of Science Degree Programme shall register in each academic Semester for such number of Courses as contributing to not less than such number of Credits as prescribed by Rules and Regulations for the respective Programme.

(7) Students who are admitted to the Master of Science in Computer Science shall engage fully and complete the research and thesis, in the fifth semester, which already commenced in the third semester.

Medium of Instruction

9. The medium of instruction as well as that of assessment/examinations shall be English, and the medium for correspondence shall also be English.

Registration for Academic Courses

10. (1) In each Semester, students shall register for the Core Courses of the Semester and such number of Elective Courses as aggregating to not less than the prescribed number of Credits required for that Semester. The procedure for registering in such Core and Elective Courses, as the case may be, shall be specified by the Board of Study.

(2) The School shall notify internally the list of Elective Courses available for registration. After notification, if for whatever reason, an Elective Course cannot be conducted and if a student has applied for registration for any such Course/s, he/she shall be permitted by the School to withdraw such application and apply for registration for any other Course/s as the case may be provided that such Course/s is/are being conducted during such Semester.

(3) A student shall not be permitted to voluntarily withdraw an application for registration for any such Elective Course/s in respect of any Semester unless such

withdrawal is permitted by the Board of Study, and no student shall be permitted to apply for registration for any Elective Course/s after the prescribed date.

(4) No student who, without valid reasons acceptable to the Board of Study, fails to register for the required or needed number of Courses, shall be permitted to appear for any assessment or examination of any paper in that Semester.

PART III- ASSESSMENT & EXAMINATIONS

11. (1)

(c) The Examinations leading to the award of the Masters Degree in Computer Science, shall consist of all four Semester examinations and an Oral Examination for the defense of the Dissertation on the relevant Individual Project.

(d) The Examinations leading to the award of the Master of Science in Computer Science Degree, shall consist of all four Semester examinations and assessment of the thesis and an Oral Examination for the defense of the Thesis on the relevant Individual Research Project.

(2) Each Semester examination shall consist of one or more than one written paper and such number of components of continuous assessments, assignments, reports, presentations, oral examinations or a combination of such methods of evaluation as prescribed by the Regulations and/or Rules.

(3) Each student who is registered for either of the Programme shall make an application in the form provided by the School for entry to the relevant Examination.

(4) No application for an Examination made by any student shall be entertained by the School unless the Director of the School has certified that the student took part in the different forms of instruction provided for each Course in the Semester.

(5) A student in a particular Semester of the relevant Programme shall take the Examination for that Semester on the first occasion in which the Examination is held for the particular Course. If the student does not take the Examination in the first available opportunity he/she shall be deemed to have exhausted an attempt at the Examination of the Course, unless the Senate on the recommendation of the School decides otherwise due to any valid reason.

(6) A student in a particular Semester of the relevant Programme shall undertake work related to Continuous Assessment for that Semester on the first occasion when it is set for the Semester. Where a student does not undertake the work specified for continuous assessment and/or fails to complete such work on the first occasion he/she shall be deemed to have exhausted an attempt at undertaking the work for the continuous assessment.

(7) A student who does not undertake the work specified for continuous assessment for a Semester and/or fails to complete such work and/or fails in the continuous

assessment, he/she may be given an opportunity to do the continuous assessment at the ensuing Semester where it is offered. However, he/she shall not be permitted to attend lectures in such Semester except where the Senate on the recommendation of the School permits him/her to undertake the continuous assessment subject to such conditions, including a payment of prescribed fees, as may be imposed by the Senate.

(8) It shall be lawful for the School, following due process, to terminate the registration of any student after one warning in writing, if the progress of study made by such student and/or his/her conduct and behaviour are unsatisfactory. No refund of any fees shall be payable if and when the registration of such a student is terminated.

12.

(1) A student who obtains less than C grade for any Course shall be eligible to retake the assessment/examination in the next available opportunity as decided by the School provided that such Course is available and he/she is otherwise eligible to retake the assessment/examination.

(2) Such a student shall pay to the School, the prescribed fees for retaking each such evaluation, and such student shall not be entitled to attend any lectures unless the Senate on the recommendation of the School decides to permit him/her.

(3) If such a student makes use of the opportunity to retake the evaluation of such a course, the highest mark scored shall be taken into consideration for the computation of results for the award of the Degree.

Provided, in respect of the computation of results for the award of Distinction under sub-section (2) of section 14 of these By-Laws, a GPV of 2.00 only shall be taken into consideration when he/she secures a GPV of 2.00 or more at the re-evaluation.

(4) No Grade or a percentage score or the result of the evaluation of any Course shall receive official recognition for any purpose unless such Grade or percentage or the result of such evaluation, as the case may be, has been approved by the relevant Board of Examiners and the final results pertaining to the award of the Master Degree in the relevant year have been confirmed by the Senate.

