M.Sc. Computer Science   Prospectus No. 20161216

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा
(FACULTY OF SCIENCE)

PROSPECTUS
OF
MASTER OF SCIENCE IN
COMPUTER SCIENCE
Semester -I & III , Winter 2015
Semester-II & IV, Summer-2016

2015

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I N D E X

M.Sc. (Computer Science) Prospectus No.20161216

SANT GADGE BABA AMRAVATI UNIVERSITY
SPECIAL NOTE FOR INFORMATION OF THE STUDENTS

(1) Notwithstanding anything to the contrary, it is notified for general information and guidance of all concerned that a person, who has passed the qualifying examination and is eligible for admission only to the corresponding next higher examination as an ex-student or an external candidate, shall be examined in accordance with the syllabus of such next higher examination in force at the time of such examination in such subjects papers or combination of papers in which students from University Departments or Colleges are to be examined by the University.

(2) Be it known to all the students desirous to take examination/s for which this prospectus has been prescribed should, if found necessary for any other information regarding examinations etc., refer the University Ordinance Booklet the various conditions/provisions pertaining to examination as prescribed in the following Ordinances.

Ordinance No. 1	:	Enrolment of Students.
Ordinance No. 2	:	Admission of Students
Ordinance No. 4	:	National cadet corps
Ordinance No. 6	:	Examinations in General (relevent extracts)
Ordinance No. 18/2001	:	An Ordinance to provide grace marks for passing in a Head of passing and Inprovement of Division (Higher Class) and getting Distinction in the subject and condonation of defficiency of marks in a subject in all the faculties prescribed by the Statute NO.18, Ordinance 2001.
Ordinance No. 9	:	Conduct of Examinations (relevent extracts)
Ordinance No. 10	:	Providing for Exemptions and Compartments
Ordinance No. 19	:	Admission of Candidates to Degrees.
Ordinance No. 109	:	Recording of a change of name of a University student in the records of the University.

Ordinance No.19/2001 : An Ordinance for Central Assessment Programme, Scheme of Evaluation and Moderation of answerbooks and preparation of results of the examinations, conducted by the University, Ordinance 2001.

Registrar
Sant Gadge Baba Amravati University.

PATTERN OF QUESTION PAPER ON THE UNIT SYSTEM.

The pattern of question paper as per unit system will be broadly based on the following pattern

(1) Syllabus has been divided into units equal to the number of question to be answered in the paper. On each unit there will be a question either a long answer type or a short answer type.

(2) Number of question will be in accordance with the unit prescribed in the syllabi for each paper i.e. there will be one question on each unit.

(3) For every question long answer type or short answer type there will be an alternative choice from the same unit. However, there will be no internal choice in a question.

(4) Division of marks between long answer and short answer type question will be in the ratio of 40 and 60

(5) Each short answer type question shall contain 4 to 8 short sub question with no internal choice.

%ORDINANCE NO. 4 of 2008

Examinations leading to the Degree of विज्ञान पारंगत (Master of Science)(Four Semesters Degree Course), Ordinance, 2008.

Whereas it is expedient to provide an Ordinance regarding Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semesters Degree Course), in the faculty of Science. The Management Council is hereby pleased to make the following Ordinance.

1. This Ordinance may be Called, "Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semesters Degree Course), Ordinance, 2008".

2. This Ordinance shall come into force w.e.f. the date of its approval by the Management Council.

3. The duration of the course shall be two academic years,
   (a) M.Sc. Course is divided into Semester-I, Semester-II, Semester-III & Semester-IV.
   (b) University shall hold examinations in Winter and in Summer every year for all semesters.
   (c) The main examination of odd semesters shall be held in Winter and the main examination of even semesters shall be held in Summer every year. The supplementary examination for odd semesters shall be held in Summer and the supplementary examination for even semesters shall be held in Winter every year.

4. The period of Academic Session/Term shall be such as may be notified by the University and the Examination shall be held at such places and on such dates as may be fixed by the Board of Examinations.

5. Subject to their compliance with the provisions of this Ordinance and of other Ordinances in force from time to time, the following persons shall be eligible for admission to the examinations, namely:-
   (A) For विज्ञान पारंगत भाग-१ प्रथम सत्र M.Sc.Part-I:-
   (a) A collegiate candidate admitted to the Degree of Bachelor of Science who has prosecuted a regular course of study in a college or a University Department.
   (b) a teacher admitted to the Degree of Bachelor of Science and eligible under Ordinance No. 18;
   (c) a woman candidate admitted to the Degree of Bachelor of Science, who has not pursued a course of study in the University or a College;

% As approved by Management Council on dated 30.5.2008, Vide Item No. 196, and latest amended vide Ordinance No. 14 of 2009 (M.C. dated 25.5.09)

Provided that, applicants eligible under clauses (b) and (c) above shall, if laboratory work is prescribed in the subject which they offer for examination, attend the full course of laboratory instruction in the University Department or a College or a recognised Institution imparting instruction upto the standard of the examination;

Provided further, that in the case of applicants under clauses(b) and (c) above, not less than one academic year shall have elapsed since the date of their passing the examination for the Degree of विज्ञान स्नातक (Bachelor of Science);

(d) Candidate who has passed B.Sc.Examination of Sant Gadge Baba Amravati University with Chemistry as one of the optional subjects and has also passed the Diploma of Associateship of Institution of Chemists (India) Calcutta and is working as Jr/Sr.Laboratory Asstt. in National Environmental Engineering Research Institute, Nagpur (NEERI) or Council of Scientific and Industrial Research (CSIR), Nagpur or Indian Bureau of Mines (IBM) will be eligible to appear at M.Sc.Semester-I in Chemistry only, without prosecuting a regular course of study in a College/Department in the University.

Provided he produces certificate of completion of practical course prescribed for M.Sc. Part-I (Semester-I & Semester-II) Examination in Chemistry from his employer.

(e) any other graduate in Science not eligible under clause (a) (b) or (c) above, shall be eligible for admission to the examination in Mathematics only, after a lapse of not less than one academic year since the date of his passing the examination for the Degree of विज्ञान स्नातक (Bachelor of Science):

(f) an applicant holding the भेषजी स्नातक (B.Pharm) or the विज्ञान स्नातक कृषी (B.Sc.Agri.) Degree shall be eligible for admission to the विज्ञान पारंगत (M.Sc.) Course in Biochemistry only;

(Note: The विज्ञान स्नातक (B.Sc.) Degree referred to in clause (a) above, shall include the विज्ञान स्नातक (B.Sc.) Degree of the University or an equivalent Degree of any other Statutory University)

(g) an applicant holding the B.Sc. (Ind.Chem.) Degree of the Banaras Hindu University;

(h) an applicant holding B.A./B.Sc. with Mathematics/ Statistics or Bachelor of Computer Science Degree for admission to M.Sc. Course in Statistics or Mathematics ;

(i) i) for admission to M.Sc. Microbiology a candidate shall have offered Microbiology or Industrial Microbiology or Biochemistry as a subject of study and examination at the B.Sc. degree.

    ii) for admission to M.Sc. Biochemistry a candidate shall have offered Microbiology or Industrial Microbiology or Biochemistry as a subject of study and examination at the B.Sc. degree.

    For admission to M.Sc.Biochemistry, in case of vacancies, a students offering Chemistry alongwith Biological Science shall be admitted.

(j) i) for admission to M.Sc. Electronics (Instrumentation) a candidate shall have offered Physics or Electronics (Instrumentation) or Electronics or Electronics Science or Computer Maintenance as subjects of study and examination at the B.Sc. level and B.C.S. degree of this University or any other equivalent Degree of Statutory University.

    ii) a person passing B.E. (Electronics & Telecommunication or Industrial Electronics) Examination of Sant Gadge Baba Amravati University is eligible to take admission direcltly at second year of M.Sc. Electronics (Instrumentation). Such a student who is admitted to second year of M.Sc. Electronics (Instrumentation) shall be awarded M.Sc. degree on the basis of his performance at M.Sc. Part-II only.

(k) for admission to (M.Sc.) Geography a candidate shall have offered Geography as a subject to study and examination at the B.Sc. Degree.

(l) for admission to (M.Sc.) Petrochemical Science, a candidate shall have offered Petrochemical Science subject to study and examination at the B.Sc. Degree.

(m) i) for admission to M.Sc. Part-I (Environmental Science) a candidate shall have offered one of the optional subject as Environmental Science or Botany or Zoology or Life Sciences or Microbiology or Biochemistry or Biotechnology at B.Sc. degree,

    ii) Sixty percent seats of the total intake shall be reserved for students who have passed B.Sc. with Environmental Science. If students having Environmental Science as an optional subject are not available then students having other optional subjects be considered.

(n) for admission to M.Sc. Geoinformatics or Remote Sensing and GIS, a candidate shall have passed B.Sc. in any discipline of Life Sciences. Preference shall be given to graduates having offered Geology at undergraduate level.

(o) for admission to M.Sc. Bioinformatics a candidate shall have passed B.Sc. in any discipline of Life Sciences, Bio Sciences or Bachelor Degree in Agriculture, Veternary and Fishery Sciences, Pharmacy, or Medical Sciences - Bachelor of Medicine and Bachelor of Surgery, Bachelor of Dental Surgery, B.A.M.S., B.H.M.S. or any equivalent examination recognised by Sant Gadge Baba Amravati University.

(B) For विज्ञान पारंगत भाग-२ (M.Sc. Part-II) Examination:-

 (a) a student who has been admitted to the Degree of विज्ञान स्नातक (Bachelor of Science) and who has since passing the M.Sc.Part-I (Semester-I & II) Examinations, prosecuted a regular course of study for not less than one academic year in the University or in the College in the subject in which he offers himself for the M.Sc.Part-II Examinations;

 (b) a teacher admitted to the Degree of विज्ञान स्नातक (Bachelor of Science) and eligible under Ordinance

No. 18 and who has not less than one academic year previously, passsed the M.Sc.Part-I Examination in the subject in which he offers himself for M.Sc.Part-II Examinations;

(c)   a woman candidate admitted for the Degree of विज्ञान स्नातक (Bachelor of Science) and who has not less than one academic year previously, passed the M.Sc. Part-I Examination in that subject in which she offers herself for the M.Sc. Part-II Examinations;

(d)   a candidate who has been admitted under Para 3 (A) (d) above and who has not less than one academic year previously, passed M.Sc. Part-I Examination in the subject Chemistry in which he offers himself for the M.Sc.Part-II Examination.

Provided he produces a certificate of completing of practical course prescribed for M.Sc. Part-II Examination in Chemistry from his empolyer;

(e)   any other Graduate in Science not eligilbe under clause (a) (b) or (c) who has not less than one academic year presiously, passed the M.Sc. Part-I (Semester-I & Semester-II) Examinations in the subject which he offers himself for the Part-II Examination;

6.   Subject to his / her compliance with the provisions of this Ordinance and other Ordinances (Pertaining to Examination in General) in force from time to time, the applicant for admission, at the end of the course of study of a perticular term shall be eligible to appear at it, if,

(i)   he / she satisfied the conditions in the table and the provisionsthereunder.

(ii)   he / she has prosecuted a regular course of study in the university / college affiliated to the university.

(iii)   he / she has in the opinion of the Head of the Department / Principal shown satisfactory progress in his / her study.

Name of Exam.	The student should have passed the Examination of satisfacotry	The student should have completed the session/semester
M.Sc.Part-I(Semester-I) examination	The qualifying mentioned in para 5	M.Sc.Part-I (Semester-I)
M.Sc.Part-I (Semester-II)		M.Sc.Part-I (Semester-I & II)
M.Sc.Part-II (Semester-III)	Semester-I	M.Sc.Part-II (Semester-III)
M.Sc.Part-II (Semester-IV)	Semester-I	M.Sc.Part-II (Semester-III & IV)

7.   Without prejudice to the provisions of Ordinance No.6 relating to the Examinations in General, the provisions of Paragraphs 8,10, and 31 of the said Ordinance shall apply to every collegiate candidate.

8.   The fee for each Semester Examination shall be as prescribed by the University time to time.

Provided that a non-collegiate candidate, other than an ex-student shall also pay a registration fee as prescribed by the University time to time.

9.   Every candidate for admission to the examination shall offer one of the following subjects for his examination, namely-

(1)   Mathematics,

(2)   Physics,

(3)   Chemistry,

(4)   Botany,

(5)   Zoology,

(6)   Geology,

(7)   Statistics,

(8)   Biochemistry,

(9)   Microbiology,

(10)   Electronics (Instrumentation),

(11)   Geography,

(12)   Geoinformatics,

(13)   Remote Sensing & GIS,

(14)   Environmental Science, and

(15)   Bioinformatics.

Provided firstly, that an examinee who has passed Part-II Examination in one of the subjects listed above from 1 to 15 and is desirous of appearing.

(a) in any other subject, or

(b) in a new paper or a combination of papers in the subject in which he has passed, may, without prosecuting a regular course of study present himself in any subsequent academic year for Part-I of the Examination in that other subject or that new paper or new combination of papers, and after not less than one academic year after passing the said Part-I Examination, for Part-II Examination in the said new paper or the said new combination of papers.

Provided secondly, that a candidate eligible for appearing at a examination under the first proviso shall, in the subject or a new paper or the new combination of papers which he is offering for the examination, attend the full course of practical Training, wherever such training is prescribed in the University Department or a College or a recognised Institution imparting instruction upon the standard of the Examination.

Provided thirdly, that an examination successful under clause (b) of the first proviso shall not be awarded division nor shall he be eligible for any scholarship, medal or prize of the University.

10. An examinee at the M.Sc.Part-I or the M.Sc. Part-II Examination shall have the option of not being declared successful at the examination in case he does not secure a minimum of Second Division marks /Higher Second Division marks fifty five percent marks (55%) at the Examination. The option will have to be exercised everytime an application is submitted to any of the three examinations and shall be on the proforma printed on the application form itself. Once exercised the option shall be binding upon the examinee, and shall not be revoked under any circumstances.

11. Any person who has obtained a Third Division at the M.Sc. Examination of this University shall be eligible to take the examination again under this Ordinance in the same subject or group of subjects as the case may be for improving his division. In such a case the provisions of Ordinance No.138 relating to Improvement of Division shall apply.

12. (1) The scope of the subject shall be as indicated in the syllabus.

(2) The medium of instruction and examination shall be English.

13. The number of papers and marks alloted to each subject and the minimum marks which an examinee must obtain in order to pass the examination shall be as indicated in Appendix-ÐAø

14. Examinees who are sucessful in the M.Sc. Semester-I, II, III & IV Examination and have obtained not less than 60% marks in the aggregate of the M.Sc. Semester-I, II, III & IV Examinations taken together shall be placed in the First Division, those obtained less than 60% but not less than 55% marks, in the Higher Second Division, those obtained less than 55% but not less than 48% marks, in the Second Division, and all other successful examinees, in the Third Division.

