

M.Sc. Sem. I to Sem. IV  
(Microbiology)

Prospectus No. 2017128

संत गाडगे बाबा अमरावती विद्यापीठ

SANT GADGE BABA AMRAVATI UNIVERSITY

विज्ञान विद्याशाखा  
(FACULTY OF SCIENCE)

अभ्यासक्रमिका  
विज्ञान पारंगत परिक्षा (सुक्ष्मजीवशास्त्र)  
सत्र-१ ते सत्र-४

**PROSPECTUS**  
OF  
MASTER OF SCIENCE EXAMINATION  
IN MICROBIOLOGY  
Semester - I & Semester III Winter 2016  
Semester - II & Semester IV Summer 2017



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PUBLISHED BY  
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**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 Improvement 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.

**Dr. Ajay P. Deshmukh**  
 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;

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% 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 directly 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, Veterinary 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, passed 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 employer;
- (e) any other Graduate in Science not eligible under clause (a) (b) or (c) who has not less than one academic year previously, 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 particular term shall be eligible to appear at it, if,
- He / She satisfied the conditions in the table and the provisions thereunder.
  - He / She has prosecuted a regular course of study in the university / college affiliated to the university.
  - 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 satisfactory	The student should have completed the session/semester
M.Sc.Part-I(Semester-I)	The qualifying examination 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-
- Mathematics,
  - Physics,
  - Chemistry,
  - Botany,
  - Zoology,
  - Geology,
  - Statistics,
  - Biochemistry,
  - Microbiology,
  - Electronics (Instrumentation),
  - Geography,
  - Geoinformatics,
  - Remote Sensing & GIS,
  - Environmental Science, and
  - 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 an 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 allotted to each subject and the minimum marks which an examinee must obtain in order to pass the examination shall be as indicated in Appendix--Aø

14. Examinees who are successful 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 University.
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)**

i) M.Sc. Part-I Semester-I	Paper-I	-	50 Marks	Practical-I	-	40 Marks
	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 Semester-II	Paper-V	-	50 Marks	Practical-III	-	40 Marks
	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 Semester-III	Paper-IX	-	50 Marks	Practical-V	-	40 Marks
	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 Semester-IV	Paper-XIII	-	50 Marks	Practical-VII	-	40 Marks
	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 separate 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 existence 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 Honorable 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.

AND

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  
Date : 29/6/2009

Sd/  
(Dr.Kamal Singh)  
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 11<sup>th</sup> Plan of 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 11<sup>th</sup> 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 "Scheme 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 an optional course from the basic subject or specialization.

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 chooses 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 3<sup>rd</sup> 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 ó (Member)
- iii) Three teachers from the affiliated colleges having post graduate courses other than University Department ó nominated by the Vice-Chancellor. (Member)
- iv) Deputy Registrar (Acad) ó (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 Honðble 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	06	04	04	04	12
Internal Assessment	05	05	05	05	20
Project	06	06	06	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	06	9	06	9	18
Lab courses	24	18	18	12	72
Seminar	06	01	01	06	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 Master's 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)
<b>O</b>	<b>90-100</b>	<b>10</b>	<b>Outstanding</b>
<b>A+</b>	<b>80-89</b>	<b>9</b>	<b>Excellent</b>
<b>A</b>	<b>70-79</b>	<b>8</b>	<b>Very Good</b>
<b>B+</b>	<b>60-69</b>	<b>7</b>	<b>Good</b>
<b>B</b>	<b>55-59</b>	<b>6</b>	<b>Fair</b>
<b>C+</b>	<b>50-54</b>	<b>5</b>	<b>Average</b>
<b>C</b>	<b>40-49</b>	<b>4</b>	<b>Below Average</b>
<b>F</b>	<b>Below 40</b>	<b>0</b>	<b>Fail</b>

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 & 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:

$$SGPA = \frac{U_1 \times M_1 + U_2 \times M_2 + \dots + U_n + M_n}{U_1 + U_2 + \dots + U_n}$$

Where  $U_1, U_2, \dots$  are subject credit of the respective course and  $M_1, M_2, \dots$  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:

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

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 evaluation 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. Notwithstanding anything contained in the foregoing, Hon'ble 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  
Date : 2/6/2010

(Dr.Kamal Singh)  
Vice-Chancellor

**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 abbreviation; 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	ISA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
2	ISA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
3	ISA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
4	ISA-4	E	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
5	ISA-5	Lab-I	0	0	0	0	0	100 (03)	40 (04)
6	ISA-6	Lab-II	0	0	0	0	0	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.