Grading System and Calculation of Grade Point Average (GPA)

13. (1) The Range of Marks, the corresponding Grades and Grade Point Values (GPV) shall be those given in Table 1 below:

Table 1
Range of Marks, Grades & their Respective Grade Point Values

Range of Marks	Grades	Grade Point Values (GPV)
90 – 100	A+	4.25
80 – 89	A	4.00
75 – 79	A-	3.75
70 – 74	B+	3.25
65 – 69	B	3.00

60 – 64	B-	2.75
55 – 59	C+	2.25
50 – 54	C	2.00
45 – 49	C-	1.75
40 – 44	D+	1.25
30 – 39	D	1.00
20 – 29	D-	0.75
0 – 19	E	0.00
0	NC*	-

*NC –Not Completed

(2) If Grade Point Average (GPA) of a student is required for any purpose, it shall be calculated using the following equation –

$$GPA = \frac{\left(\sum \text{GPV of compulsory course} * \text{credit value of compulsory course}\right) + \left(\sum \text{GPV of required optional course (disregarding additional optional course)} * \text{Credit value of required optional course}\right)}{\sum \text{credit value}}$$

The GPA is rounded to the second decimal place.

(3) Any student who has not appeared for the evaluation of a Course may be assigned a GPV of 00 Value for such Course for the purpose of calculating his/her GPA.

PART IV – AWARD OF DEGREE

14. (1) The minimum conditions which a student shall satisfy for the award of the Degree of Master of Computer Science are that he/she has obtained -

(a) not less than a GPV of 2.00 in the Courses which make up a minimum of 35 Credits;
(b) not less than a GPA of 2.00 for all the Courses which make up a minimum of 45 Credits; and
(c) not less than a C Grade (Pass) for the Individual Project/Dissertation.

(2) Subject to sub section (1) of this section and sub section (3) of section 12, a student who has qualified for the award of the Masters Degree by completing all the relevant requirements may be awarded Distinction if he/she has obtained GPA of not less than 3.50 provided he/she had completed the Masters Degree at the first attempt.

(3) No student shall be entitled to the award of the Degree of Master of Computer Science unless he/she has satisfied all the prescribed requirements and he/she has supplicated for the award of the Masters Degree at the relevant Convocation of the University of Colombo.

15. (1) The minimum conditions which a student shall satisfy for the award of the Degree of Master of Science in Computer Science are that he/she has obtained -

(a) not less than a GPV of 2.00 in the Courses which make up a minimum of 50 Credits;
(b) not less than a GPA of 2.00 for all the Courses which make up a minimum of 60 Credits;
(c) not less than a C Grade (Pass) for the Individual Research Project/Thesis; and,
(d) obtained grades of D or superior for all the compulsory courses.

(2) No student shall be entitled to the award of the Degree of Master of Science in Computer Science unless he/she has satisfied all the prescribed requirements and he/she has supplicated for the award of the Master of Science Degree at the relevant Convocation of the University of Colombo.

(3) A student who is registered for the Master of Science Degree Programme but who could not satisfy the criteria/requirements relating to the completion of the Individual Research Project (Thesis) may be granted the Masters Degree provided he/she makes such a request in writing and satisfies the examiners at a fresh viva of the criteria/requirements of the Individual Project.

(4) A student who was upgraded to the Master of Science Degree Programme and who wishes to follow the Masters Degree Programme and/or wishes to be downgraded to the Matsers Degree Programme may be permitted to do so provided he/she either in that year or the following year fulfills all the conditions/ requirements of the Masters Degree programme.

PART V – AWARD OF DIPLOMA/CERTIFICATE

16. (1) The Senate shall, on the recommendation of the School, have the authority to award either a Postgraduate Diploma in Computer Science (hereinafter referred to as "the Diploma") or a Postgraduate Certificate in Computer Science (hereinafter referred to as "the Certificate") to a student who has been registered for the Masters Programme but who has not been awarded the Masters Degree.

(2) The requirements for and the conditions under which the Diploma or the Certificate may be awarded are prescribed in the Regulations made by the Senate.

PART VI – TRANSITIONAL PROVISIONS

17. (1) Notwithstanding anything contained in these By-Laws, the candidates who have already been registered under the provisions of the Master of Computer Science By-Laws No. 08 of 2008 as subsequently amended in 2009 (hereinafter referred to as the 2009 By-Laws) may continue their programme under and subject to those provisions until December 2020.

(2) Subject to Sub-Section (1) above, the 2009 By-Laws are hereby repealed.