15. Provision of Ordinance No. 18 of 2001 relating to the an Ordinance to provide grace marks for passing in a Head of passing and improvement of division (higher class) and getting distinction in the subject and Condonation of Deficiency of Marks in a subject in all the faculty prescribed by the Statute No.18, Ordinance, 2001, shall apply to the examinations under this ordinance.

16. As soon as possible after the examination, but not later than 30th, June next following, the Management Council shall publish a list of successful examinees arranged in Three Divisions. The names of examinees passing the examination as a whole in the minimum prescribed period and obtaining the prescribed number of places in each subject in the First or Second Division, shall be arranged in Order of Merit as provided in the Examinations in General Ordinance No.6.

17. Save as provided in Paragraph 11 of this ordinance, no person shall be admitted to an examination under this ordinance, if he has already passed the same examination of this University or an equivalent examination in M.Sc. Part-I (Semester-I & II), and M.Sc. Part-II (Semester-III & IV) of any other Statutory Univerisity.

18. Examinees successful at the M.Sc. Part-I (Semester-I & II), and M.Sc. Part-II (Semester-III & IV) shall on payment of the prescribed fees, be entitled for the award of the respective Degree in the prescribed form, signed by the Vice-Chancellor.

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(Note : - " P.G. Workload in the faculty shall be as per Ordinance No. 131.")

APPENDIX-A
SCHEME OF EXAMINATION FOR M.Sc. PART-I & II.
(FOR ALL SUBJECTS)

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i) M.Sc. Part-I	Paper-I	-	50 Marks	Practical-I	-	40 Marks
Semester-I	Paper-II	-	50 Marks	Internal Assessment	-	10 Marks
	Paper-III	-	50 Marks	Practical-II	-	40 Marks
	Paper-IV	-	50 Marks	Internal Assessment	-	10 Marks
M.Sc. Part-I	Paper-V	-	50 Marks	Practical-III	-	40 Marks
Semester-II	Paper-VI	-	50 Marks	Internal Assessment	-	10 Marks
	Paper-VII	-	50 Marks	Practical-IV	-	40 Marks
	Paper-VIII	-	50 Marks	Internal Assessment	-	10 Marks
M.Sc. Part-II	Paper-IX	-	50 Marks	Practical-V	-	40 Marks
Semester-III	Paper-X	-	50 Marks	Internal Assessment	-	10 Marks
	Paper-XI	-	50 Marks	Practical-VI	-	40 Marks
	Paper-XII	-	50 Marks	Internal Assessment	-	10 Marks
M.Sc. Part-II	Paper-XIII	-	50 Marks	Practical-VII	-	40 Marks
Semester-IV	Paper-XIV	-	50 Marks	Internal Assessment	-	10 Marks
	Paper-XV	-	50 Marks	Project Work	-	40 Marks
	Paper-XVI	-	50 Marks	Internal Assessment	-	10 Marks

ii) For the subject Mathematics, there shall be five theory papers of sixty marks for each semester.

Notes:-(1)   Minimum pass marks for theory and practical examination including internal assessment shall be 36% separately.

(2) (a)   Topic of project work shall be given by concerned supervisor with prior approval of Head of Department.

There shall be no duplication of the topic of the project work. Project shall be based on research in the laboratory

and / or field work. Project work shall be allotted at the beginning of third semester and the student shall have to

submit it atleast 15 days before commencement of practical examination of the fourth semester. Project work will be

evaluated by external and internal examiners.

(b)   There should be atleast 2 to 3 external examiner for a batch of 10 students or 3 to 5 external examiner for a batch

more than 10 students.

(3)   There shall be seperate exemption in theory and / or practical on getting minimum pass marks.

(4)   Internal Assessment marks for all semesters shall be granted on the basis of - performance of students in any of the following activities:-

(i) Study tour, (ii) Seminar, (iii) field visits, (iv) Industrial visits, (v) visit to research institute / organisation.

(vi) Assignments, (vii) Unit test and any other co-curricular activities.

(5)   The concerned Department or College shall have to maintain the record of award of internal assessment marks.

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DIRECTION

No. : 14 / 2009   Date : 29.6.2009

Subject : Examinations leading to the Degree of विज्ञान पारंगत **(Master of Science) (Four Semester Degree Course), Direction, 2009.**

Whereas, Ordinance No.4 of 2008 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course) Ordinance, 2008 is in existance in the University.

AND

Whereas, the Board of Studies in Computer Science (including Computer Application and Computer Science (Computer Software)) in the faculty of Science in its meeting held on 5.6.2009 has resolved to accept revised syllabi of M.Sc. Semester-I to IV Computer Software, eligibility criteria and other details.

AND

Whereas, the Board of Studies further recommended that the scheme of examination will be applicable as per Ordinance No.4 of 2008 to M.Sc. Computer Software, as it is, and the revised syllabi shall be implemented from the academic session 2009-10 expeditiously in the light of advancement of knowledge in the subject.

AND

Whereas the Honoble Vice-Chancellor has accepted the revised syllabi of M.Sc. Computer Software, Eligibility criteria, Scheme of examinations and other details under section 14(7) of the Maharashtra Universities Act, 1994 on behalf of the faculty of Science and Academic Council.

AND

Whereas, Original Ordinance No.4 of 2008 is required to be amended for inclusion of the above said course.

AND

Whereas, the matter for the admission to student at the examination of above said course is required to be regulated by an Ordinance, and making amendments in Ordinance is time consuming process.

Now, therefore, I, Dr. Kamal Singh, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called "Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), Direction, 2009".

2. This direction shall come into force from the date of its issuance.

3. Eligibility criteria for admission to M.Sc. Computer Software shall be as given below.

   "A person who has passed the Degree of Bachelor of Science with Computer Science/Vocational Computer Application Subjects

   OR

   A person who has passed the Degree of Bachelor of Science with Post Graduate Diploma in Computer Science of this University

   OR

   An Examination Recognised as an equivalent of this University or of any other statutory University."

4. The Scheme of Examination for M.Sc. Computer Software shall be as per Ordinance No.4 of 2008 as other Science subjects, as it is.

Amravati   Sd/
                                       (Dr.Kamal Singh)
Date : 29/6/2009   Vice-Chancellor

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DIRECTION

No. : 26 / 2010   Date : 24/06/2010

Subject   :   Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science, Direction, 2010.

Whereas, University Grants Commission, New Delhi vide D.O.No.F-2/2008/(XI Plan), Dtd.31 Jan.2008 regarding new initiatives under the 11th Plan – Academic Reforms in the University has suggested for improving quality of higher education and to initiate the Academic Reform at the earliest.

AND

Whereas, the Academic Council while considering the above letter in its meeting held on 30.4.2008, vide item No.55 has resolved to refer the same to Dean's Committee, and the Dean's Committee in its meeting held on 19.07.2008 has decided to refer the matter to all Board of Studies.

AND

Whereas, the recommendations of various Board of Studies in the faculty of Science regarding Upgradation and Revision of various syllabi and introduction of choice based credit pattern Examination System at post graduate level was considered by the faculty of Science in its meeting held on 7.12.2009 and constituted a Committee of all Chairmen of Board of Studies and one member nominated by Chairmen of respective B.O.S. under the Chairmanship of Dean of faculty to decide the policy decision regarding choice based credit system examination pattern at P.G. level.

AND

Whereas, the faculty of Science in its emergent meeting held on 11th May, 2010 vide item No.27, has considered, accepted and recommended to Academic Council, the policy decision regarding introduction of Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science under ordinance No.4 of 2008. The recommendations of the faculty was approved by the Academic Council in its emergent meeting held on 28.5.2010, vide item No.36.

AND

Whereas, Ordinance No.4 of 2008 in respect of Examinations leading to the Degree of विज्ञान स्नातक (Bachelor of Science) is in existence in the University as per semester pattern examination system.

AND

Whereas, it is necessary to frame the Regulation regarding the Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science which is to be implemented from the Academic Session 2010-11 of M.Sc.Semester-I & onwards to all subjects in the faculty of Science and framing of Regulation for the above examination is likely to take some time.

AND

Whereas, the admission of students in the above pattern at M.Sc. Part-I (Semester-I) of all subjects in the faculty of Science are to be made in the Academic Session 2010-11.

Now, therefore, I, Dr. Kamal Singh, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called õScheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science, Direction, 2010.

2. This Direction shall come into force with effect from the examination as shown below for all subjects for the Examinations leading to the Degree of Master of Science in the faculty of Science-

   (i) Winter 2010 examination for M.Sc. Part-I, Semester-I,

   (ii) Summer-2011 examination for M.Sc. Part-I, Semester-II,

   (iii) Winter-2011 examination for M.Sc. Part-II, Semester-III,

   (iv) Summer-2012 examination for M.Sc. Part-II, Semester-IV.

3. The detailed Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate students in the Faculty of Science is as given below-

I. The CBCS System

All Programmes (named after the Core subject) mentioned in para 9 of Ordinance No.4 of 2008 shall be run on Choice Based Credit System (CBCS) and the grades in 7 point scale will be awarded to the students. It is an instructional package developed to suit the needs of students to keep pace with the developments in higher education and the quality assurance expected of it in the light of liberalization and globalization in higher education.

II. Credits and Degrees

i) A candidate who has successfully completed all the core courses Compulsory, Elective/ Specialised courses and project prescribed and optional approved by the University for the programme

and accumulated not less than 72 (52 core and elective) Credits and who has put in the minimum residence time shall be eligible to receive the degree.

ii) One Credit shall mean one teaching period per week for one semester (of 16 weeks) for theory courses and one laboratory session of two periods / week for one semester. One teaching period shall be of 60 minutes duration including 10 minutes for discussion / movement.

III. Courses

(i) **Core Course :-** A core course is a course that a student admitted to a particular programme must successfully complete to receive the degree. There may be two kinds of core courses: The **hard-core** courses which cannot be substituted by any other course and which must be successfully completed and **soft-core** courses which may be substituted by equivalent courses from the same department. In all P.G. programmes a project with 03 credits shall be included. The project may include a viva-voce examination with a credit of 1, Normally no theory course shall have more than 4 credits.

(ii) **Elective Course :** Means a optional course from the basic subject or specilization.

The core credits for any P.G. programme (inclusive of hard-core, soft-core and project) shall not exceed 60 credits and shall not be less than 48 credits. Each Board of Studies shall specify the core-credit load for their respective programme apart from approving syllabi,for all the courses offered by the department.

(iii) General Interest Course (GIC)

The General Interest Course shall be the choice of student. The student who choose the GIC shall have to register for it on payment of fees as prescribed by the University.

The Departmental Committee shall follow a selection procedure on a first come first served basis, fixing the maximum number of students, after counselling to the students etc. to avoid overcrowding to particular course(s) at the expense of some other courses.

(iv) Each **Course** is designed such that it includes lectures / tutorials / laboratory or field work / Seminar / Practical training / Assignments / Term paper / Report writing or review of literature and any other innovative practice etc., to meet effective teaching and learning needs.

(v) **Attendance :-** Students must have 75% of attendance in each Core and Elective course for appearing the examination. However student having attendance less than 75% may apply to the H.O.D. for condonation of attendance upto 15% under the provision of para 6-A (i) of Ordinance No.6.

IV. Registration for General Interest Course :-

i) Each student, on admission shall be assigned to a faculty advisor who shall advise the student about the academic programme and counsel him on the choice of courses listed in Appendix-Q depending on his general interest, academic background and objective.

ii) With the advice and consent of the faculty advisor the student shall register for courses he plans to take for the semester before classes start. No student shall be permitted to register for courses exceeding 30 credits per semester including those of repeat courses nor shall any student be permitted to register for any course without satisfactorily completing the prerequisites for the course except with the permission of the concerned teacher in the prescribed format.

iii) If the student feels he has registered for more courses than he can handle, he shall have the option of dropping one or more of the courses he has registered for, with the consent of his advisor before the end of 3rd week of the semester. However, a student, to retain his status, should have registered at least for core course and elective course of that semester.

iv) Students, other than those freshly admitted, shall register for the courses of their choice in the preceding semester by filling in the prescribed forms.

v) The University shall prescribe the maximum number of students in each General Interest Course taking into account the teachers and Physical facilities available in the Department.

vi) The University may make available to all students a listing of all the courses offered in every semester specifying the credits, the prerequisites, a brief description or list of topics the course intends to cover, the instructor who is giving the courses, the time and place of the classes for the course. This information shall be made available on the University website.

vii) Normally no course shall be offered unless a minimum of 10 students are registered.

viii) The student shall have to pay the prescribed fee per course for the registration.

V. Programme Committee :-

There shall be the programme committee at the University level constituted as under-

i) Dean of the faculty (Chairman)

ii) Heads of all the Departments – (Member)

iii) Three teachers from the affiliated colleges having post graduate courses other than University Department – nominated by the Vice-Chancellor. (Member)

iv) Deputy Registrar (Acad) – (Secretary)

Duties and responsibilities of the Programme Committee shall be as under-

i) To identify the General Interest Courses (GIC) as per the need of the student and availability of teachers in the Departments.

ii) To approve the time table of GIC and make it available to the students before the commencement of respective semester. This time table also be made available on the University website.

iii) To consider and approve the report of grivence redresal committee.

iv) To remove the difficulties if any faced during implementation of the CBCS and report it to Honøble Vice-Chancellor for further action.

v) Any other matter as it think fit for the effective implementation of CBCS.

VI. Departmental Committee

1. Every P.G. programme of the University/College shall be monitored by a committee constituted for this purpose by the Department.

   The Committee shall consist of H.O.D. as a Chairman and all the teachers of the Deptt. of its members including one student members per class. There shall be atleast one student member on the committee.

VII. Grievances Redressal Committee

The University or College shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD. This Committee shall solve all grievances relating to the Internal Assessment marks of the students.

VIII. Total credits per semester :-

Table-I

For all subjects other than Mathematics,

Biotechnology & Computer Science

Course	Credits				Total
	Sem-I	Sem-II	Sem-III	Sem-IV	
Core	12	12	12	12	48
Elective	04	04	04	04	16
GIC	00	04	04	04	12
Lab. Course	06	06	06	03	21
I.A.	04	04	04	04	16
Project	00	00	00	03	03
Total	26	26 or 30	26 or 30	26 or 30	116

Table-II

For Mathematics

Course	Credits				Total
	Sem-I	Sem-II	Sem-III	Sem-IV	
Core courses	12	12	12	12	48
Elective Courses	08	08	08	08	32
GIC	ô	04	04	04	12
Internal Assessment	05	05	05	05	20
Project	ô	ô	ô	04	04
Total	25	25 or 29	25 or 29	25 or 33	116

Table-III

For Biotechnology

Course	Credits				Total
	Sem-I	Sem-II	Sem-III	Sem-IV	
Core courses	16	12	12	08	48
Elective Courses	ô	9	ô	9	18
Lab courses	24	18	18	12	72
Seminar	ô	01	01	ô	02
Project				06	06
Assignment			02		02
Internal Assessment			02		02
Total	40	40	35	35	150

Table-IV

For Computer Science

Course	Credits				Total
	Sem-I	Sem-II	Sem-III	Sem-IV	
Core	25	20	15	10	70
Elective	-	05	05	05	15
GIC	-	-	05	-	05
Lab. Course	06	06	06	03	22
I.A.	-	-	-	02	02
Project	-	-	-	04/02	06
Total	31	31	31	26	119

IX. Grade Awards :-

(i) A seven point rating scale is used for the evaluation of the performance of the student to provide letter grade for each course and overall grade for the Masterøs Programme. Grade points are based on the total number of marks obtained by him/her in all the heads of examination of the course. These grade points and their equivalent range of marks are shown separately in Table-I. The performance of the student in theory, practical, internal assessment, subjects shall be evaluated in accordance with following Table-I.

