

UNIVERSITY OF MUMBAI
No.UG/470 of 2009

CIRCULAR:-

The Head, University Department of Computer Science, the Directors/Heads, recognized Science Institutions concerned, the Principals of the affiliated Colleges in Science and the Professor-cum-Director, Institute of Distance and Open Learning are hereby informed that the recommendation made by the Ad-hoc Board of Studies in Computer Science at its meeting held on 17th April, 2009 has been accepted by the Academic Council at its meeting held on 21st April, 2009 vide item No.4.58 and subsequently approved by the Management Council at its meeting held on 21st August, 2009 vide item No.17 and that, in accordance therewith, the Five Year Integrated M.Sc. Degree Course in Computer Science has been introduced by the University from the academic year 2009-2010.

Further that in exercise of the powers conferred upon the Management Council under Section 54(1) and 55(1) of the Maharashtra Universities Act, 1994, it has made **Ordinances 5854 and 5855 and Regulations 8005, 8006, 8007, 8008, 8009 and 8010** including the Structure of the Five Year M.Sc. degree course, containing the examination pattern and fee structure is as per Appendix and that the same has been brought into force with effect from the academic year 2009-2010.

MUMBAI-400 032
12th December, 2009

PRIN. K. VENKATARAMANI
REGISTRAR

To,

The Head, University Department of Computer Science, the Directors/Heads, recognized Science Institutions concerned, the Principals of the affiliated Colleges in Science and the Professor-cum-Director, Institute of Distance and Open Learning.

A.C./4.58/21.04.2009
M.C./17/21.08.2009

No.UG/470-A of 2009, MUMBAI-400 032

12th December, 2009

Copy forwarded with compliments for information to :

- 1) The Dean, Faculty of Science,
- 2) The Chairperson, Ad-hoc Board of Studies in B.Sc. & M.Sc.
Computer Science,
- 3) The Controller of Examinations,
- 4) The Co-ordinator, University Computerization Center



21.4.2009

UNIVERSITY OF MUMBAI



Ordinances and Regulations,
Including Fee Structure
of

Five Years Integrated
M.Sc. degree Course
in
Computer Science

(Introduced from the academic year 2009-2010)

UNIVERSITY OF MUMBAI

ORDINANCES AND REGULATIONS INCLUDING THE STRUCTURE OF THE

5-YEAR INTEGRATED MSC DEGREE COURSE IN COMPUTER SCIENCE

0.5854

Title: The degree shall be titled as 5-YEAR INTEGRATED MSC DEGREE COURSE IN COMPUTER SCIENCE

0.5855

Eligibility: A candidate for being eligible to take admission to the 5-YEAR INTEGRATED MSC DEGREE COURSE IN COMPUTER SCIENCE must have passed standard XII (10+2 schooling examination or 10+3 Diploma in technical education) from any recognized board in India (or equivalent) with 60% marks for General category and 55% marks for Reserved category in aggregate or equivalent grade. Admissions to the foreign students are subject to the eligibility of the entrance test or its equivalence.

R-8005

Admission procedure: Students seeking admission to 5-YEAR INTEGRATED MSC DEGREE COURSE IN COMPUTER SCIENCE will have to first appear for a National Level Entrance Test as prescribed by the University of Mumbai and the subsequent interview for the final selection of the shortlisted candidates. Students will be selected for admission strictly on the basis of the entrance score and the performance in the interview.

R-8006

Break-up of Fee Structure (will be submitted later)

R-8007

Term: 1st term: 1st August to 30th November
2nd term: 1st January to 30th April
Summer Project: May to July

R-8008

Duration: The course shall be a full time course. The course shall be covered in Five years in Ten semesters.

R-8009

Number of students: A batch shall normally consist of 40 students.

R-8010

Conduct of the course, scheme of examination and awarding grades:

For all practical purposes, there will be a Course Coordinating Committee (CCC) that would be responsible for the academics and routine administration of the course.

Definition of Course Coordinating Committee: Head of the Department would nominate a teacher in the Department as a course coordinator. All the teachers of the course constitute the CCC. Head is ex-officio member of the committee.

- **Type of grading:** Students will be awarded letter grades (A, B, C, D, E and F) in each subject and not the numerical marks.
- **Meaning of grades:** There will be four passing grades, namely, A, B, C and D
Grade E means performance of student in the subject is not satisfactory enough to award any grade points. For the improvement of E grade, the student has to either appear for re-examination or has to repeat the entire subject with any of the subsequent batches (or during the vacations subject to the availability of the instructor). For re-examination, the student has to apply to the course-coordinator within 15 days of declaration of the semester result and the course-coordinator will schedule a reexamination within 2 months of declaration of the semester results.
Grade F means that the performance of the student in the subject has been poor and for the improvement, the student has to repeat the entire course with any of the subsequent batches (or during the vacations subject to the availability of the instructor).

Student can opt for maximum one subject besides the prescribed ones for the semester. Grades for such audit courses will be denoted by superscript # in the score card.