18. (1) The candidates who have been registered under the 2009 By-Laws and who have not successfully completed the requirements for the award of the degree of Master of Computer Science under those provisions (the 2009 programme) may within a period of 12 months from these By-Laws come into effect apply to the University that they be considered for transfer of registration for the programme under the present By Laws.

Provided the Senate shall have the right either to decline such request or to permit such request subject to such conditions as it may deem necessary to impose on the recommendation of the Academic Syndicate and Board of Study.

(2) The Senate, on the recommendation of the Academic Syndicate and Board of Study may consider extending an exemption from following a Course and taking the examination of the Course subject to such conditions as it may deem fit and proper. This decision shall be made by the Senate on a case by case basis and its decision shall be final.

(3) The Senate retains the discretion to deny any request made under sub section (1) of this section if it thinks that granting such facility will be prejudicial to the interests of any stake holders.

PART VII – REMOVAL OF DIFFICULTIES

19. The Vice Chancellor of the University shall have the authority, in consultation with the Director of the University of Colombo School of Computing, to take such actions or give such directions not inconsistent with the spirit and principles underlying the provisions of these By-Laws as appears to him/her to be necessary or expedient for the purpose of removing any difficulties that may arise in the interpretation of the provisions or for which there is no provision in these By-Laws or in the case of students who had followed or have been following the Masters Degree Programme under the earlier arrangements.

PART VIII - INTERPRETATION

20. In these By-Laws, unless the context requires otherwise:

"The Act" means the Universities Act No. 16 of 1978 as amended subsequently;

"Council" means the Council of the University of Colombo;

"Director" means the Director, Deputy Director or any other Officer authorized to sign for and on behalf of the Director of the University of Colombo School of Computing;

"Prescribed" means prescribed by the University/School as the case may be either by these By-Laws, or Regulations or Rules or by decisions made by these authorities;

"Registrar" means the Registrar, Acting Registrar, Deputy Registrar, Senior Assistant Registrar, Assistant Registrar or any other Officer authorized to sign for and on behalf of the Registrar of the University of Colombo School of Computing;

"School" means the University of Colombo School of Computing established by Order made under Section 24A read with Section 18 of the Act;

"Senate" means the Senate of the University of Colombo;

"University" means the University of Colombo.

21. Any question regarding the interpretation of these By-Laws shall be referred to the Council whose decision thereon shall be final.

UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF MASTER OF COMPUTER SCIENCE/ MASTER OF SCIENCE IN COMPUTER SCIENCE

REGULATIONS

of the

Degree of Master of Computer Science/Master of Science in Computer Science

Regulations made by the Senate of the University of Colombo under Section 136 of the Universities Act No.16 of 1978 as subsequently amended and read with Section 13 of the University of Colombo School of Computing Ordinance No. 1 of 2002 as subsequently amended.

Regulations

1. (1) These Regulations may be cited as the Degree of Master of Computer Science and Master of Science in Computer Science Regulations No ...of 2018.

(2) These Regulations shall be deemed to have come into operation with effect from January 2017 and shall be read in conjunction with the Degree of Master of Computer Science and Master of Science in Computer Science By-Laws No. 9 of 2018.

(3) These Regulations shall govern the Degree of Master of Computer Science (hereinafter sometimes referred to as "the Masters Degree") and the Degree of Master of Science in Computer Science (hereinafter sometimes referred to as "the Master of Science Degree").

PART I – ACADEMIC PROGRAMME

2. (1) There shall be assigned, to each Course offered in the Programme leading to the Degree of Master of Computer Science/Master of Science in Computer Science, a

Course Code, Title (Name), Level & Semester, Number of Credits [or Credit Value] and whether it is Compulsory or Optional Academic Course.

(2) The Schedule to these Regulations shall provide the details mentioned in sub-section (1) of this section and also a brief syllabus of each Course.

3. (1) Each Credit Value shall correspond to different quantum of hours depending on the type of learning activities, the guidelines of which are as specified in Table I below:

Table 1. Guidelines for Volume of Learning

Course Description	Credit Value	Direct Staff-Student Contact Hours	Notional Hours (direct staff-student contact hours and independent learning)
Lecture Course	1	15	50
Laboratory Course	1	30	50
Individual Project	5	Variable	500
Individual Research Thesis	15	Variable	1500

(2) The minimum number of Credits per Course is one.

(3) One Credit shall be considered equivalent to 50 Notional Learning Hours for a Lecture (Taught) Course and Laboratory Course. In the case of Individual Project and/ or Individual Research Thesis, a minimum of 100 notional hours is equivalent to one Credit.

4. The Senate shall, on the recommendation of the Academic Syndicate, have the power to make changes to the list of Courses, Course Codes, Course Titles (Name), Level & Semester, and Number of Credits (Credit Values) and whether Compulsory or Optional.