TABLE –I

Grade	Range of Marks obtained out of 100 or Equivalent fraction	Grade Points	Remarks (Not to be displayed On transcripts)
O	90-100	10	Outstanding
A+	80-89	9	Excellent
A	70-79	8	Very Good
B+	60-69	7	Good
B	55-59	6	Fair
C+	50-54	5	Average
C	40-49	4	Below Average
F	Below 40	0	Fail

TABLE-II: Final Grade Points for SGPA and CGPA

Grade Points	Final Grade	Remarks (Not to be displayed On transcripts)
9.00-10.00	O	Outstanding
8.00 – 8.99	A+	Excellent
7.00-7.99	A	Very Good
6.00-6.99	B+	Good
5.50 – 5.99	B	Fair
5.00 – 5.49	C+	Average
4.00 – 4.99	C	Below Average

Equivalence of the conventional division/class with the CGPA is in accordance with the following table no. 4.

Table III. Equivalence of Class/Division to CGPA

Sr.No.	CGPA	Class/Division
1	8.00 or more	First Class ó Exemplary
2	7.50 or more but less than 8.00	First Class with Distinction
3	6.00 or more but less than 7.49	First Class
4	5.50 or more but less than 5.99	Higher Second Class
5	4.00 or more but less than 5.49	Second Class
6	Less than 4.00	Fail

The overall performance of a student is evaluated by assigning appropriate weightage to all the *four* semesters in order to maintain the quality of education. A student is permitted to appear for the semester examination subject to he or she has a minimum attendance of 75% in theory and practical classes, completes all his/her internal/ sessional assignments and clears all his/her dues. Non appearance in any examination is treated as the student having secured zero mark in that subject examination.

The evaluation is based on an average weightage system. Every subject has credit points based on the hours of study required. Every student is assessed in a subject with appropriate weightage to internal/sessional work and semester examination, thereby making the students study regularly. Every student is awarded Grade points out of maximum 10 points in each subject (based on 7 Points Scale). Based on the Grade points obtained in each subject, Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) are computed.

X. Computation of SGPA & CGPA

Every student will be awarded points out of maximum 10 points in each subject. (based on 7 Points Scale). Based on the Grade points obtained in each subject the Semester Grade Point Average (SGPA) and then Cumulative Grade Point Average (CGPA) are computed. The computation of SGPA & CGPA, is as under:

Semester Grade Point Average (SGPA) is the weighted average of points obtained by a student in a semester and is computed as follows:

$$SGPA = \frac{U1 \times M1 + U2 \times M2 + ... + Un + Mn}{U1 + U2 + ...Un}$$

Where U1, U2, í .. are subject credit of the respective course and M1, M2, í .. are the Grade Points obtained in the respective subject (out of 10)

The Semester Grade Point Average (SGPA) for all the four semesters is also mentioned at the end of every semester.

The Cumulative Grade Point Average (CGPA) is used to describe the overall performance of a student in the course and is computed as under:

$$CGPA = \frac{\sum_{n=1}^{4} SGPA(n)C_n}{\sum_{n=1}^{n=4} C_n}$$

Where SGPA (n) is the nth Semester SGPA of the student and C_{-n} is the nth Semester total credit. The SGPA and CGPA are rounded off to the second place of decimal.

XI. Internal Evaluation Method :-

(i) At the beginning of each course, every teacher shall inform his/her students unambiguously the method he/she proposes to adopt for the continuous assessment. Normally the teacher concerned may conduct three written sessional examinations spread periodically during the semester and select best two for contributing to the final marks.

(ii) At the end of each semester the Departmental Committee shall assign grades to the students.

(iii) The Departmental Committee shall prepare the copies of the result sheet in duplicate.

(iv) Every student shall have the right to scrutinize answer scripts of sessional/end-semester examinations and seek clarifications from the teacher regarding eveluation of the scripts immediately thereafter or within 3 days of receiving the evaluated scripts.

(v) The Department shall display the grade points and grades for the notice of students.

(vi) The department shall send all records of evaluation, including sessional evaluation, for safekeeping to the Controller of Examinations as soon as all the formalities are over.

XII. Grade Card

The University shall issue at the beginning of each semester a grade card for the student, containing the grades obtained by the student in the previous semester and his Semester Grade Point Average (SGPA).

The grade card shall list:

(a) the title of the courses along with code taken by the student

(b) the credits associated with the course,

(c) the grade and grade points secured by the student,

(d) the total credits earned by the student in that semester.

(e) the SGPA of the student,

(f) the total credits earned by the students till that semester and

(g) the CGPA of the student (At the end of the IVth Semester).

XIII. At the end of the IVth semester, the University shall issue the statement of marks to the Students showing details of marks obtained by the student in each Head in each semester along with grade total marks.

XIV. Power to modify and remove difficulties :-

1. Not withstanding anything contained in the foregoing, Honøble V.C. in consultation with the Dean of the faculty shall have the power to issue directions or orders to remove any difficulty,

2. Nothing in the foregoing may be construed as limiting the power of the University to amend, modify or repeal any all of the above.

sd/-

Amravati   (Dr.Kamal Singh)

Date : 2/6/2010   Vice-Chancellor

Appendix-A

Examination Scheme under C.B.C.S. for the subject other than Mathematics, Biotechnology and Computer Science in the

faculty of Science

M.Sc. Part-I

Semester-I

SA-Subject abbrivation; C-Core; E-Elective

Sr.No.	Paper / Code	Course	Theory					Practical	
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)	Max. Marks (Credit)	Min. Marks marks (Min. Grade Point)
1	2	3	4	5	6	7	8	9	10
1	1SA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
2	1SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
3	1SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
4	1SA-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
5	1SA-5	Lab-I	ô	ô	ô	ô	ô	100 (03)	40 (04)
6	1SA-6	Lab-II	ô	ô	ô	ô	ô	100 (03)	40 (04)

Total Marks : 600;   Minimum Total Credits : 26

Note :- (1) If the student has scored minimum marks or minimum grade points mentioned in Column No.8 out of the sum of total marks of theory and internal assessment taken together then he/she will be declared to have cleared with (04+01) 05 credits.

(2) If the student has scored minimum marks or minimum grade points in either theory or in internal assessment then he/she will be declared to have cleared in that particular head.

Appendix-B

Examination Scheme under C.B.C.S. for the subject other than Mathematics, Biotechnology and Computer Science in the faculty of Science

M.Sc. Part-I

Semester-II

SA-Subject abbrivation; C-Core; E-Elective; GIC-General Interest Course

Sr.No.	Paper / Code	Course	Theory					Practical	
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)	Max. Marks (Credit)	Min. Marks marks (Min. Grade Point)
1	2	3	4	5	6	7	8	9	10
1	2SA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
2	2SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
3	2SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	
4	2SA-4 Or 2GIC-X	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
5	2SA-5	Lab-III	ô	ô	ô	ô	ô	100 (03)	40 (04)
6	2SA-6	Lab-IV	ô	ô	ô	ô	ô	100 (03)	40 (04)

Total Marks : 600;   Minimum Total Credits : 26

Note :- (1) If the student has scored minimum marks or minimum grade points mentioned in Column No.8 out of the sum of total marks of theory and internal assessment taken together then he/she will be declared to have cleared with (04+01) 05 credits.

(2) If the student has scored minimum marks or minimum grade points in either theory or in internal assessment then he/she will be declared to have cleared in that particular head.

Appendix-C

Examination Scheme under C.B.C.S. for the subject other than Mathematics, Biotechnology and Computer Science in the faculty of Science

M.Sc. Part-II

Semester-III

SA-Subject abbrivation; C-Core; E-Elective; GIC-General Interest Course

Sr.No.	Paper / Code	Course	Theory					Practical	
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)	Max. Marks (Credit)	Min. Marks marks (Min. Grade Point)
1	2	3	4	5	6	7	8	9	10
1	3SA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
2	3SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
3	3SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
4	3SA-4 Or 3GIC-Y	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
5	3SA-5	Lab-V	ô	ô	ô	ô	ô	100 (03)	40 (04)
6	3SA-6	Lab-VI	ô	ô	ô	ô	ô	100 (03)	40 (04)

Total Marks : 600;   Minimum Total Credits : 26

Note :- (1) If the student has scored minimum marks or minimum grade points mentioned in Column No.8 out of the sum of total marks of theory and internal assessment taken together then he/she will be declared to have cleared that (04+01) 05 credits.

(2) If the student has scored minimum marks or minimum grade points in either theory or in internal assessment then he/she will be declared to have cleared in that particular head.

Appendix-D

Examination Scheme under C.B.C.S. for the subject other than Mathematics, Biotechnology and Computer Science in the faculty of Science

M.Sc. Part-II

Semester-IV

SA-Subject abbrivation; C-Core; E-Elective; GIC-General Interest Course

			Theory				Practical		
Sr.No.	Paper / Code	Course	Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)	Max. Marks (Credit)	Min. Marks marks (Min. Grade Point)
1	2	3	4	5	6	7	8	9	10
1	4SA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
2	4SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
3	4SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
4	4SA-4 Or 4GIC-Z	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	ô	ô
5	4SA-5	Lab-V	ô	ô	ô	ô	ô	100 (03)	40 (04)
6	4SA-6	Project	ô	ô	ô	ô	ô	100 (03)	40 (04)

Total Marks : 600;   Minimum Total Credits : 26

Note :- (1) If the student has scored minimum marks or minimum grade points mentioned in Column No.8 out of the sum of total marks of theory and internal assessment taken together then he/she will be declared to have cleared with (04+01) 05 credits.

(2) If the student has scored minimum marks or minimum grade points in either theory or in internal assessment then he/she will be declared to have cleared in that particular head.

Appendix-E

Examination Scheme under C.B.C.S. for the subject Mathematics in the faculty of Science

M.Sc. Part-I

Semester-I

			Theory				
Sr.No.	Paper / Code	Course	Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)
1	2	3	4	5	6	7	8
1	1MTH-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
2	1MTH-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
3	1MTH-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
4	1MTH-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
5	1MTH-5	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
			400 (20)		100 (05)		

Total Marks : 500;   Total Credits : 25

Note :- (1) If the student score Minimum Marks or Minimum Grade Points mentioned in Column No.8 out of the sum total marks of theory and internal assessment taken together then he/she will be declared to have clear (04+01) 05 credits.

(2) If the student score Minimum Marks or Minimum Grade Points in either theory or internal assessment then he/she will be declared to have clear either of the head.

Appendix-F

Examination Scheme under C.B.C.S. fors the subject Mathematics in the faculty of Science

M.Sc. Part-I

Semester-II

Sr.No.	Paper / Code	Course	Theory				
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)
1	2	3	4	5	6	7	8
1	2MTH-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
2	2MTH-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
3	2MTH-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
4	2MTH-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
5	2MTH-5 and/or 2GIC-X	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
			400 (20)		100 (05)		

Total Marks : 500;   Total Credits : 25

Note :- (1) If the student score Minimum Marks or Minimum Grade Points mentioned in Column No.8 out of the sum total marks of theory and internal assessment taken together then he/she will be declared to have clear (04+01) 05 credits.

(2) If the student score Minimum Marks or Minimum Grade Points in either theory or internal assessment then he/she will be declared to have clear either of the head.

Appendix-G

Examination Scheme under C.B.C.S. for the subject Mathematics in the faculty of Science

M.Sc. Part-II

Semester-III

Sr.No.	Paper / Code	Course	Theory				
			Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)
1	2	3	4	5	6	7	8
1	3MTH-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
2	3MTH-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
3	3MTH-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
4	3MTH-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
5	3MTH-5 and/or 3GIC-Y	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
			400 (20)		100 (05)		

Total Marks : 500;   Min. Total Credits : 25

Note :- (1) If the student score Minimum Marks or Minimum Grade Points mentioned in Column No.8 out of the sum total marks of theory and internal assessment taken together then he/she will be declared to have clear (04+01) 05 credits.

(2) If the student score Minimum Marks or Minimum Grade Points in either theory or internal assessment then he/she will be declared to have clear either of the head.

Appendix-H

Examination Scheme under C.B.C.S. for the subject

Mathematics in the faculty of Science

M.Sc. Part-I

Semester-IV

			Theory				
Sr.No.	Paper / Code	Course	Max. Marks (Credits)	Min Pass Marks (Min. Grade Pt.)	Int. Ass. (Credits)	Min. Pass Marks (Min. Grade Pt.)	Th + Int. Ass. Min.Pass Mar (Grade Pt.)
1	2	3	4	5	6	7	8
1	4MTH-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
2	4MTH-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
3	4MTH-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
4	4MTH-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
5	4MTH-5 and/or 4GIC-Z and/or Project	E and/or GIC and/or Project	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)
			400 (20)		100 (05)		

Total Marks : 500;   Min.Total Credits : 25

Note :- (1) If the student score Minimum Marks or Minimum Grade Points mentioned in Column No.8 out of the sum total marks of theory and internal assessment taken together then he/she will be declared to have clear (04+01) 05 credits.

(2) If the student score Minimum Marks or Minimum Grade Points in either theory or internal assessment then he/she will be declared to have clear either of the head.