- **Grade Point Average (GPA):** For the purpose of GPA, points for each subject are deemed to be out of 10. Grade points for the grades O, A, B, C and D are taken as 10, 9, 7, 6 and 4 respectively. GPA is computed by taking the number of credits (c_i) for each subject as weights to the student's score (p_i) in the subject. i.e., $GPA = \frac{\sum (c_i * p_i)}{\sum c_i}$. Grades E and F correspond to Zero grade points and are included in the computation of GPA. Grades with superscript # are not included in the GPA.
- **Declaration of Scores:** Each student will be notified his / her GPA for the just completed semester (SGPA) and cumulative GPA of all the semesters till the date (CGPA). The result of re-examination or repeat subject will not be included in any SGPA but will be included in the CGPA.
- **Admission to the next semester:** If any student has three or more E or F in a semester or accumulated a total of five E or F grades that have not been cleared till the point or if the CGPA of the student drops below 4.0, he /she will not be allowed to progress to the next semester. The subsequent semester(s) will be deemed dormant during which the student will have to clear the backlog for the progression to the subsequent academic semester.
- **Grading individual subjects:** Evaluation of individual subject will involve two components: (1) continuous evaluation that would consist of the student's performance in announced and unannounced class tests, quizzes, home assignments, class work, projects, practice and reporting etc. and is left to the discretion of the subject instructor(s), (2) semester-end examination.

Normally the weights for the continuous evaluation and semester-end examinations will be 70 and 30% respectively.

Any deviation from the scheme will be acceptable only with the approval of the course coordinating committee.

At the end of each semester, the instructors may submit the numeric scores along with the recommended grades for the students of their subjects to the course coordinator.

Transformation of numeric score to grade will follow general guideline stated in the computation of GPA. Any student securing at least 40% of absolute numerical marks should not be awarded grade E or F.

On recommendation of the course instructor, Course coordinating committee may consider awarding special grade O for outstanding performance in any subject. The grade O cannot be awarded as a routine for good performance but reserved for only distinguished cases.

These guidelines are to be implemented flexibly. The Course coordinating committee is authorized to make value judgment of the mark distribution and permit some deviation from the instructor recommended scores / grades.

- **Award of Degree:** Student may be deemed fit for an award of the degree after completion of 100% of credits from the prescribed syllabus of the all 5 years. Certificate of degree will mention the CGPA.
- **Reevaluation:** If any student wishes for a reconsideration of a grade awarded in any particular course, he /she can appeal to the Course coordinator within fifteen days of declaration of grades. Course coordinator, in consultation with the CCC may implement the re-assessment of the grades awarded. Decision reached by the CCC, after re-assessment will be final.
- Department reserves right to refuse further extension to any student, if he/she fails to complete the course within 7 years from start. The Course coordinator, in consultation with the CCC, reserves the right to recommend discontinuation of enrollment of any student at any time during the course, if his / her motivation level was found to be less than satisfactory.

Future scope: We wish to develop a role model of a global standard computer science education in Indian Universities. Employing "Remote teacher" model, team teaching and developing the quality resources as a part of the evolution of the course are some of the objectives.

Having studied various models that have been employed worldwide, and taken note of the views of international professional societies (ACM and IEEE) in computer science, we propose that this course would run as an experimental set up. Assuming the availability of quality resources, including personnel and academic flexibility for the implementation of the course, one expected evolution and outcome of this model is as follows.

At the end of third year, we would have semi-structured courseware in our hands. Our efforts would be towards producing the courseware in a finished form. One main aim would be: localization of the content available in the world-wide resource base. This would not in any way dilute of the quality of the content. Rather, enrichments in the available material by incorporating the actual teaching-learning experience are expected. This courseware should partly satisfy the needs of today's computer science teachers at large. Organization of teacher training programmes would complement this activity, to produce a number of teachers ready to teach the model syllabus. Generating exhaustive study material through continuous teacher-student interaction, and keeping it continuously updated with the involvement of the newly trained teachers in this programme, would be a major task.

Conclusion: The benefits of the proposal are many. The model is to provide quality education to Computer Science students, to train aspiring teachers and to save teachers from being the examination agencies. It promises rigor in implementation and enhanced quality of research and development.

5-YEAR INTEGRATED MSc IN COMPUTER SCIENCE

Structure of the Proposed degree programme at
Department of Computer Science, University of Mumbai

Preamble:

Objective: To produce academics and research scholars in computer science as well as technically competent persons for the software industry.

Background: Both academia and industry have been facing a scarcity of qualified and well-educated human resources in computer science. The demand for this quality of persons is increasing due to challenging problems of ever-increasing complexity faced by professionals in industry and research. The present 3+2 yr MSc (Computer Science) structure cannot meet this requirement as its objective is to educate a large number of students among affiliated colleges, who become ready to work in industry as programmers and testers (not analysts and designers). Only a very small proportion of MSc graduates pass the SET/NET exam needed to qualify as college lecturers.

At present our MSc (Computer Science) students are exposed to some of the diverse technologies in the field of information technology, with the result that their future is tied up largely with the technology tide and slack in the market. One way to overcome this situation is to train the students in the fundamentals of core computer science, with an emphasis on problem solving. We have to motivate the students to take up challenges in academia and contemporary industry and prepare them to work out the solutions. Such people will have a mindset to orient, modify, indeed define the technology and utilize it towards creating solutions that are appreciated by both industry and academia.