5. The detailed syllabus applicable to the Courses shall be prescribed by the School from time-to-time as approved by the Academic Syndicate.

PART II- ASSESSMENT & EXAMINATIONS

6. The procedure for continuous assessment, forms of evaluation in respect of each Course and the mode of their evaluation shall be decided by the relevant Board of Study and approved by the Academic Syndicate. The Academic Syndicate shall also have power, on the recommendation of the relevant Board of Study, to determine the structure and rubric of question papers on each Course when and where relevant.

7. Each Course including Individual Project (Dissertation)/ Individual Research (Thesis) shall be marked out of 100.

8. Each student may be required to submit assignments within a prescribed period as part of continuous assessments of such Courses.

Individual Project / Individual Research Thesis

9. (1) Every student of the Masters Degree Programme shall undertake an Individual Project and submit a Dissertation in the Fourth Semester of the Masters Degree Programme. Every student of the Master of Science Degree Programme shall undertake Individual Research and submit a Thesis in the Fifth Semester of the Programme.

(2) Each student shall submit, a Project Proposal in the format, according to the guidelines and within the period nominated by the Board of Study, for the approval of the School.

(3) Each student shall commence work on the Project/ Research once it is accepted by the School. The School shall nominate a Supervisor for each student.

(4) Throughout the whole Project/ Thesis, the student shall seek advice, comments and guidance from his/her Supervisor on the nature of the Project/ Thesis and standard expected. Students shall maintain a notebook to record the meetings with their supervisors.

(5) Progress of the work of the Project/ Thesis shall be evaluated based on progress reports and/or any other reports and/or presentations as prescribed by the School.

(6) Each Masters Degree student shall submit a Dissertation, at the end of the Fourth Semester adhering to the format as prescribed by the Board of Study. The Dissertation shall, at minimum, demonstrate the student's knowledge of methods of study, his/her competence to present material systematically, translate theoretical

knowledge into practical applications by designing, implementing and providing solutions to real world problems and his/her ability to evaluate and analyze as well as demonstrate innovative and creative applications

(7) Each Master of Science Degree student shall submit a Thesis, at the end of the Fifth Semester adhering to the format as prescribed by the Board of Study. The Thesis shall, at minimum, demonstrate the student's knowledge and application of research methods in Computing, his/her competence to present material systematically, and evaluate and synthesize research contributions and to critically apply theoretical knowledge into practical applications as well as his/her ability to foresee futuristic developments in the selected field and present innovative and creative Thesis.

(8) It shall be the responsibility of each student to contact and be in touch with his/her nominated Supervisor regularly for discussion and guidance. Failure to do so may lead to the Dissertation/Thesis not being accepted for evaluation if the Supervisor refuses to give his/her approval for the final defense.

(9) The evaluation of the Dissertation/Thesis, as the case may be, brought out in pursuance of the Project/ Research may involve a presentation and/or an oral examination.

(10) A student who did not make the presentation and/or participate at the oral examination of the Dissertation/Thesis on the first occasion shall submit a request for a reschedule giving valid reasons supported by acceptable evidence to the School within seven (7) working days from the scheduled date of the examination. The School shall have the power to consider favorably such requests on a case-by-case basis.

(11) A student who is unable to defend his/her Dissertation/Thesis to the satisfaction of the Board of Examiners shall receive a Grade of 'NC' (not complete) for the Individual Project (Dissertation)/Individual Research (Thesis). Such student shall not be permitted to resubmit the Dissertation/Thesis and/or re-defend his/her Dissertation/Thesis unless the relevant examiners recommend that a modified Dissertation/Thesis be submitted and/or another Oral Examination is required.

(12) Such a modified Dissertation/Thesis and/or an Oral Examination, if undertaken, shall be at the expense of the student the fees of which shall be specified by the Council on the recommendation of the School. A student who is unable to submit the modified Dissertation/Thesis and/or re-defend the Dissertation/Thesis within the prescribed

period shall be deemed to have failed to complete the Individual Project/Individual Research.

(13) Each student who passes the Individual Project/Individual Research is required to submit a hard-bound copy of the Dissertation/Thesis, as the case may be, after improving it based on the comments given by the Board of Examiners. Failure to do so may result in the Grade of the Individual Project/Individual Research being downgraded to 'NC'.

(14) Students shall adhere strictly to the Policy and Rules/Regulations of the University on plagiarism in undertaking the Project/Research. Unacceptable acts of plagiarism include, but not restricted to, such actions as taking the work of others and passing them off as their own work; providing neither proper references to the original sources nor quotation marks; making use of their own work submitted already for another academic programme; getting someone else to writing the Dissertation/Thesis but claiming such work as their own work; etc.