Appendix-I

Scheme of Teaching and Examination under C.B.C.S. for the Subject Biotechnology
M.Sc. (Biotechnology) SEMESTER PATTERN
M.Sc.Part-I (SEMESTER-I)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/Week		Credits		Examination Scheme								
									Theory				Practical			
				T	P/TU	Theory	Pract.	Paper Hrs	Max External; Marks	Max Internal Marks	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	1BTB-1	I	C	04	06	04		3	100		100	4	--	--	--	--
2	1BTB-2	II	C	04	06	04		3	100		100	4	--	--	--	--
3	1BTB-3	III	C	04	06	04		3	100		100	4	--	--	--	--
4	1BTB-4	IV	C	04	06	04		3	100		100	4	--	--	--	--
5	1BTB-5	Lab-I		--	P 01		12	--	--	--	--	-	80	20	100	5
6	1BTB-6	Lab-II		--	P 02		12	--	--	--	--	--	80	20	100	5
				16	24	16	24				400				200	

Total Credits: 40

Appendix-J

Scheme of Teaching and Examination under C.B.C.S. for the Subject Biotechnology
M.Sc. (Biotechnology) SEMESTER PATTERN
M.Sc.Part-I (SEMESTER-II)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/Week		Credits		Examination Scheme								
									Theory				Practical			
				T	P/TU	Theory	Practical	Paper Hrs	Max Theory	Max Internal	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	2BTB-1	V	C	04	06	4		3	100		100	4	--	--	--	--
2	2BTB-2	VI	C	04	06	4		3	100		100	4	--	--	--	--
3	2BTB-3	VII	C	04	06	4		3	100		100	4	--	--	--	--
4	2BTB-4 and/or 2GIC-X	VIII	E and/or GIC	04	06	4		3		100	100	4	--	--	--	--
5	2BTB-5	Lab-III			P 02		12	--	--	--	--	--	80	20	100	5
6	2BTB-6	Lab-IV			P 02		12	--	--	--	--	--	80	20	100	5
		Total		16	25	16	24				400				200	

Total Credits: 40

Appendix-K

Scheme of Teaching and Examination under C.B.C.S. for the Subject Biotechnology
M.Sc. (Biotechnology) SEMESTER PATTERN
M.Sc.Part-II (SEMESTER-III)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/Week		Credits		Examination Scheme								
								Theory					Practical			
				T	P/TU	Theory	Pract.	Paper Hrs.	Max Theory	Max Internal	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	3BTB-1	IX	C	04	06	04		3	100	--	100	4	--	--	--	--
2	3BTB-2	X	C	04	06	04		3	100	--	100	4	--	--	--	--
3	3BTB-3	XI and 3GIC-Y	C and GIC	04	06	04		3	100	--	100	4	--	--	--	--
4	3BTB-4	Lab-V			P 02		18	--	--	--	--	--	80	20	100	5
5	3BTB-5	Internal Assessment			01		02	--	--	--	--	--	--	75	75	5
6	3BTB-6	Assignment					02	--	--	--	--	--	--	50	50	5
7		Seminar			01	1		-	--	--	--	--	--	75	75	5
		Total		12	20	13	22	-	--	--	300	--	--	--	300	--

Total Credits: 35

Appendix-L

Scheme of Teaching and Examination under C.B.C.S. for the Subject Biotechnology
M.Sc. (Biotechnology) SEMESTER PATTERN
M.Sc.Part-II (SEMESTER-IV)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/Week		Credits		Examination Scheme								
								Theory					Practical			
				T	P/TU	Theory	Pract.	Paper Hrs.	Max Theory	Max Internal	Total	Min Passing Grade Points	Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	4BTB-1	XII	C	04	06	04		3	100	--	100	4	--	--	--	--
2	4BTB-2	XIII	C	04	06	04		3	100	--	100	4	--	--	--	--
3	4BTB-3 and/or 4GIC-Z	XIV	E and/or GIC	04	06	04		3		100	100	4	--	--	--	--
4	4BTB-4	Lab-VI					18						80	20	100	5
5	4BTB-5	Project			06		06						200	--	200	5
		Total		12	24	12	24	-	--	--	300	--	--	--	300	--

Total Credits: 35

Scheme of Teaching and Examination under C.B.C.S. for the subject Computer Science
M.Sc. (Computer) SEMESTER PATTERN
M.Sc.Part-I (SEMESTER-I)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course, C-Core

SN	Subject Code	Paper	Course	Hrs/Week		Credits		Examination Scheme									
								Theory						Practical			
				T	P/TU	Theory	Practical	Paper Hrs	Max External; Marks	Max Internal Marks	Total	Min Passing Grade Points		Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	1MCS-1	I	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
2	1MCS-2	II	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
3	1MCS-3	III	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
4	1MCS-4	IV	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
5	1MCS-5	V	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
6	1MCS-6	Lab-I	-	-	7	-	03			-							
7	1MCS-7	Lab-II	-	-	7	-	03			-				100	-	100	40 4.0
		Total		25	14	25	06							100	-	100	40 4.0

Total Credits: 40

Scheme of Teaching and Examination under C.B.C.S. for the subject Computer Science
M.Sc. (Computer) SEMESTER PATTERN
M.Sc.Part-I (SEMESTER-II)

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course, C-Core

SN	Subject Code	Paper	Course	Hrs/Week		Credits		Examination Scheme									
								Theory						Practical			
				T	P/TU	Theory	Practical	Paper Hrs	Max Theory	Max Internal	Total	Min Passing Grade Points		Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
1	2MCS-1	VI	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
2	2MCS-2	VII	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
3	2MCS-3	VIII	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
4	2MCS-4	IX	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
5	2MCS-5 Or 2GIC-X	X	E or GIC	5	-	5	-	3 Hrs	100	-	100	40	4.00				
6	2MCS-6	Lab-III	-	-	7	-	03	-	-	-	-						
7	2MCS-7	Lab-IV	-	-	7	-	03	-	-	-	-			100	-	100	40 4.0
				25	14	25	06							100	-	100	40 4.0

Total Credits: 40

Scheme of Teaching and Examination under C.B.C.S. for the subject Computer Science
M.Sc. (Computer) SEMESTER PATTERN
M.Sc.Part-II (SEMESTER-III)

Appendix-O

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/Week		Credits		Examination Scheme									
								Theory						Practical			
								Paper Hrs.	Max Theory	Max Internal	Total	Min Passing Grade Points		Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
				T	P/TU	Theory	Pract.										
1	3MCS-1	XI	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
2	3MCS-2	XII	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
3	3MCS-3	XIII	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
4	3MCS-4	XIV	E	5	-	5	-	3 Hrs	100	-	100	40	4.00				
5	3MCS-5 Or 3GIC-Y	XV	E or GIC	5	-	5	-	3 Hrs	100	-	100	40	4.00				
6	3MCS-6	Lab-V	-	-	7	-	03			-							
7	3MCS-7	Lab-VI	-	-	7	-	03			-				100	-	100	40 4.0
		Total		25	14	25	06							100	-	100	40 4.0

Total Credits: 35

Scheme of Teaching and Examination under C.B.C.S. for the subject Computer Science
M.Sc. (Computer) SEMESTER PATTERN
M.Sc.Part-II (SEMESTER-IV)

Appendix-P

T: Lectures, P: Practical, TU: Tutorial/Assignment; G.I.C. – General Interest Course

S N	Subject Code	Paper	Course	Hrs/Week		Credits		Examination Scheme									
								Theory						Practical			
								Paper Hrs.	Max Theory	Max Internal	Total	Min Passing Grade Points		Max Marks Practical	Max Marks Int. Ass	Total	Min Passing Grade Points
				T	P/TU	Theory	Pract.										
1	4MCS-1	XVI	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
2	4MCS-2	XVII	C	5	-	5	-	3 Hrs	100	-	100	40	4.00				
3	4MCS-3 Or 4GIC-Z	XVIII	E or GIC	5	-	5	-	3 Hrs	100	-	100	40	4.00				
4	4MCS-4	Lab-VII	-	-	7	-	03	4 Hrs	-	-	-		-	100		100	40 04
5	4MCS-5	Project	-	-	7	-	03+1			-	-		-	100	50	100	40 04
6	4MCS-6	Seminar	-	02	-	-	01+1			-	-		-	100	50	150	60 04
7	4MCS-7	Internal Assessement	-	06	-	-	02		-	-	-	40	4.00		50	50	20 04
		Total		23	14	15	11										

Total Credits: 35

Appendix-Q

List of General Interest Courses (GIC) to be opted

by the student/s in Semester-II

Sr.No.	Subject	Subject Code Elective	Equivalent General Interest Course Code
1	2	3	4
1	Chemistry	2CHE3	2GIC-1
		2CHE4	2GIC-2
2	Physics	2PHY3	2GIC3
		2PHY4	2GIC4
3	Mathematics	2MTH4	2GIC5
		2MTH5	2GIC6
4	Zoology	2ZOO3	2GIC7
		2ZOO4	2GIC8
5	Botany	2BOT3	2GIC9
		2BOT4	2GIC-A
6	Statistics	2SCA3	2GIC-B
		2SCA4	2GIC-C
7	Biotechnology	2BTB3	2GIC-D
		2BTB4	2GIC-E
8	Computer Science	2CMS3	2GIC-F
		2CMS4	2GIC-G
9	Microbiology	2MCB3	2GIC-H
		2MCB4	2GIC-I
10	Electronics	2ELE3	2GIC-J
		2ELE4	2GIC-K
11	Biochemistry	2BMC3	2GIC-L
		2BMC4	2GIC-M
12	Geology	2GEO3	2GIC-N
		2GEO4	2GIC-O
13	Bioinformatics	2BIT3	2GIC-P
		2BIT4	2GIC-Q
14	Environmental Science	2ENV3	2GIC-R
		2ENV4	2GIC-S
15	Geoinformatics	2GIT3	2GIC-U
		2GIT4	2GIC-V
16	Computer Software	2CSW3	2GIC-W
		2CSW4	2GIC-1A
17	Remote Sensing and GIS	2RSG3	2GIC-1B
		2RSG4	2GIC-1C
18	Pharmaceutical Chemistry	2PCH3	2GIC-1D
		2PCH4	2GIC-1E

Note : Title of the paper shall prescribed in the respective prospectuses.

DIRECTION

No. : 27 / 2010   Date : 24.6.2010

Subject : Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), Direction, 2010.

Whereas, Ordinance No.4 of 2008 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course) Ordinance, 2008 is in existance in the University.

AND

Whereas, the Academic Council in its meeting held on 28.5.2010 vide item No.36 has approved the policy decision regarding introduction of Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science, for all subjects along with Draft Regulation in this behalf.

AND

Whereas, due to implementation of Scheme for Choice Based Credit System (CBCS) and Awarding Grades to the Post Graduate Students in the Faculty of Science, the provision under Ordinance No.4 of 2008 need to be revised accordingly.

AND

Whereas, admission to students for M.Sc. Part-I (Semester-I) for all subjects in the faculty of Science are to be made in the Academic Session 2010-11 in choice based credit system (C.B.C.S.).

AND

Whereas, making amendments in Original Ordinance No.4 of 2008 is likely to take some time.

Now, therefore, I, Dr. Kamal Singh, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called "Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), Direction, 2010".

2. This direction shall come into force from the date of its issuance.

3. The word "or Biochemistry" in clause i) of sub-para (i) of para 5 shall be deleted.

4. The title of the subject "Electronics (Instrumentation)" be substituted as "Electronics" wherever occur in the Ordinance.

5. Following shall be the eligibility criteria for admission to M.Sc. Part-I Semester-I for the subjects – (i) Pharmaceutical Chemistry,

   (ii) Biotechnology, (iii) Computer Science.

(a) for admission to M.Sc. Pharmaceutical Chemistry a candidate shall have offered Chemistry or Industrial Chemistry or Biochemistry as a subject of study and examination at the B.Sc. Degree.

(b) following shall be the eligibility for admission to M.Sc. Semester-I (Biotechnology) -

   (i) B.Sc. in any discipline of Life Sciences, Bio Sciences or Bachelor's Degree in Agriculture, Veterinary and fishery Sciences, Pharmacy, or Bachelor of Medicine and Bachelor of Surgery (M.B.B.S.) or Bachelor of Dental Surgery or equivalent examination recognized by Sant Gadge Baba Amravati University are eligible to appear in entrance test as given in para (iii) below.

   (ii) The student should have minimum 50% marks as aggregate in the degree course.

   (iii) The student will have to pass entrance examination for admission in M.Sc. Semester-I (Biotechnology) as per the Sant Gadge Baba Amravati University rules.

(c) following shall be the eligibility for admission to M.Sc. Semester-I (Computer Science) -

   i. A person who has passed the Degree of Bachelor of Science of this university with Computer Science / Computer Application (Vocational) as on the subjects.

OR

   ii. A person who has passed B.A. / B.Sc. with Mathematics plus Post Graduate Diploma in Computer Science of this University.

OR

   iii. A person who has passed a Degree of Bachelor of Computer Science.

6. The following subject be inserted in para 9) of the Ordinance after Sr.No. "15. Bioinformatics".

   "16. Computer Software,

   17. Computer Science

   18. Biotechnology, and

   19. Pharmaceutical Chemistry.

7. A person who desire to improve the division obtained by him/her at M.Sc. examination shall be eligible for improvement of division under the provision of Ordinance No.6 of 2008. However, for improvement of division he/she shall have to offer the core courses only. In no

case he/she shall be allowed for improvement of division/grade/CGPA by offering General Interest Course.

8. The number of papers and marks allotted to each subject and the minimum marks which an examinee must obtained in order to pass the examination shall be as indicated in Appendices, appended with the Regulation.

9. The classification in reference to the class/division/grade to be awarded to the examinee shall be as per the Table-III (Equivalence to Class / Division to CGPA) of para No.IX, appended to the Regulation.

10. As soon as possible after the examination, but not later than 30th, June following, the B.O.E. shall publish a list of successful examinees arranged in Division as mentioned in Table-III (Equivalence to Class / Division to CGPA) of para No.IX, appended to the Regulation. The names of examinees passing the examination as a whole in the minimum prescribed period and obtaining the prescribed number of places in each subject in the division as per Table-III of the Regulation shall be arranged in order of merit as provided in the Examinations in General Ordinance No.6.

Sd/-

Amravati   (Dr.Kamal Singh)

Date : 21/6/2010   Vice-Chancellor

*****

DIRECTION

No. :39/ 2011   Date :23.8.2011

Subject : Corrigendum to Direction No. 26/2010

Whereas, the Direction No.26 of 2010 in respect of Scheme of Choice Based Credit System (CBCS) and awarding Grades to the Post Graduate students in the faculty of Science is in existence.

AND

Whereas, the Academic Council in its emergent meeting held on 28.5.2010 vide item No.36 has approved the decision regarding introduction of scheme for C.B.C.S. and Awarding grades to the P.G. students in the faculty of Science under Ordinance No.4 of 2008..

AND

Whereas, in sub-para V of para 3, under Direction No.26 of 2010, there shall be Programme Committee and the duties of the Programme Committee shall be to remove the difficulties if any faced during implementation of C.B.C.S. and report it to Honøble Vice-Chancellor for further action and any other matter as it think fit for the effective implementation of C.B.C.S.

AND

Whereas, the Programme Committee in its meetings held on 14.7.2011, 20.7.2011, 30.7.2011 & 9.8.2011 has recommended necessary corrections in the above Direction which will be effective from the academic session 2011-12. The minutes of the Programme Committee was accepted by Honøble Vice-Chancellor on dated 22.8.2011.