The 5-year integrated MSc (Computer Science) degree course (after 10+2) proposed here is an implementation model to meet our objective. In the first two years the focus will be on mathematics and the basic sciences, computing, and some humanities. The core of computing will emphasize computer science, to a slightly lesser extent software engineering and information technology, and basic ideas of analog and digital electronics. (Details are given in the semester-wise subject list.)

Our plan has taken many ideas from the varied undergraduate curricula proposed by ACM and IEEE-CS (international professional societies in computing and electronics) during the years 2001-06.

Admission: The admission to this course will be purely on the basis of competitive merit obtained in a nation-wide entrance test specifically for the proposed programme, conducted at say 10 centres (5 in Maharashtra and others across India). Students finishing HSC (or 10+2 equivalent) with minimum score of 60% (55% for reserved category candidate) will be eligible to appear for the entrance test. The test would be intended to evaluate students' abstraction and logical abilities, grasp of mathematics, and English communication (minimum satisfactory competence, since English is the medium of instruction for this course).

The proposed intake is 40 students, out of which about 30+ would complete their education in 5 years. Given the large sample of 10+2 students, we may assume that relatively good students can be selected, so the syllabus can be both realistic and rigorous.

Curriculum: subjects covered during the first three years:

The overall scheme of papers in this course shall typically take following form. Variations **will be** allowed as per the requirements of skill sets needed of UDCS graduates in any time period.

Curriculum: subjects covered during the first three years:

Semester – I	Semester – II
Programming - I (Functional and Imperative paradigms)	Programming – II (Science of Programming)
Maths - I (Logic)	Maths - III (Algebra)
Maths - II (Calculus and Numerical Methods)	Maths - IV (Analysis)
Electronics - I (Analog and Digital)	Electronics - II (Analog and Digital)
Physics - I (Classical theory of electromagnetism)	Physics - II (Semiconductors and Devices)
Elective ARE-I	Elective ARE-II
Semester III	Semester IV
Programming practices – I	Programming practices – II
Programming principles – I	Programming principles – II
Digital signal processing	Embedded systems
Computer organization	Operating systems
Maths - V	Maths - VI
Elective ARE-III	Elective ARE-IV
Semester V	Semester VI
Algorithms – I	Algorithms – II
Databases – I	Databases – II
Networking – I	Networking – II
Software engineering-I	Software engineering-II
Simulation	Artificial Intelligence
Elective ARE-V	Elective ARE-VI

Elective ARE I to VI are the Electives for the All Round Education (EAREs). A student has to select one out of the recommended set of EAREs for the semester. A set of EAREs available at the semester would be approved by the BOS in Comp. Sc. and would be brought to the notice of the students before the commencement of the respective semester.

A sample list of EAREs has been provided below.

- * English for communication
- * Linguistics
- * Technical writing
- * Biology
- * Commerce and accounting
- * Music / performing art
- * Mass communication
- * History of science & maths etc.

- * English literature
- * Indian / Foreign language
- * Chemistry
- * Geology
- * Economics
- * Environmental Science
- * Philosophy

Each subject will have 4 contact hours per week. In the case of first five subjects there will be 3 hours teaching-learning and 1 hour for the activities under continuous evaluation. Each of the subjects will carry 5 credits. For the sixth subject in each semester, there will be 2 hours teaching-learning and 2 hours for the activities under continuous evaluation. These subjects will carry 2 credits. Summer project would carry a separate credit of 2.

Second degree Master's course is intended to bring up the students for the rigorous research. A list of specializations would be updated and approved by the concerned BOS before commencing the semester VII. Out of the subjects listed in the specializations, a student of semester VII will have to select four subjects (that are complimentary to his area of research interest). Out of the four he/ she will have to select two for the further studies during the semester VIII and finally confirm one out of the two for the deeper studies during semester IX. Semester X is devoted to the implementation and publication of research project.

Each of the four subjects offered by the student in semester VII will be evaluated for 4 credits under one head of passing. Introduction to the domain and the detail study of domain specific data structures and algorithms would be the components of the syllabus. Each of the two subjects at semester VIII would be evaluated for 8 credits under two heads of passing (therefore 4 heads of passing each of credit 4). Semester VIII syllabus would include domain specific study of classical and modern trends – theory and practice – in the respective subjects. There will be 4 heads of passing of one subject in semester IX, each carries 4 credits. The objective of semester IX being the contemporary literature survey, the basis of the syllabus would be the state of art research for the discussions and critical analysis. The research project implementation and publication would be evaluated for 4 credits in the semester X.

There will be 4 contact hours (3 teaching-learning + 1 tutorials) per 4 credit course.

A sample list of specialization has been provided below.

1. Compiler Construction (internet language, ontological language etc.)
2. Computer Graphics and animations
3. Machine learning
4. Embedded applications
5. Bio-inspired computing
6. Distributed and mobile computing
7. Information management
8. Algorithmic
9. Chip fabrication—architecture and VLSI Design etc.