(15) When the act of plagiarism by any candidate is proven, he/she shall be subjected to punishment on the recommendation of the Examinations Committee. The punishment may include the impugned Dissertation/Thesis being rejected and the Student registration with the University being cancelled with or without a debarment of future registrations. There will be penalties for such dishonest actions on the recommendation of the Examinations Committee.

10. (1) A student shall be deemed to have passed the Oral Examination for the Individual Project in Computer Science if he/she satisfies the Board of Examiners of the criteria/requirements specified in Sub-Section (6) of Section 9 of these Regulations and other requirements prescribed by the relevant By-Laws and/or those prescribed by these Regulations.

(2) A student shall be deemed to have passed the Oral Examination for the Individual Research in Computer Science if he/she satisfies the Board of Examiners of the criteria/requirements specified in Sub-Section (7) of Section 9 of these Regulations and other requirements prescribed by the relevant By-Laws and/or those prescribed by these Regulations.

PART III – ELIGIBILITY FOR PROGRESSION

11. (1) The rules of progression within the Masters Degree Programme shall be as follows;

a) A Student who has obtained minimum of 2.00 GPA for all the courses at the First and Second Semester shall proceed to the Third and Fourth Semester Courses.

b) A student who has obtained a GPV of not less than 2.00 for Courses which add up or exceed 12 Credits in the First and/or Second Semesters may proceed to the Third and Fourth Semester Courses.

(2) A Student who has obtained minimum of 2.50 GPA for all the courses with GPV of not less than 2.00 for minimum of courses adding up to 15 credits at the First and Second Semester shall proceed to the Third, Fourth and Fifth Semester Courses of the Master of Science Degree Programme.

PART IV - POSTGRADUATE DIPLOMA / POSTGRADUATE CERTIFICATE

12. (1) A student who has secured a GPV of not less than 2.00 for the Courses which add up or exceed 25 Credits may be awarded the Postgraduate Diploma in Computer Science, provided he/she satisfies other conditions for the award of such Diploma as laid down in these Regulations or the relevant By-Laws.

(2) A student who has secured a GPV of not less than 2.00 for the Courses which add up or exceed 20 Credits may be awarded the Postgraduate Certificate in Computer Science, provided he/she satisfies other conditions for the award of such Certificate as laid down in these Regulations or the relevant By-Laws.

(3) A student can opt to obtain the Postgraduate Diploma in Computer Science after obtaining a minimum of 25 Credits or the Postgraduate Certificate in Computer Science after obtaining a minimum of 20 Credits.

13. (1) A student shall satisfy the following conditions if he/she wishes to be awarded the Postgraduate Diploma in Computer Science -

( ) he/she has obtained a GPV of not less than 2.00 for Courses which add up or exceed 25 credits;

( ) he/she has obtained a minimum of 2.00 of GPA;

( ) he/she has not qualified to be awarded the Masters Degree in Computer Science/Master of Science in Computer Science Degree; and,

( ) he/she has made a written request for the award of the Diploma.

(2) A student shall satisfy the following conditions if he/she wishes to be awarded the Postgraduate Certificate in Computer Science-

i) he/she has obtained a GPV of not less than 2.00 for Courses which add up or exceed 20 credits;

ii) he/she has obtained a minimum of 2.00 of GPA;

iii) he/she has not qualified to be awarded the Masters Degree in Computer Science/Master of Science in Computer Science Degree and/or the Postgraduate Diploma in Computer Science; and,

iv) he/she has made a written request for the award of the Certificate.

THE SCHEDULE

Master of Computer Science/Master of Science in Computer Science

A. The Course Codes, Titles, Credits and their Standing in each Semester are as follows:

First Semester Courses

Code	Title	Credits	Standing [Compulsory / Optional]
MCS1201	Advanced Algorithms	03	**C**
MCS1202	Advanced Software Engineering	03	**C**
MCS1203	Advanced Database Systems	03	**C**
MCS1204	Selected Topics in Computer Science	02	**C**
MCS1205	Principles of Programming Language	03	**C**

Second Semester Courses

Code	Title	Credits	Standing [Compulsory / Optional]
MCS2201	Information Systems Security	03	C
MCS2202	Advanced Concepts in Data Communications Networks	03	C
MCS2203	Data Analytics and Machine Learning	03	C
MCS2204	Theoretical Computing	02	C

Third Semester Courses

Code	Title	Credits	Standing [Compulsory / Optional]
MCS3201	Intelligent Systems	03	C
MCS3202	Systems Modelling & Simulation	03	C
MCS3204*	Individual Project	05	C
MCS3205	Distributed Systems	03	O
MCS3206	Advanced Computer Graphics and Gaming	03	O
MCS3207	Bioinformatics	02	O
MCS3208***	Research Methods	02	C/O
MCS3203**	Individual Research	15	C

* This applies to the Masters Degree Programme only.