AND

Whereas, it is necessary to carry out the corrections in the above said Direction immediately.

Now, therefore, I, Dr.Mohan K.Khedkar, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called õCorrigendum to Direction No.26/2010.

2. This direction shall come into force from the date of its issuance.

3. (A) In Direction No.26/2010 in respect of Scheme of Choice Based Credit System (CBCS) and awarding Grades to the Post Graduate students in the faculty of Science following paras be corrected as follows :

i)   In para II, sub para (i) of para 3 in the fifth line after the words "less than" the figure, sign, and words "72 (52 core and elective)" be substituted by the figures, sign, and words "88(64 core and elective)"

ii) In para VI: the title "Departmental Committee" be replaced as "Programme Monitoring" and Para 1 be completely deleted. Instead of this, the new para should be "Every P.G. programme of the University/College shall be monitored by the Head of the Department of the University/College of the concerned subject."

iii) The para VII shall be substituted as given below -

"VII. Grievance Redressal

All the grievances regarding Internal Assessment shall be settled by H.O.D. or the teacher of the department nominated by H.O.D. / Principal".

iv) In para IX : Table I: the grades in column No.2 shall be substituted as under -

     "O   by   AA
     A⁺   by   AB
     A   by   BB
     B⁺   by   BC
     B   by   CC
     C⁺   by   CD
     C   by   DD"

v)   **In para X :**

     i)   In the first line the word "Grade" be added after the word "awarded" and before the word "points"

     ii) In third line the words "obtained in each subject" be substituted by the words "obtained in Core and Elective courses of the subject"

vi) **In para XI :**

     • In sub para (i) in the first line the word "Head of the Department" be inserted after the words & sign "each course," and before the words "every teacher".

     • The sentence "Normally the teacher concerned may conduct three written sessional examinations spread periodically during the semester and select best two for contributing to the final marks" shall be deleted.

     • Sub para (ii) & (iii) be deleted completely.

     • Sub para (iv) be renumbered as sub para (ii) and the word "teacher" in the second line of the original sub para (iv) be substituted by the words "Head of Departments".

     • Sub para (v) be renumbered as sub para (iii). In original sub para (v) the words "grade points and grades" be deleted.

     • Sub para (vi) be deleted completely.

vii) The word "Minimum" printed below the table in Appendix A, B, C, D, G, and H, shall be deleted.

viii) Following special explanatory Note be added below the table in Appendix-D, H, L, and P respectively.

     "**Special Explanatory Note** :- At the end of IVth semester, the students/examinee who accumulated atleast 88 credits (out of these 88 credits, 64 credits must be on core and elective course) and who has put in the minimum residence time shall be eligible to receive the degree in the subject he/she has admitted".

(B) The students should have accumulated 28 credits of M.Sc. Part-I, Sem-I & II taken together for admission to III Semester and should have completed the term of M.Sc. Part-I (Semester-I & II) satisfactorily.

                                        Sd/-
Amravati   (Mohan K.Khedkar)
Date : 22/8/2011   Vice-Chancellor

                      *****
                   DIRECTION
No. : 25 / 2012   Date : 29/6/2012
          **Subject : Corrigendum to Direction No.26/
                       2010 and 39/2011**

    Whereas, the Direction No.26 of 2010 in respect of Scheme of Choice Based System (CBCS) and awarding Grades to the Post Graduate Students in the faculty of Science is in existence.
                        AND

    Whereas, University has issued corrigendum to Direction No.26 of 2010 vide Direction No.39 of 2011 on dated 23.8.2011.
                        AND

Whereas, in sub-para V of para 3, under Direction No.26 of 2010, there shall be Programme Committee and the duties of the Programme Committee shall be to remove the difficulties if any faced during implementation of C.B.C.S. and report it to Honφble Vice-Chancellor for further action and any other matter as it think fit for the effective implementation of C.B.C.S.

AND

Whereas, the Programme Committee in its meeting held on 1st March, 2012 and 18th April 2012 has recommended necessary corrections in the above said Directions which shall be effective for 2011-12 session and the minutes of the Programme Committee was accepted by the Honφble Vice-Chancellor.

AND

Whereas, the Academic Council in its meeting held on 13.1.2012, vide item No.14(5) F) R-3, I) R-2 & R6 has accepted additional eligibility criteria for Admission to M.Sc. (Zoology), Direct admission to M.Sc. Part-II (Computer Science) for the students who have passed the degree of M.Sc. (Computer Software), and revised syllabi of M.Sc. (Computer Science), which is to be implemented from the Academic Session 2012-13.

AND

Whereas, it is necessary for carryout the corrections in the above said Direction immediately.

Now, therefore, I, Dr.Mohan K.Khedkar, Vice Chancellor of Sant Gadge Baba Amravati University, in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act., 1994, do hereby direct as under:

1. This Direction may be called õCorrigendum to Direction No.26/2010 and 39/2011ö.

2. This direction shall come into force from the date of its issuance.

3. In Direction No.26/2010 in respect of Scheme of Choice Based System (CBCS) and awarding Grades to the Post Graduate Students in the faculty of Science, following corrections shall be carried out-

   A) i) In para 5th , the words and brackets õDegree of विज्ञान स्नातक (Bachelor of Science)ö shall be substituted as õDegree of विज्ञान पारंगत (Master of Science)ö

   ii) The clause (i), of sub-para (II) of para 3 shall be deleted.

   iii) The clause (i), of sub-para (II) of para 3 shall be renumbered as para (õiö) and new para (ii) shall be added as follows.

õMinimum total credits that students shall have to accumulate in all four semesters for receiving the M.Sc. degree core subject shall be as shown in the table given as under ó

Subject/s	Minimum total credits (Core Elective and GIC)
All subjects other than Mathematics, Computer Science & Biotechnology	104
Computer Science	119
Biotechnology	150
Mathematics	100

B) i) Under Table-III (Equivalence of Class/Division of CGPA) of Para IX,

   (a) the figures shown ÷7.49ø, ÷5.99ø, and ÷5.49ø against Sr.Nos.3, 4 & 5 in Column No.2 (CGPA) be substituted by the figures ÷7.50ø, ÷6.00ø, and ÷5.50ørespectively.

   (b) Following sub-para be added before the para ÷Xø

   õDeclearation of Merit List :- Merit list of M.Sc. (C.B.C.S.) examination shall be prepared from the examinee who have successively cleared minimum total credits including GIC as shown in the table assigned in the first attempt.

   ii) Special Explanatory note shown under Appendix-D, H, I, L and P shall be deleted.

   The note No.(2) printed under Appendix-A, B, C, D, E, F & H shall be substituted as follows-

   õIf the student has not scored minimum marks or minimum grade points mentioned in column No. 8 and if the student scores minimum marks or minimum grade points in either theory or internal assessment then he/she will be declared to have cleared either of the headö.

4. In Direction No.39 of 2011, under para IX), in Table-I & II, under column No.2, i.e. õGrade Pointsö and õFinal Gradeö shall be substituted respectively as under.

õO	by	AA
A+	by	AB
A	by	BB
B+	by	BC
B	by	CC
C+	by	CD
C	by	DDö

5. As the revised syllabi has been accepted by the Academic Council, for the subject Computer Science of four theory papers to each semester therefore the Scheme of Examination for M.Sc. Semester-I to IV shall be as per Appendices-A, B, C & D appended to Direction No.26 of 2010, which is to be implemented for Semester-I from Winter-2012, Semester-II from Summer-2013, Semester-III from Winter-2013 & Semester-IV from Summer-2014 respectively.

6. The students passing B.Sc. Agriculture with specialization Antomology and Fisheries shall be eligible for admission to M.Sc. Zoology with specialization Antomology and Fisheries respectively.

7. The student having Degree of M.Sc. (Computer Software) shall be eligible for directly admission to M.Sc. Part II (Semester III) (Computer Science) in the faculty of science within the jurisdiction of sant Gadge Baba Amravati University, Amravati. The average percentage of Marks of M.Sc. (Computer software) and percentage of marks of M.Sc. (Computer Science) shall be considered to award class / Grade for awarding the degree of M.Sc. (Computer Science).

Sd/-

Amravati   (Mohan K.Khedkar)

Date : 28/6/2012   Vice-Chancellor

*****

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

DIRECTION

No. : 7 of 2014   Date: 07/05/2014

Subject : Corrigendum to Direction No.25 of 2012

Whereas, Direction No.25 of 2012 in respect of Corrigendum to Direction No.26/2010 and 39/2011 in the Faculty of Science is in existence in the University.

AND

Whereas, the Academic Council in its meeting held on 17.2.2014 vide item No.22 2) E) R-2 while considering the recommendations of Faculty of Science has approved the recommendation regarding award of M.Sc. (Computer Science) degree.

AND

Whereas, the matter is required to be regulated by framing the Ordinance and making of an Ordinance may likely to take some time.

AND

Whereas, the changes are to be made applicable from the Academic Session 2014-15.

Now, therefore, I, Dr.J.A.Tidke, Vice-Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under:

1) This Direction may be called, õCorrigendum to Direction No.25 of 2012, Direction, 2014ö

2) This Direction shall come into force w.e.f. the date of its issuance.

3) In Direction No.25 of 2012, in Para 7., the lines õThe average percentage of Marks of M.Sc. (Computer software) and percentage of marks of M.Sc. (Computer Science) shall be considered to award class / Grade for awarding the degree of M.Sc. (Computer Science)ö be substituted by the lines õ**The class / Grade for awarding the degree of M.Sc. (Computer Science) shall be awarded on the basis of performance at M.Sc. Part-II (Computer Science) onl**y.

Date : 3/5/2014

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

DIRECTION

No. : 8 of 2014   Date : 07/05/2014

Subject : **Corrigendum to Direction No. 14 of 2009 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course).**

Whereas, Ordinance No.4/2008 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), Ordinance, 2008, in the Faculty of Science is in existence in the University.

AND

Whereas, Direction No. 14 of 2009 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course) in the Faculty of Science is in existence in the University.

AND

Whereas, the Academic Council in its meeting held on 17.2.2014 vide item No.22 2) E) R-1 while considering the recommendations of Faculty of Science has approved the B.C.A. degree holders of this University are eligible for admission to M.Sc. (Computer Software) course.

AND

Whereas, the matter is required to be regulated by framing the Ordinance and making of an Ordinance may likely to take some time.

AND

Whereas, the changes are to be made applicable from the Academic Session 2014-15.

Now, therefore, I, Dr.J.A.Tidke, Vice-Chancellor of Sant Gadge Baba Amravati University, Amravati in exercise of powers conferred upon me under sub-section (8) of section 14 of the Maharashtra Universities Act, 1994, do hereby direct as under:

1)   This Direction may be called, õCorrigendum to Direction No. 14 of 2009 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course) Direction 2014.ö

2)   This Direction shall come into force w.e.f. the date of its issuance.

3)   In Direction No. 14 of 2009 in respect of Examinations leading to the Degree of विज्ञान पारंगत (Master of Science) (Four Semester Degree Course), in para 3., after the lines õA person who has passed the Degree of Bachelor of Science with Post Graduate Diploma in Computer Science of this University OR õfollowing lines be inserted

õThe Candidates having B.C.A. degree of this University shall be eligible to take admission to M.Sc. Part-I (Computer Software) course OR õ

Date : 3/5/2014   Sd/-
                                                  (Dr.J.A.Tidke)
                                                  Vice-Chancellor
                                     Sant Gadge Baba Amravati University

Sant Gadge Baba Amravati University, Amravati
Syllabus prescribed for

M.Sc. Part-I and Part-II [Semester I to IV] (Computer Science)

SEM-I (CBCS)

1MCS1 Digital System and Microprocessor
1MCS2 .Net Technologies and C#
1MCS3 Operating System
1MCS4 Computer Networks
1MCS5 Lab I - Based on 1MCS1 and 1MCS3
1MCS6 Lab II ó Based on 1MCS2

SEM-II (CBCS)

2MCS1 Java Programming
2MCS2 Data Structures
2MCS3 Software Engineering
2MCS4 (1) Discrete Mathematical Structures
      (2) Compiler Construction (GIC)
2MCS5: Lab III - Based on 2MCS1
2MCS6: Lab IV - Based on 2MCS2 and 2MCS3

SEM-III (CBCS)

3MCS1 Data Mining and Data Warehousing
3MCS2 Computer Graphics
3MCS3 Client-Server Computing
3MCS4 (1) Distributed Database System   (GIC)
      (2) Theory of Computation
3MCS5 Lab V - Based on 3MCS1 and 3MCS2
3MCS6 Lab VI - Based on 3MCS3

SEM-IV (CBCS)

4MCS1 Artificial Intelligence and Expert Systems
4MCS2 Design and Analysis of Algorithms
4MCS3 Network Security
4MCS4 (1) Mobile Communications
      (2) Digital Image Processing
      (3) Software Testing   (GIC)
4MCS5 Lab VII - Based on 4MCS1 and 4MCS2
4MCS6 Project

Syllabus prescribed for
M.Sc.Part-I Semester I and II (Computer Science)

SEMESTER-I

1MCS1: Digital Systems and Microprocessor

Unit I : Representation of integers and floating point nos., Boolean Algebra: laws, simplification of logic equations using Boolean laws, SOP and POS, standard forms of SOP and POS, Karnaugh Maps donøt care conditions in K-map,

Unit II : Logic families: classification and characteristics, TTL, ECL, MOS, CMOS, their comparison, Combinational logic design using MSI chips: Multiplexers, De-multiplexers/ Decoders, Digital comparator; parity generator/checker; code converters: BCD to Binary, Binary to BCD, Priority encoder: Decimal to BCD, Octal to Binary.

Unit III : Design of Arithmetic circuits: Half Adder, half subtractor, full adder, full subtractor, parallel binary adder, subtraction using 1øs and 2øs compliment schemes, use of adder as subtractor, controlled parallel adder, ALU IC 74181.

Unit IV: Flip Flops: construction and working of RS, JK, MS-JK, D and T Flip flops. Shift registers and Counters: Buffer register, controlled buffer register, shift registers: SISO, SIPO, PISO, PIPO, bidirectional shift register, ring counter, twisted ring counter, applications of shift registers; Counters: asynchronous counter designs, synchronous counter, UP/DOWN counters, lock out in counters.

Unit V : Overview of microcomputer system, evolution of microprocessors, architecture of 8086 microprocessor, pin diagram, signal description, register organisation, concept of pipelining, memory segmentation, memory address generation, modes of operation of 8086 (minimum and maximum).

Unit VI : Stack structure, interrupts in 8086 microprocessor, interrupt responses, Interrupt Vector Table, H/W and S/W interrupt processing; Interfacing: absolute and linear decoding, I/O mapped I/O and Memory Mapped I/O, memory interfacing (Even and Odd Banks), interfacing of keyboards, interfacing of displays, interfacing if ADC and DAC, address mapping.

Books:

1. Digital Integrated Electronics: Taub and Schilling (McHill)

2. Digital Principles and Applications: Malvino and Leach (TMH)

3. Modern digital Electronics: R. P. Jain (TMH)
4. Microprocessor and Interfacing: D. V. Hall (TMH)
5. The Intel Microprocessors: Barry B. Bray (PHI)

1MCS2: .Net Technologies and C#

Unit I : Understanding .net: The C# environment: origins of .net technology, .net framework, the common language runtime, framework base classes, user and program interfaces, visual studio .net, .net languages, benefits, c# and .net

Unit II : Overview of C#: namespaces, comments, aliases for namespaces, command-line arguments, program structure; Literals, variables and data types, operators, expressions, Decision making and branching, looping, methods in c#, Array handling, string manipulation, structures and enumerations,

Unit III : Classes and objects: Principle of OOP, Access modifiers, constructors, destructors, Nesting of classes; Inheritance and Polymorphism: multilevel inheritance, hierarchical inheritance, overriding, hiding methods, abstract methods and classes, sealed classes and methods; Interfaces: defining, extending and implementing interfaces, interfaces and inheritance, explicit interface implementation, abstract class and interfaces.

Unit IV : Operator overloading: unary, binary, comparison, Delegates and events; Console I/O operations: console class, console input-output, formatted output. Errors and Exceptions: types of errors, exceptions, exception handling codes, multiple catch statements, exception hierarchy, catch handler, finally statement, nested try blocks.

Unit V : Multithreading in c#: Introduction, System. Threading namespace, scheduling, synchronizing threads, thread pooling. File Manipulation: Managing File System, Moving, copying, deleting files, Reading, writing to files, Reading Drive information, File Security.

Unit VI : Data Access with .Net: ADO.net overview, Database connections, commands, the Data Reader, the DataSet class, populating a DataSet, persisting a DataSet.

Books:

1. Programming in C# - E. Balagurusamy, Tata McGraw-Hill Publications
2. Professional C# 2005 with .NET 3.0 - Christian Nagel, Bill Evjen, Jay Glynn, Morgan Skinner and Karli Watson Wrox Press

3. Programming C# - J. Liberty, OʻReilly Publications
4. The Complete Reference: C# - Herbert Schildt, Tata McGraw-Hill Publications
5. C# and the .NET Platform - Andrew Troelsen, A! Press

1MCS3 : Operating System

UNIT–I: **Introduction:** Services, Types, User-O.S. Interface: Command Interpreter, Graphical User Interface; System Calls; System Programs; Operating System Structure: Simple, Layered Approach; Micro-kernels, Modules; Virtual Machine; System Boot.

UNIT–II: Process Management: Process Concept, Process States, Process Control Block, Process Scheduling: Schedulers, Context Switch; Operations on Process: Creation, Termination, Inter Process Communication; Threads: Concept, Benefits; CPU Scheduling: Burst Cycle, Types of Scheduling, Scheduler, Dispatcher, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, Priority Scheduling, Round-Robin, [multiple processor scheduling]

UNIT–III: Process Synchronization and Deadlocks: Critical Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors. Deadlock: System Model, Deadlock Characterization, Resource Allocation Grpah, Methods for handling Deadlock: Prevention, Avoidance and Detection; Recovery from Deadlock: Process Termination, Resource Preemption.

UNIT–IV: Memory Management: [Basic Hardware, Address Binding]; Logical and Physical Address Space, Swapping, Contiguous Allocation, Dynamic Storage Allocation: First-fit, Best-Fit, Worst-fit; Fragmentation; Paging; Segmentation. **Virtual Memory:** Introduction, Virtual Address Space, Demand Paging, Copy-on-write, Page Replacement: Concept, Page Replacement Algorithms: FIFO, Optimal Page Replacement, LRU, Second-Chance Page Replacement; Thrashing, I/O Interlock.

UNIT-V : File System: File: Concept, Attributes, Operations; File Organization and Access: Sequential, Index Sequential, Indexed, Direct or Hash File. Directory: Operations, Structures.

Protection: Access Control and Permissions. File System Structure, Allocation Methods, Free Space Management. Disk

Structure, Disk Scheduling Algorithms: FCFS, SSTF, SCAN, C-SCAN, LOOK. [Disk Management, Swap Space Management], RAID: Concept. I/O Systems: I/O Hardware, Interrupts, DMA, Application I/O Interface, Kernel I/O Subsystem.

UNIT-VI: Distributed File System: Concept, Naming and Transparency, Remote File Access**,** Stateful Vs Stateless Service, File Replication, Remote Login, Remote File Transfer, Data Migration, Computation Migration, Process Migration. Embedded Operating Systems: Embedded Systems: Definition, Requirements and Constraints, Organization of Embedded System; Characteristics of Embedded Operating Systems.

Case Studies: Linux and Mobile Operating Systems

Books:

1. Operating System Concepts ó **Seventh** Edition : Abraham Silberschatz, Peter Galvin, Greg Gagne (John Wiley & Sons)

2. Operating Systems : William Stallings (Pearson)

3. Modern Operating System : Andrew S. Tanenbaum

1MCS4: Computer Networks

UNIT–I: **Digital Communication:** Advantages; **Data Transmission:** Modes: Parallel, **Serial:** Asynchronous, Synchronous, Isochronous; Transmission **Media:** Guided and unguided; **Modulation:** Amplitude, Phase Shift, Frequency, QAM; **Multiplexing:** FDM, WDM, TDM, STDM, CDM; Switching**:** Circuit, Message, Packet; Delays in Packet Switched Network, Packet Loss; **Network Reference Models:** OSI: Layered Architecture and Services, TCP/IP: Layered Architecture and Services

UNIT-II : **Application Layer:** Principles of Application Layer Protocols; **Processes:** Client-Server Model, Socket Interface; Services required by Application Layer; **HTTP:** Introduction, RTT, HTTP Handshake, types of HTTP Connections, HTTP Messages, Authentication and Cookies; **FTP:** Service Model, FTP Commands; Electronic Mail; SMTP; **DNS:** Services and working

UNIT-III: **Transport Layer:** Transport-Layer Services and Principles; Multiplexing and Demultiplexing Applications; Connectionless Transport ó UDP; Principles of Reliable of Data Transfer (RDT); Stop-and-wait and Pipelined protocols;

GBN protocol; Connection-Oriented Transport: TCP; Flow Control; Principles of Congestion Control; Approaches towards Congestion Control; TCP Congestion Control

UNIT-IV: **Network Layer:** Introduction; Network Service Model: Datagram, Virtual Circuit; Routing Principles; Routing Algorithms: Classifications; Hierarchical Routing; Internet Protocol: IP Addressing, IPv4: Classes and Packet format, DHCP; ICMP; Routing in the Internet: RIP, OSPF, BGP; Router; IPv6; Multicast Routing

UNIT-V: **Data Link Layer:** Introduction; Services; Error Detection and Correction; Multiple Access Protocols and LANs; LAN Addresses and ARP; Ethernet; Hubs, Bridges and Switches; Wireless LANs: IEEE 802.11; The Point-to-Point Protocol; ATM, X.25 and Frame Relay.

UNIT-VI: **Network Security and Management:** Secured Communication: Threats and Characteristics; Cryptography: Principles of Cryptography, Symmetric Key Cryptography, Public Key Cryptography; Privacy, Authentication, Integrity, Nonrepudiation; Digital Signature; Key Distribution and Certification. Areas of Network Management; Network Management Architecture; Internet Network Management Framework; SMI, MIB, SNMP.

Books:

1) Computer Networking ó James F. Kurose and Keith W. Ross (Addison-Wesley)

2) Data Communication and Networking ó Behrouz A. Forouzan (McGraw Hill)

3) Computer Network & Internet - Douglas E. Comer (Pearson)

4) Data and Computer Communication ó William Stallings (Pearson)

5) Computer Networks - Andrew S. Tanenbaum (PHI)

1MCS 5 : Lab I - Based on 1MCS1 and 1MCS3

1MCS6 : Lab II - Based on 1MCS2

"Distribution of marks for Computer Lab-I and Lab-II"

A) Each student shall perform two practicals.

B) Question slip for each examinee shall be attached to the answer book.

C) Marks should be given on the basis of following criteria:

I)   Practical-I   : 30 marks

II) Practical-II   : 30 marks

III) Viva-Voce (Each practical 15 marks)   : 30 marks

IV) Record   : 10 marks

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Total   **: 100 marks**

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SEMESTER-II
2MCS1: Java Programming

Unit I   : Introduction to java, Java development tools, Java and WWW, Java applications, java building elements: Identifiers, Keywords, variables, constants, operators. Data types and type casting and type conversion. Control Structures: Simple if, If..else, switch statement, Loop structure : For , Do..while, while , loop control using break and continue.

Unit II   : Objects and classes: class variable, instance variable, class methods, Access specifier, access modifiers. Methods: main method, creating methods, calling methods, overloading methods, abstraction, recursion. Object: Initialization of object using constructors, parameterized constructor, Dynamic Memory allocation, Garbage collection. Passing objects to methods.

Unit III : Packages: creating and importing packages, Arrays : Declaration, initialization, sorting searching, array of objects. String: String class, StringBuffer, StringTokenizer. Command line arguments.   Inheritance: super class, subclass , super keyword, this keyword, final modifier, abstract class, Method overriding. Interface: implementing interfaces.

Unit IV : Applet: Life cycle of an applet, APPLET tag, passing arguments to an applet, paint, repaint, update methods. Graphics class, AWT class hierarchy, Frames, Layout managers, components, containers. Color class, Font class.

Unit V   : Exception Handling : Error and Exception class, Error handling routine, try , catch , throw, throws, finally, uncaught exceptions, built-in exception, nested try-catch, user defined exception. Thread: Thread class, Runnable interface, states, priority and synchronization. Java I/O classes, File handling.

Unit VI : User Interface: Button, Label, TextField, TeatArea, Choice, List, CheckBox, CheckBox Group, Dialog Boxes, Menu,

Multiple Windows, Event handling: Event Delegation model, Adapter classes, Event classes, Event Listener Interfaces, Handling Mouse and Keyboard events.

Books:

1.   The complete Reference Java- 5th edition ó Herbert Schildt and Patrick Naughton- Tata McGraw Hill

2.   JAVA2 : Unleashed Techmedia

3.   Learning Java- Rich Raposa, Willey, dreamTech Publication

4.   Java in a nutshell desktop quick reference Flanagan-SPD, Oǿreilly

5.   Programming in Java 2 ó Rajaram, -Scitech Pub. India pvt Ltd.

2MCS2 : Data Structures

Unit I   : Introduction, Types of Data Structures, Linear & Nonlinear data structures, **Arrays:** Arrays as ADT, 1D, 2D, Multidimensional Arrays, Memory Representation and Applications. **Linked List** : Concept , Operations : Insert, Delete, Traversal, Static implementation using arrays,Dynamic implementation , Doubly Linked list, Circular list,Linked list applications : Merging of two linked lists.

Unit II   : **Stacks:** Introduction, Push and Pop operations, Stack implementation using array, Stack applications, Infix to Postfix conversion of expression, Expression evaluation, Recursion. **Queues:** Introduction, Insert and Delete operations, Queue implementation using array, Types óPriority Queue, Circular queue, Dequeue, Queue applications: CPU Scheduling Algorithms FCFS , Round Robin algorithm, Stacks and Queues as Linked Lists

Unit III : **Trees:**Terminology and Concepts , Binary Tree Representation, Static implementation using arrays , Linked representation, Binary Search Tree, Operations on Binary search tree - Insert, Delete, Tree Traversals, Representing, Threaded binary trees, Height-balanced trees, AVL Rotations. Searching: Sequential binary tree searches.

Unit IV : **Searching and Sorting :**Searching, Concept and need, Techniques, Linear search, Binary search, Indexed sequential search, Sorting, Concept and Need, Performance criteria, Bubble sort, Insertion Sort, Selection Sort, Shell Sort, Quick Sort, Heap Sort, Merge Sort.

Unit V : **Graphs :** Terminology and concepts, Graph Representation: Adjacency matrix, Adjacency list, Adjacency multi-list, Traversals: Depth first and Breadth first. Minimum spanning tree, shortest path algorithm, topological ordering, sparse matrices, linked list implementation of graph and graph traversal.

Unit VI1: **Indexing:** B-tree indexing, Multilevel indexing, B+ tree, Hashing, Collision processing, Bucket hashing, Dynamic hashing, Linear hashing, Extendible hashing, Tries.

Books:

1. õIntroduction to Data Structuresö - Bhagat Singh & T.L. Naps.

2. õData structures using Cö-Tanenbaum, Langsam, Augenstein PHI

3. õClassic Data Structuresö, - D. Samanta PHI

4. õData structure and Program design in Cö - Kruse, Leung, Tondo (PHI)

5. õData structureö - Tenanbaum

6. õData structure algorithms and Applications in C++ õ: Sartaj Sahani Macgraw Hill

7. õData structure and algorithm analysis in C++ õ: Mark Allan Welss, Addison weslay

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2MCS3 : Software Engineering

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Unit-I : **System Concept:** Definition, Characteristics of System, Elements of System; Types of System: Physical or Abstract Systems, Open or Closed Systems, Man-made Information Systems; Subsystem. **System Analyst:** Role; Skills: Interpersonal, Technical; Information Gathering Tools (Fact Finding Techniques); Feasibility Study.

Introduction to Software Engineering: Definition and Characteristics of Software; Software Application Domains; Software Engineering: Definition, Layered Model.

Unit-II : Software Process Framework; Umbrella Activities. Process Models: SDLC (Waterfall); Incremental; Evolutionary Models: RAD, Prototyping, Spiral; Concurrent Development Model; Components based Development Model. **Agility:** Agile Process: Assumptions, Agility Principles, Human Factors. **Software Engineering Practice:** Essence of Practice, Core Principles, Communication Principles, Planning Principles, Modeling Principles, Construction Principles, Deployment Principles.

Unit-III : **Requirements Engineering:** Requirements Engineering Tasks: Inception, Elicitation, Elaboration, Negotiation, Specification, Validation. Requirements Management; Steps in Requirements Engineering. Requirements Analysis: Objectives; **Requirements Modeling Approaches:** Scenario-Based Modeling: Use-Case; Class Models: E-R Diagram, Class Diagrams; Flow Oriented Modeling: DFD, CFD; Behavioral Models: State Diagram, Sequence Diagrams.

Unit-IV : **Software Design:** Design Process and Quality; Design Concepts: Abstraction, Architecture, Modularity, Information Hiding, Functional Independence, Refinement. Component Level Design: Component-Definition; Object-oriented View, Traditional View, Cohesion, Coupling. **Designing Traditional Components:** Graphical Design ó Notations (Flow Chart), Tabular Design ó Notations (Decision Table), Program Design Language (Structured English or Pseudo-code). User Interface Design: Rules; Interface Design Models; Interface Analysis.