** This applies to the Master of Science Degree Programme only

*** MCS 3208 shall be compulsory for Master of Science Degree Programme

Fourth Semester Courses

Code	Title	Credits	Standing [Compulsory / Optional]
MCS4201	Cognitive Systems	02	C
MCS4202	Embedded Systems	02	C
MCS4203	Image Processing and Vision	02	O

MCS4204	Software Project Management and Quality Assurance	03	**O**
MCS4205	Natural Algorithms	02	**O**
MCS4206	Mobile Computing	03	**O**
MCS4207	Enterprise Web Architecture	02	**O**

B. Brief description of the syllabus of each Course is as follows:

MCS1201: Advanced Algorithms	Asymptotic Analysis of Algorithms: Time Complexity, Order of growth, Tractable and Intractable Problems, Solving Recurrences; String Matching Algorithms: Naïve String Matching, Boyer-Moore String Matching, KMP Algorithms, Rabin-Karp Algorithm; Dynamic Programming and Greedy Strategy, Graph Algorithms: Shortest Path Algorithms, Minimum Vertex Cover Problems, Minimum Spanning Trees; Randomized Algorithms: Monte Carlo Algorithms, Las Vegas Algorithms.
MCS1202: Advanced Software Engineering	Challenges in Software Engineering, Evolution of Software Development Models, Software Requirement Engineering and Management, Industry Practices in Unified Process Models, Object-Oriented Modelling & Frameworks, Software Architecture and Refactoring, Design Patterns and Application, Software Reuse and Component-based Software Engineering, Code Quality and Code Summarization, Empirical Software Engineering, Open Source Software Engineering, Social Software Engineering, Agile Practices and Culture, Code Analyzer, Code Clone Analyzer, Static and Dynamic Code Analyzer, Emerging Trends.
MCS1203: Advanced Database Systems	Database Integrity, Transaction Management and Recovery, Concurrency, Distributed Databases, Query Processing and Optimistic Databases, Emerging Technologies: Data Warehousing, XML and Internet Databases, Object-Relational Databases, Emerging Trends
MCS1204: Selected Topics in Computer Science	Logic, Information Theory Concepts, Zero-Knowledge Interactive Proofs, Game Theory, Social Network Dynamics, Concurrent Process Algebras, Quantum Computing, Geometric Computation, Image Security, Biological Computing, Combinatory, Secure Software Development, Adaptive Gaming, Cryptocurrency, Dark Web, Emerging Trends
MCS1205: Principles of Programming Languages	Introduction, Evaluation Criteria for Languages, Language Implementation Methods, Syntax and Semantics, Lexical and Syntax Analysis, Data Types, Names, Bindings, Type Checking and Scope, Language Expressions and Assignments, Control Statements, Subprograms, Object Orientation Support in Languages, Exceptions and Event Handling, Introduction to Lambda Calculus, Functional Programming Language Fundamentals, Emerging Trends

MCS2201: Information Systems Security	Introduction to Information Security & Cryptography, Hash Algorithms, Secret Key (Symmetric) Encryption Systems, Properties of Arithmetic Operations, Public Key (Asymmetric key) Encryption Systems, Key Management Protocols, Java Cryptography, Network Security, Web Security, Secure Electronic Mail, Operating Systems Security, Database Security, Program Security, Legal Issues, Emerging Trends.
MCS2202: Advanced Concepts in Data Communications Networks	Introduction, Channel Characterization, TCP/IP Stack, IP Addressing, IP Support Protocols; Multi-access Protocols: Static and Dynamic Channel Allocation, CSMA, CSMA/CA, CSMA/CD, FDMA and TDMA; Routing: IPv6, OSPF, RIP, BGP, MPLS, Multicast (DVMRP, etc.), key based (DHT); End to End Issues: TCP and Congestion Control and QoS; Data Centre Design and Virtualization, SDN Concepts; CDMA, MANETS, IoT, Vehicular Ad Hoc Nets; Network Simulation (NS, Mininet), Emerging Trends.
MCS2203: Data Analytics and Machine Learning	Data Mining: Introduction to Data Mining, Knowledge Extraction Process, Data Pre-processing, Frequent Itemsets Mining, Association Rule Mining, Classification and Cluster Analysis, BI Tools and Application, Overview of Big Data Analytics; Data Warehousing: Introduction to Data Warehouse, Data Warehouse Architecture, Multidimensional Data Model, Concept Hierarchies, Attributes Generalization and Relevance, Online Analytical Process, Business Intelligence (Tools and Visualization); Machine Learning: Supervised Learning, Unsupervised Learning, Ensemble methods, Overview of Deep learning, Natural Algorithm and Reinforcement Learning, Emerging Trends.
MCS2204: Theoretical Computing	Mathematical Preliminaries, Strings and Languages, Recursive Definition of Sets, Finite Specification of Languages, Regular Sets, Regular Expressions, Deterministic Finite State Automata (DFA), Nondeterministic Finite State Automata (NFA), Construction of Equivalent DFA of a Given NFA, Equivalence of DFA, NFA, and Regular Expressions, Closure Properties of Regular Languages, Myhill - Nerode Theorem as Characterization of Regular Languages, and States Minimization of DFA, Context-Free Grammars (CFG) and Languages Generated, Regular Grammar, and Equivalence of Regular Grammar and Finite State Automata, Ambiguity of CFG and Normal forms of CFG, Pushdown Automata (PDA) and its variations, Turing Machines, Generalized Versions of Turing Machines, Decidability and Recognizability, Decision Problems and the Church – Turing Thesis, Encoding of Turing Machines and the Halting Problem for Turing Machines, Universal Turing Machine, Reducibility, Rice's Theorem; Decidability of Membership, Emptiness, and Equivalence Problems of Languages.