Unit-V : **Software Quality:** Definition; Garvinøs Quality Dimensions; McCalløs Quality Factors; ISO 9126 Quality Factors. Software Quality Assurance: Elements, Goals, ISO 9001-2000 Quality Standards. **Software Metrics:** Attributes, Metrics for Requirements Model: Function-based Model (FP). Metrics for Specification Quality, Metrics for Design Model: Architectural Design Metrics. Metrics for Object-Oriented Design, User-Interface Design Metrics, Metrics for Source Code, Metrics for Testing, Metrics for Maintenance.

Unit-VI : **Software Testing:** Need, Verification and Validation, Unit Testing, Integration Testing, Validation Testing, System Testing, Debugging, Test Characteristics. White Box Testing: Flow Graph Notations, Test Cases, Control Structure Testing. Black Box Testing: Graph-based Testing Methods, Equivalence Partitioning, Boundary Value Analysis, Orthogonal Array Testing.

Books:

1. System Analysis and Design: Ellias M. Awad (Galgotia)

2. Software Engineeringó A Practitionerøs÷Approach (7th Ed): Roger S. Pressman (Mc-Graw Hill)

3. Analysis and Design of Information Systems: James A. Senn (Mc-Graw Hill)

4. Software Engineering Concepts: Richard Fairley

2MCS4(1) : Discrete Mathematical Structures

Unit I : Mathematical logic: Introduction, statements and notations, connectives ó negation, conjunction, disjunction, Statement formulas and truth tables, conditional, bi-conditional, well formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological implications, functionally complete sets of connectives, other connectives, Normal and principal normal forms, completely parenthesized infix and polish notations, Theory of inference for statement calculus ó validity using truth table, rules of inference, consistency of premises and indirect method of proof.

Unit II : Set theory: Basic concepts of set theory, representation of discrete structures, relations and ordering: relations, properties of binary relations in a set, relation matrix and graph of a relation, partition and covering of a set, equivalence relation, compatibility relations, composition of binary relations, Functions ó composition of functions, Inverse function.

Unit III : Algebraic Structures: Algebraic systems: Examples and general properties, Semigroups and monoids, Grammar and Languages, Polish expressions and their compilation, Groups- Definition and examples, subgroups and homomorphism, cosets and Lagrangeøs theorem, Group codes ó the communication model and basic notions, generation of codes by using parity checks, error recovery in group codes.

Unit IV : Lattices and Boolean algebra: Lattice as POSETs, definition, examples and properties, Lattice as algebraic systems, sublattices, Direct product and homomorphism, Special lattices, Boolean algebra - definition and examples, subalgebra, Direct product and homomorphism, Boolean functions, representation and minimization of Boolean Finite state machines.

Unit V : Graph theory: Basic concepts of graph theory ó definitions, paths, reachability and connectedness, matrix representation, Storage representation and manipulation of graphs- trees, representation and operations, list structures and graphs, Simple precedence grammars-syntax terminology, a view of parsing, notion and use of precedence relations, formal definition of precedence relations.

Unit VI : Fault detection in combinational switching circuits ó Faults in combinational circuits, Notions of Fault detection, Algorithm for generating a fault matrix, procedure for

detection of faults; Introduction to computability theory: Finite-state acceptors and regular grammars, Turing machines and partial recursive functions.

Books:

1. Discrete Mathematical Structures with applications to computer science- J. P. Tremblay & R.. Manohar (McGraw Hill Editions)

2. Discrete mathematics - Semyour Lipschutz, Marc Lipson (MGH), Schaumøs outlines.

3. Discrete mathematics and its applications - Kenneth H. Rosen (AT&T Bell Labs) (mhhe.com/ rosen)

4. Discrete Mathematical Structures ó Bernard Kolman, Robert Busby, S.C. Ross and Nadeemur- Rehman (Pearson Education).

2MCS4(2) : Compiler Construction

Unit I : Introduction to Compilers: Overview, typical compiler Structure, implementation. Programming Language Grammars: Elements of formal language grammars, derivation, reduction, syntax tree, ambiguity, regular grammars and expressions.

Unit II : Scanning and Parsing Techniques: The scanner, top-down and bottom-up parsing, syntax directed translation, Symbol table organization, Hash table organization, Linked List and Tree structured symbol tables, symbol table organization for structures and records.

Unit III : Memory Allocation: Static and dynamic memory allocation, array allocation and access, allocation for strings, structure allocation, common and equivalence allocation. Compilation of expressions.

Unit IV : Compilation of control structures: Control transfers, procedural calls, conditional execution, iteration control constructs.

Unit V : Error detection, indication and recovery. Compilation of I/O statements: Compilation of I/O list, compilation of FORMAT list, the I/O routine, file control.

Unit VI : Code optimization: Major issues, optimizing transformations, local optimizations, program flow analysis, Global optimization, writing compilers.

Books:

1. Compiler construction ó D.M. Dhamdhere, Macmillan India Ltd.

2. Principles of Compiler Design ó Alfred V. Aho, Jeffrey D. Ullman

3. The Theory and Practice of Complier Writing ó J.P. Trembly, P.G. Sorenson McGraw Hill Publication

4. Engineering a compiler ó K.D.Cooper and Linda Torczon, Elsevier Direct Publ.

2MCS5 : Lab III - Based on 2MCS1

2MCS6 : Lab IV - Based on 2MCS2 and 2MCS3

"Distribution of marks for Computer Lab-III and Lab-IV"

A) Each student shall perform two practicals.

B) Question slip for each examinee shall be attached to the answer book.

C) Marks should be given on the basis of following criteria:

I)	Practical-I	: 30 marks
II)	Practical-II	: 30 marks
III)	Viva-Voce (Each practical 15 marks)	: 30 marks
IV)	Record	: 10 marks

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Total   **: 100 marks**

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Syllabus prescribed for
M.Sc.Part -II Semester III and IV (Computer Science)

SEMESTER-III

3MCS1: Data Mining and Data Warehousing

Unit I : Introduction, Data Mining Functionalities, Data Preprocessing: Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

Unit II : Data Warehouse and OLAP Technology: Overview, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Data Generalization and Concept Description.

Unit III : Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining Various Kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Unit IV : Classification and Prediction: Issues, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation. Prediction: Linear Regression, Nonlinear Regression, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor.

Unit V : Cluster Analysis: Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data. Mining Time-Series Data, Mining Sequence Patterns in Biological Data.

Unit VI : Graph Mining, Social Network Analysis and Multirelational Data Mining. Mining Object, Spatial, Multimedia, Text, and Web Data, Data Mining Applications, Trends in Data Mining.

Books:

1. Data Mining: Concepts and Techniques - J. Han, M. Kamber

2. Data Mining: Introductory and Advanced Topics - Margaret H.Dunham, Pearson Education

3. Data Warehousing in the real world - Sam Anahory, Dennis Murry, Pearson Education

4. Principles of Data Mining - David Hand, Heikki Manila, Padhraic Symth, PHI

5. Data Warehousing, Data Mining & OLAP, Alex Bezon, Stephen J.Smith MeGraw-Hill Edition

6. Data Warehousing Fundamentals, Paulraj Ponniah, Wiley-Interscience Publication

3MCS2 : Computer Graphics

Unit I : Geometry and line generation: Introduction, points and lines, planes and coordinates, Line segments, perpendicular line segments, vectors, pixels and frame buffers, vector generation, character generation, displaying the frame buffer. Graphics primitive: Introduction, display devices, primitive operations, the Display-File Interpreter, normalized device coordinates, Display-file structure, Display control, Text line style primitives.

Unit II : Polygon: Introduction, Polygon , Polygon representation, Entering polygon, An inside test, filling polygon, Antialiasing. Transformations: Introduction, matrices, scaling transformations, sin and cos, sum of angles, identifiers, rotation, homogeneous coordinates and translation, rotation about an arbitrary point, other transformations, display procedures.

Unit III : Segments: Introduction, the segment table, segment creation, closing a segment, deleting a segement, renaming a segment, visibility, image transformations, saving and showing segments, other display file structures, some rater techniques, Windowing and clipping: Introduction, viewing transformation, implementation, clipping, clipping the polygon, adding clipping to the system, a voiding division, generalized clipping, position relative to an arbitory line, multiple windowing,

Unit IV : Interaction : Introduction, hardware, input devices, handling algorithm, event handling, sample devices, the detectability attributes, simuating a locator with a pick and pick with a locator, Echoing, Interactive techniques. Three dimension: Introduction, 3D Geometry, primitives and transformations, rotation about an arbitrary axis, parallel projection, perspective projection, viewing parameters, conversion to view plane coordinates, The 3D viewing transformation, , special projection.

Unit V : Hidden surfaces and lines: Introduction, back face removal, the painter algorithm, collection of polygons, remembering the style, the hidden surface check, decomposition into triangles, comparing two triangles, The minima test, Overlapping edges, containment of points, finding a point in the triangle plane, comparing of the entire triangle, establishing depth order, geometrical sorting, linked list, sorting the triangles.

Unit VI : Shading: Introduction, diffusion, illumination, point source illumination, specular reflection, transparency and shadows. Curves: Introduction, curve generation, implementation, interpolating polygons, E-splines, B-Splines and Curves.

Books:

1. õ Computer Graphics A Programming approachö- Steven Harington.

2. õIntractive Computer Graphicsö- Newmann and Sproul

3. õComputer Graphicsö- Rogers.

3MCS3 : Client-Server Computing

Unit I : Networking in Java: Basics, Socket overview, Client-Server concepts, Proxy servers, Internet addressing, Java Networking classes and interfaces, InetAddress, TCP/IP Client Sockets, URL Connection, TCP/IP Server sockets, Creating TCP client-server.

Unit II : Java Database Connectivity: JDBC concepts, JDBC API, DriverManager, Connection, Statement and ResultSet classes with relevant methods. Prepared and Callable statements, Handling queries, inserts, deletes and updates to database. Displaying query results.

Unit III : Servlets: Structure and lifecycle of Servlets, Servlet API: basics, Various classes & interfaces. Servlet requirements, writing. Running and debugging of Servlets, Concepts of Cookies, State and session management with Servlet API. Server side includes and request forwarding. Servlet chaining. Jdbc Servlets.

Unit IV : JavaScript Overview, Variables, Operators, Data Types, Control Statements, Functions and Objects, The Window Object: Dialog Boxes, Status Bar Messages, Window Manipulations; The Document Object: Writing to Documents, Dynamic Documents, The Form Object: Working With Form Elements and Their Properties The String and RegExp Objects, Dates and Math object

UNIT V: Remote Method Invocation (RMI): Object serialization in Java, Concept of remote object, Architecture of RMI application, Java RMI package, classes & Interfaces, Client-Server application using RMI, RMI Servlets, RMI-JDBC Servlets.

UNIT VI: Introduction to JSP; Simple JSP concepts, Request-time expressions. Advanced JSPs: Scripts. conditionals, loops, Try/ Catch. Concept of Beans, Properties, Bean instances & serialization; Bean Scopes, Writing Beans, Introspection, Beans & Scriplets..

Books:

1. Dustin R Callaway: Inside Servlets Pearson Education (LPE)

2. Larne Pekowasky: Java Server Pages, Pearson Education (LPE)

3. Dietel & Dietel: WWW: How To Program, Pearson Education (LPE)

4. Dietel, Nieto, Lin, Sadhu : XML: How to Program, Pearson Education.

5. Horstmann & Cornell õCore Java 2ö Vol-1 & Vol. II., Sun Microsystems.

3MCS4(1) : Distributed Operating System

UNIT I :   Introduction to distributed systems: goals of distributed system, hardware and software concepts, design issues. Communication in distributed systems: Layered protocols, ATM networks, the client-server model, remote procedure call and group communication.

UNIT II: Synchronization in distributed systems: Clock Synchronization, mutual exclusion, Election Algorithms, the Bully algorithm, a ring algorithm, atomic transactions, dead lock in distributed systems, distributed dead lock prevention, and distributed dead lock detection.

UNIT III: Processes and processors in distributed systems: Threads, system, models, processor allocation, scheduling in distributed system, fault tolerance and real time distributed systems.

UNIT IV: Distributed file systems: Distributed file systems design, distributed file system implementation, trends in distributed file systems. Distributed shared memory: What is shared memory, consistency models, page based distributed shared memory, shared variable, distributed shared memory, object based DSM.

UNIT V: Case Study : AMOEBA :

Introduction to AMOEBA, objects and capabilities in AMOEBA, Process Management in AMOEBA, Memory Management in AMOEBA, Communication in AMOEBA. The AMOEBA servers : The Bullet Server - Interface and Implementation, The Directory Server ó Interface and Implementation, The Replication Server, The Run Server, The Boot Server, The TCP/IP Server, Other Servers.

UNIT VI : Case study MACH: Introduction to MACH, Process management, in MACH, Memory management in MACH, communication in MACH, UNIX emulation in MACH. Case study DCE: Introduction to DCE threads, RPCøs, Time service, directory service, security service, distributed file system.

Books:

1.   Andrew. S. Tanenbaum, Distributed operating system, PHI

2.   Ceri & Palgathi, Distributed Database System, McGraw Hill

3.   Raghu Rama Krishnan and Johannes Gechrib, Database Management System, McGraw Hill

4.   Date C.J, An Introduction to Database system, Vol-I & II, Addition Wesley

5.   Korth, Silbertz, sudarshan, Database Concepts, McGrew Hill

6.   Elmasari, Navathe, Fundamentals of Database Systems, Addition Wesley

7.   Data C.J. An introduction to database system, Addition Wesley

8.   Rama Krishnan, Gehke, Database Management system, McGraw Hill

9.   M. Tamer Ozsu and Patrick Valduriez, Principles of Distributed Database Systems II Edition Pearson Education Asia

10.   Stefano Ceri and Giuseppo Pelagatti Distributed Database , Principles and Systems McGraw Hill

3MCS4(2) :Theory of Computation

Unit I :   Strings, alphabets and languages, Graphs and trees, Inductive proofs, set notations, relations, Finite automata and regular Expression: Finite state system, Non deterministic finite automata, Finite automata with þ-moves. Deterministic finite automata, equivalence between NFA and DFA, Conversion of NFA to DFA.

Unit II :   Regular set and regular expression, Two way finite automata, finite automat with output, Applications of finite automata. Equivalence of RE and FA, Inter conversion, pumping lemma, closure propery of regular sets, Regular grammars, Right linear and Left linear grammar, equivalence between Regular linear grammar and FA inter conversion between RE and RG.

Unit III :   Context free grammar, derivation trees, Chomsky Normal Form, Greibach Normal Form. Push Down Automata: Definition, model, acceptance of CFL, equivalence of CFL and PDA , Interconversion, Enumeration of properties of CFL.

Unit IV :   Turing Machine: Definition, model, Design of turing machine, computable languages and function, Techniques of turing machine construction, Modifications of Turing machine, Churchøs Hypothesis.

Unit V :   Chomsky Hierarchy of languages, Linear bounded automata and context sensitive languages, Introduction of DCFL and DPDA, Decidability of problems.

Unit VI: Undecidability : Properties of recursive & non recursive enumerable languages, universal turing machine, post correspondence problem, introduction to recursive function theory.

Books:

1. õIntroduction to Automata theory, Languages and Computationö- Hopcraft J.E. & Ullman J.D.

2. õAn Introduction to Formal Languages and automataö- Peter Liz.

3. õIntroductory theory of Computer Scienceö- V.Krishnamurthy (EWP)

4. õElements of Theory & Computationsö- Lavis and Padadimitron- PHI.

3MCS5 : Lab V - Based on 3MCS1 and 3MCS2

3MCS6: Lab VI - Based on 3MCS3

"Distribution of marks for Computer Lab-V and Lab-VI"

A) Each student shall perform two practicals.

B) Question slip for each examinee shall be attached to the answer book.

C) Marks should be given on the basis of following criteria:

    I) Practical-I   : 30 marks

    II) Practical-II   : 30 marks

    III) Viva-Voce (Each practical 15 marks) : 30 marks

    IV) Record   : 10 marks

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Total   **: 100 marks**

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SEMESTER-IV

4MCS1: Artificial Intelligence and Expert Systems

UNIT-I : **Prolog Programming:** Introduction to turbo prolog, introduction to language, structure of language, cut, fail, recursion, lists and complex structures, interactive programming, expert system in prolog.

Unit II : **Introduction:** Definition of AI, AI technique, tic-tac-toe, pattern recognition, level of the model, criteria for success, problems and problem spaces, defining the problems, production systems, control strategies, heuristic search, problem characteristics, decomposition of problems, solution steps, predictability, absolute and relative solutions.

Unit-III: Basic problem solving methods, reasoning, problem trees and graphs, knowledge representation, matching indexing with variables, heuristic functions, weak methods, problem reduction, constraints satisfaction, means-ends analysis, analysis of search algorithms.

Unit-IV: **Game Playing:** Minimax search procedure, adding alphabeta cutoffs, additional refinements, waiting for quiescence, secondary search, using book moves limitations.

Unit-V : Knowledge representation using predicate logic: representing simple facts in logic, augmenting the representation, structural representation of knowledge: some common knowledge structures, choosing the level of representation, finding the right structure as needed, declarative representation.

Unit VI : **Natural Language Understanding:** Concept of understanding, keyword matching, syntactic and semantic analysis, understanding, language generation and matching translation. General concepts of implementation of AI systems. Introduction to pattern recognition. Rule based systems, semantics of CFL, semantic network, frames, frame kit. Application, introduction to knowledge engineering, artificial neural network: introduction, learning: single and multilayer networks

Books:

1. Artificial Intelligence by Elaine Rich, Mcgrawhill Inc.

2. Artificial Intelligence and Expert Systems - Jankiraman, Sarukesi (M)

3. Expert System: Theory and Practice - Ermine (PHI)

4. Introduction to Turbo Prolog ó Carl Townsend

5. Rule Based Expert System - M. Sasikumar (Narosa)

6. Artificial Intelligence - Russell - Pearson - 1st Text Book

7. Prolog : Prog. for A.I. by Bratko - Pearson

8. Prolog Programming and Applications - Burnhan & Hall

9. ES: Theory and Practice - Ermine - PHI

4MCS2 : Design and Analysis of Algorithms

Unit I : Introduction: algorithm, writing algorithms in SPARKS, structured program, analyzing algorithms, Divide and conquer: The general method, Binay Search, Finding minimum and maximum, merge sort, quick sort, selection sort, Strassenøs matrix multiplication.

Unit II : Greedy Method: The general method, Optimal storage on tapes, Knapsack problem, Job sequencing with deadlines, Optimal merge patterns, minimum spanning trees, Single source shortest path. Dynamic programming: General

method, multistage graph, all pair shortest paths, Optimal binary search trees, 0/1 knapsack , Travelling salesperson problem, flow shop scheduling.

Unit III : Basic Search and Traversal techniques: General method, code optimization, AND/OR graph, game trees, biconnected components and depth first search , Back tracking : General method, 8-queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, Knapsack problem.

Unit IV : Branch and bound: General method, 0/1 knapsack problem, Travelling salesperson, efficiency considerations, Algebric simplification and transformations: General method, evalution and interpolation, fast Fourier transform, modular arithmetic.

Unit V : Lower bound theory: comparison trees for sorting and searching, Oracle and adversary arguments, techniques for algebraic problems, some lower bounds and parallel computation.

Unit VI : NP-Hard and NP-Complete problems: basic concept, cookøs theorem, NP-Hard graph problem, NP-Hard scheduling problem, NP-Hard code generation problem.

Books:

1. Fundamentals of computer Algorithms, E.Horowitz & S.S.Sahani. (Galgotia).

2. A. V. Aho and J.D. Ullman, õDesign and Analysis of Algorithmsö, Addison Wesley

3. Hopcroft , õAnalysis of algorithmö (Addision-Wesely)

4. Coreman: õDesign and analysis of algorithmö (PHI)

5. Aho : õData structure and algorithmö (Addision-wesely)

4MCS3 : Network Security

Unit-I : **Introduction:** Terminology, Notation, Networking Security Attacks, Layers And Cryptography, Authorization, Tempest, Keys, Viruses, Worms, Trojan Horses, Multilevel Model of Security, Legal Issues.

Unit-II : **Cryptography:** Introduction, Breaking an Encryption Scheme, Types of Cryptographic Function, Respective Algorithms, Standards and Modes of Operation, Hashes and Message Digests.

Unit-III: **Authentication:** Overview of Authentication System, Password-based Authentication, Address-based Authentication, Cryptographic Authentication Protocols,

Keys, Trusted Intermediaries, Authentication of People, Security Handshake Pitfalls: Login Only, Mutual Authentication, Integrity / Encryption for Data, Mediated Authentication, Performance Considerations.

Unit-IV: **Standards:** Kerberos V4: Tickets, Kerberos V5: ASN.1, Names, Delegation of Rights, Ticket Lifetimes, Key Versions, Optimizations.

Cryptographic Algorithms, Kerberos V5 Messages, Real Time Communication Security: IPSec: AH & ESP: Overview of IPSEC, IP and IPV6, AH (Authentication Header), ESP (Encapsulating Security Payload).

Unit-V : **E-mail Security:** Distribution Lists, Store and Forward, Security Services for E-Mail, Establishing Keys, Privacy, Authentication of Source, Message Integrity, Non Repudiation, Proof of Submission, Proof of Delivery, Message Flow Confidentiality, Anonymity, Containment. PEM and S/MIME, PGP.

Unit-VI: **Firewalls:** Packet Filters, Application Level Gateways, Encrypted Tunnels, Comparisons. Security Systems: Netware V3, Netware V4, Microsoft Windows Security. Web Issues: URLs/URIs, HTTP, Cookies. Web Security Problems.

Books:

1) Network Security: Private Communication in a Public World, Second Edition : Charlie Kaufman; Radia Perlman; Mike Speciner (Prentice Hall)

2) Network Security Essential by Stallings ó Pearson

3) Cryptography & Network Security by Stallings - Pearson

4MCS4(1) : Mobile Communications

Unit-I : **Mobile Communication:** Applications, History, Market, Simplified Reference Model. Frequencies, Signals, Antennas, Signal Propagation, Multiplexing, Modulation, Spread Spectrum, Cellular System.

Unit-II : **Medium Access Control:** Need, SDMA, FDMA, TDMA, CDMA, Comparison of S/T/F/CDMA. Telecommunication Systems: GSM, DECT, TETRA, UMTS and IMT-2000.

Unit-III: **Satellite Systems:** History, Applications, Basics, Routing, Localization, Handover, Examples. **Broadcast Systems:** Overview, Cyclical Repetition of Data, Digital Audio Broadcasting, Digital Video Broadcasting, Convergence of Broadcasting and Mobile Communications.

Unit-IV : **Wireless LAN:** Infrared Versus Radio Transmission, Infrastructure and Adhoc Network, IEEE 802.11, HIPERLAN, Bluetooth.

Unit-V : **Layers:** Mobile Network Layer: Mobile IP, DHCP, Mobile Adhoc Networks. Mobile Transport Layer: Traditional TCP, Classical TCP improvements, TCP over 2.5/3G Wireless Networks.

Unit-VI: **Support For Mobility:** File Systems, World Wide Web, Wireless Application Protocol, i-Mode, SyncML, WAP2.0.

Books:

1) Mobile Communication: Jochen Schiller (PE)
2) Principles of mobile communication: Gordon L. Stuber (Springer)
3) Wireless Communications: Principles and Practice: Theodore S. Rappaport (Pearson)
4) Mobile Computing: Raj Kamal (Oxford)

4MCS4(2) : Digital Image Processing

UNIT-I : **Introduction:** Definition, Origins, Examples: X-ray Imaging, Ultraviolet Band, Visible and Infrared Bands, Microwave Band, and Radio Band Imaging; Fundamental Steps, Components of an Image Processing System

Digital Image Fundamentals: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, A Simple Image Formation Model; Image Sampling and Quantization; Basic Relationships Between Pixels; Linear and Nonlinear Operations.

UNIT-II : **Image Enhancement in the Spatial Domain:** Basic Gray Level Transformations; Histogram Processing - Histogram Equalization, Histogram Matching (Specification), Local Enhancement; Enhancement Using Arithmetic/Logic Operations; Basics of Spatial Filtering, Smoothing Spatial Filters: Smoothing Linear, Smoothing Order-Statistics Filters; Sharpening Spatial Filters : The Laplacian, The Gradient; Combining Spatial Enhancement Methods

UNIT-III: **Image Enhancement in the Frequency Domain:** Introduction to the Fourier Transform and the Frequency Domain: One-Dimensional Fourier Transform and its Inverse, Two-Dimensional DFT and Its Inverse, Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domains; Smoothing and Frequency-Domain

Filters - Ideal , Butterworth, and Gaussian Lowpass Filters; Sharpening Frequency Domain Filters - Ideal , Butterworth, and Gaussian Highass Filters, Laplacian in the Frequency Domain, Unsharp Masking, High-Boost Filtering, and High-Frequency Emphasis Filtering; Homomorphic Filtering; Implementation: Additional Properties of the 2-D Fourier Transform, Inverse Fourier Transform Using a Forward Transform Algorithm, Need for Padding, Convolution and Correlation Theorems, The Fast Fourier Transform;

UNIT-IV: **Image Restoration:** Model of the Image Degradation/ Restoration Process, Noise Models: Restoration in the Presence of Noise Only Spatial Filtering: Mean, Order-Statistics, and Adaptive Filters; Periodic Noise Reduction by Frequency Domain Filtering: Bandreject, Bandpass, and Notch Filtering; Estimating the Degradation Function - Estimation by Image Observation, Experimentation and Modeling; Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Geometric Mean Filter; Geometric Transformations: Spatial Transformations, Gray-Level Interpolation.

UNIT-V: **Color Image Processing:** Color Fundamentals, Color Models; Pseudocolor Image Processing; Full-Color Image Processing, Color Transformations: Formulation, Color Complements, Color Slicing, Tone and Color Corrections, Histogram Processing; Smoothing and Sharpening, Color Segmentation, Noise in Color Images.

Morphological Image Processing: Preliminaries, Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms: Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening, Skeletons, Pruning; Extensions to Gray-Scale Images.

UNIT-VI: Image Segmentation: Detection of Discontinuities: Point, Line, Edge Detection; Edge Linking and Boundary Detection: Local Processing, Global Processing via the Hough Transform, Global Processing via Graph-Theoretic Techniques; Thresholding: Role of Illumination, Basic Global Thresholding, Basic Adaptive Thresholding, Optimal Global and Adaptive Thresholding, Use of Boundary Characteristics for Histogram Improvement and Local Thresholding, Thresholds Based on Several Variables; Region-Based Segmentation: Region Growing, Region Splitting and Merging.

Books:

1. Gonzalez, R. C. and Woods, R. E. : Digital Image Processing, 2nd/3rd ed., Prentice Hall

2. Sonka, M., Hlavac, V., Boyle, R. : Image Processing, Analysis and Machine Vision (2nd edition), PWS Publishing, or (3rd edition) Thompson Engineering

3. Anil K. Jain : Fundamentals of digital image processing (2nd Edition), Prentice-Hall, NJ

4. Willian K. Pratt : Digital Image Processing (3rd Edition), John Wiley & Sons

4MCS4(3) : Software Testing

Unit-I : **Testing:** Introduction and Outline - Introduction to testing and test outline, sample application, incremental testing approach, outline approach steps, evaluation and schedule estimation.

Unit-II : Introduction to test outline to test cases, creating test cases, documentation short cuts, introduction to using tables and spreadsheets, sample application, Documenting test cases.

Unit-III : Other types of tablets, State machines, test case table with multiple inputs, decision tables, applications with complex data, managing tests, testing object-oriented software, comparison, System testing example, Unit testing of Classes.

Unit-IV : **Testing Web Applications:** Introduction, sample application, functional and usability issues, configuration and compatibility testing, reliability and availability, security testing, database testing, post implementation testing.

Unit-V : **Reducing the No. of test cases:** Introduction, prioritization guidelines, priority category scheme, Risk analysis, interviewing to identify problem areas, combination schemes, tracking selected test cases.

Unit-VI : **Creating Quality Software:** Introduction, development environmental infrastructure, software testing environment, software testing tools, applying software standards to test documentation.

Books:

1. Introducing Software Testing: Louise Tamres (PE)

2. Software Testing in the Real World by Kit ó Pearson

3. Effective methods for software testing ó William E. Perry

4. Foundations of Software Testing ó Aditya P. Mathur

4MCS5: Lab VII - - Based on 4MCS1 and 4MCS2

"Distribution of marks for Computer Lab-VII"

A) Each student shall perform two practicals.

B) Question slip for each examinee shall be attached to the answer book.

C) Marks should be given on the basis of following criteria:

   I)   Practical-I   : 30 marks

   II) Practical-II   : 30 marks

   III) Viva-Voce (Each practical 15 marks)   : 30 marks

   IV) Record   : 10 marks

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   Total   **: 100 marks**

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4MCS6 : Project

The subject of the project will be given to the student independently on any current topic belonging to the subject. The topic should be assigned at the beginning of the semester. The examinee shall be required to produce two typed hard-bound and one soft copy (C.D.) copies of project report signed by teacher in-charge and certified by head of the department as bonafide work of him/her.

Distribution of Marks:

1.   Project Submission   :   40 marks
2.   Project Presentation   :   40 marks
3.   Viva   :   20 marks

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Total   :   100 marks

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