MCS3201: Intelligent Systems	Philosophy of AI, Search (Heuristic/Adversarial/Informed/Uninformed Search), Knowledge Representation and Reasoning, CommonKADs, Planning, Learning, Introduction to NLP and Linguistics, Intelligent Agents, Semantic Web, Emerging Trends.
MCS3202: Systems	Deterministic Systems: Difference and Differential Equation and Their Numerical Solutions, Stochastic Systems: Probability Distributions, Random

Modelling & Simulation	Variables, Markov Chains, Monte Carlo Simulation, Discrete-Time vs. Discrete Event Simulation, Cellular Automata, and System Simulation Tool.
MCS3203: Individual Research	This course unit aims to enhance the capacity of candidates to advance their knowledge, investigative skills and other skills to explore new knowledge within the field of computer science which in turn form the basis for academic advancement and technological development. A candidate specializes an area within the field of computer science and hence, should demonstrate a critical awareness of current issues and recent developments within the area of specialization. This course requires a high level of theoretical engagement, critical analysis and evaluation with respect to the research work carry out. The major expectations of this course unit are: conduct a comprehensive research work in the field of computer science with a substantial research contribution; construct hypotheses in the area of specialization and test them in a scientific manner; conduct a relevant background study with a critical analysis of related scientific work and evaluate current research in the area of specialization to clearly demonstrate the awareness of the broader context of the problem; formalize arguments logically and, employ these arguments to make sound judgements and to conclude a research solution scientifically; conduct a critical evaluation of the research which clearly demonstrates the technical quality and research merit; by following proper academic writing standards, submit a dissertation and a research paper based on the research outcome which is evaluated and accepted; demonstrate the work at the oral examination.
MCS3204: Individual Project	The aim of this course unit is to enhance the intellectual capacity of candidates to advance their knowledge and investigative skills, and other abilities relevant to computer science, forming the basis for academic advancement and technological capacity. This includes the development of an innovative software application with a research component. The major expectations of this course unit are: conduct a relevant background study with a critical analysis of similar systems and applications to clearly demonstrate a comprehensive level of knowledge and understandability of the broader context of the problem; critically analyze data, make judgments to evaluate the system to clearly demonstrate the technical quality and innovativeness; demonstrate the findings in a dissertation which will be evaluated and accepted; demonstrate the work at the oral examination.
MCS3205: Distributed Systems	Fundamental Concepts: Objectives, Evolution, Abstractions, Overview, Coordination, Agreement and Fault Tolerance: Leader Election, Consensus, BFT, Blockchain as Ledger Consensus, Atomic Commit, Time and Broadcast: Logical Clocks, Vector Clocks, Ordering and Reliability, RBCAST, URBCAST, ABCAST, Specialized Middleware: Cassandra, Zookeeper, Spanner, Streaming Pub/Sub, Parallel Computing: SIMD and MIMD architectures, Amdhal's Law, MPI, OpenMP, GPU Computing, Emerging Trends.
MCS3206: Advanced Computer	Graphics Rendering Pipeline, CUDA Programming, Graphics Primitives, Fundamentals of Transformations, Quaternions, Bezier Curves and NURBS, Texture Mapping, Rendering Techniques, Introduction to Physically based Modelling, Illumination Models, Introduction to Fundamentals of Game

Graphics and Gaming	Engines, Game Design Fundamentals, Collision Detection and Response, Game AI.
MCS3207: Bioinformatics	Introduction to Bioinformatics: Bioinformatics, Applications and Challenges, Types of Biological data – DNA, RNA, Amino Acid and Protein, Molecular Biology: Central Dogma, Archives and Information Retrieval, Genome Organization and Evolution, Sequence Alignment, Phylogeny: Phylogenetics Basics, Multiple Sequence Alignment, Gene Expression and Regulation, Structural Bioinformatics and Drug Discovery, Systems Biology: Metabolic Pathways, Dynamics of Metabolic Pathways.
MCS3208: Research Methods	Science, Scientific Method, and Research; Research Philosophies, e.g. Positivism, Subjectivism, Interpretivism, Pragmatism, Critical Realism; Approaches to Theory Development: Induction, Deduction, Abduction; Types of Research and Selecting/Defining a Research Problem, Defining Research Aims, Questions and Objectives; Conducting a Literature Review, Referencing & Referencing Styles, Research Onion; Research Strategies: Experiments, Case Studies, Action Research, Survey, Ethnography; Method Choices; Time Horizons; Credibility of Findings; Research Ethics and Integrity; Publishing.

MCS4201: Cognitive Systems	Introduction to Affective, Behavioral, and Cognitive (ABC) Systems; ACT-R Cognitive Architecture: Introduction to Production Systems, ACT-R Theory, ACT-R Programming Environment and Lisp, Selected Examples; Dynamic Field Theory (DFT): Foundations of DFT, Selected Examples; Cognitive Robotics: Biological Foundations and Emergent Behaviors, Representative Architectures and Behavioral Programming, Embodied Robotics; Affective Computing: Emotion and Psychophysiological Signals, Emotion Sensing and Recognition, Emotion Modeling; Brain-Computer Interface (BCI): Signal Acquisition and Processing, Applications, Emerging Trends.
MCS4202: Embedded Systems	Introduction to Embedded Systems, HDLs and FPGA Design Flow, PIC MCU Programming in Assembly/C, Arduino Programming, Embedded Communication Protocols; Digital Signal Processing (DSP): Introduction to DSP, DSP Filters and Analysis, DSP Controllers and Applications in Embedded Systems; Wireless Sensor Networks (WSN): Introduction to WSN, WSN MAC Layer, WSN Routing Protocols, WSN Operating Systems, WSN Localization; Special Topics: Embedded Systems Modeling, Embedded Systems Verification and Human Factors, Emerging Trends.
MCS4203: Image Processing and Vision	Image Characterization: Introduction to Image Processing and Computer Vision, Digital Image Representation, Color Theory; Spatial Domain Image Processing: Transformation and Histogram based Techniques, Filter based Techniques; Frequency Domain Image Processing: Frequency Domain Techniques; Special Topics in Image Processing: Image Restoration, Edge and Line Detection; Computer Vision: Image Segmentation, 3D reconstruction, Recognition, Computational Photography.
MCS4204: Software Project	Introduction, Integration Management, Scope Management, Time Management, Cost Management, Quality Management, Communications

Management and Quality Assurance	Management, Human Resource Management, Procurement Management, Risk Management, Financial Calculations for Project Appraisals, Software Quality Assurance.
MCS4205: Natural Algorithms	Introduction; Sorting, Shortest Path, Travelling Salesman Problem; Evolutionary Computing: Genetic Algorithms (GA), Genetic Programming (GP), Genetic Based Machine Learning (GBML); Swarm Intelligence: Particle Swarm Optimization (PSO); Foraging Algorithms: Ant Colony Optimization (ACO), Bees Algorithm (BA), Cockroach Algorithm (CA); Artificial Immune Systems (AIS), Emerging Trends.
MCS4206: Mobile Computing	Introduction, Operating Systems for Wireless Mobile Devices, Mobile Development Environment (Android), Anatomy of an Mobile App and the App Lifecycle, Mobile Development, Applications Development for Mobile Devices with Android Studio, Android User Interface, Android Intents & Android Persistence, Android WebView and Web Services, 2D Graphics, Location-based Apps, Sensing and Sensors, Hybrid Mobile App Development (Ionic), Native Mobile App Development (React Native), Mobile Testing, Mobile Security (Bouncy Castle, Spongycastle), Emerging Trends.
MCS4207: Enterprise Web Architecture	Introduction to Enterprise Web Architecture, Scale-Free Networks, Hubs, TCP/IP, HTTP, Request-Response Model, Client-Server model, Peer-to-Peer Computing, Service Oriented Architecture (SOA), XML, SOAP, Web Services, Design Patterns, Web Application Architectures, Web Application Architectural Patterns, Enterprise Integration, Enterprise Application Integration (EAI) Models, Enterprise Integration Patterns, Data/Information Architecture, Data Integration, Migrating Legacy Systems to the Web-Based Model, Software Engineering Methodologies for Enterprise Web Applications, Emerging Technologies in Web Application Architecture.