**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 abbreviation; 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)	0	0
2	2SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
3	2SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
4	2SA-4 Or 2GIC-X	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
5	2SA-5	Lab-III	0	0	0	0	0	100 (03)	40 (04)
6	2SA-6	Lab-IV	0	0	0	0	0	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.

**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 abbreviation; 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)	0	0
2	3SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
3	3SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
4	3SA-4 Or 3GIC-Y	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
5	3SA-5	Lab-V	0	0	0	0	0	100 (03)	40 (04)
6	3SA-6	Lab-VI	0	0	0	0	0	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-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 abbreviation; 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	4SA-1	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
2	4SA-2	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
3	4SA-3	C	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
4	4SA-4 Or 4GIC-Z	E and/or GIC	80 (04)	32 (04)	20 (01)	08 (04)	40 (04)	0	0
5	4SA-5	Lab-V	0	0	0	0	0	100 (03)	40 (04)
6	4SA-6	Project	0	0	0	0	0	100 (03)	40 (04)

Total Marks : 600; Minimum Total Credits : 26

- 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 in internal assessment then he/she will be declared to have clear 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**

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	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.

**Examination Scheme under C.B.C.S. for 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.

**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.

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

**M.Sc. Part-I  
Semester-IV**

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	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.

**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**

**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**

**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**

**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

S N	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

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	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 Assesment	-	06	-	-	02			-	-	40	4.00		50	50	20 04
		Total		23	14	15	11										

**Total Credits: 35**

**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.

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 existence 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 "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 30<sup>th</sup>, 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.

Amravati  
Date : 21/6/2010

Sd/-  
(Dr.Kamal Singh)  
Vice-Chancellor

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**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 Honorable 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 Honorable 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 "Corrigendum 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 "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 <sup>+</sup>	by	AB
A	by	BB
B <sup>+</sup>	by	BC
B	by	CC
C <sup>+</sup>	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.

Amravati  
Date : 22/8/2011

Sd/-  
(Mohan K.Khedkar)  
Vice-Chancellor

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## 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 Hon'ble 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 1<sup>st</sup> March, 2012 and 18<sup>th</sup> 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 Hon'ble 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 "Corrigendum to Direction No.26/2010 and 39/2011".
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 5<sup>th</sup>, the words and brackets 'Degree of विज्ञान स्नातक (Bachelor of Science)' shall be substituted as 'Degree of विज्ञान पारंगत (Master of Science)'  
 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 (i) and new para (ii) shall be added as follows.

Minimum 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

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 7.49, 5.99 and 5.49 against Sr.Nos.3, 4 & 5 in Column No.2 (CGPA) be substituted by the figures 7.50, 6.00 and 5.50 respectively.  
 (b) Following sub-para be added before the para X  
**Declaration 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-  
 If 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 head.

4. In Direction No.39 of 2011, under para IX), in Table-I & II, under column No.2, i.e. 'Grade Points' and 'Final Grade' shall be substituted respectively as under.

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

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).

Amravati  
 Date : 28/6/2012

Sd/-  
 (Mohan K.Khedkar)  
 Vice-Chancellor

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**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, "Corrigendum to Direction No.25 of 2012, Direction, 2014"
- 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 "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)" be substituted by the lines "**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) only.**"

Date : 3/5/2014

Sd/-  
(Dr.J.A.Tidke)  
Vice-Chancellor  
Sant Gadge Baba Amravati University

**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, "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) Direction 2014."
- 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 "A person who has passed the Degree of Bachelor of Science with Post Graduate Diploma in Computer Science of this University OR" following lines be inserted

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

Date : 3/5/2014

Sd/-  
(Dr.J.A.Tidke)  
Vice-Chancellor  
Sant Gadge Baba Amravati University

**Syllabus Prescribed for  
M.Sc Part I Microbiology (Semester I)**

**THEORY**

Paper I	Microbial Techniques	100 (80 + 20*) Marks
Paper II	Microbial Enzymology	100 (80 + 20*) Marks
Paper III	Microbial Physiology and Photosynthesis	100 (80 + 20*) Marks
Paper IV	Environmental Microbiology	100 (80 + 20*) Marks

**PRACTICAL**

Practical I	Soil Microbiology	100 Marks
Practical II	Analytical Biochemistry and Instrumentation	100 Marks

**M. Sc Part I Microbiology (Semester II)**

**THEORY**

Paper V	Biostatistics, Bioinformatics and Computer Applications	100 (80 + 20*) Marks
Paper VI	Enzyme Technology	100 (80 + 20*) Marks
Paper VII	Microbial Metabolism	100 (80 + 20*) Marks
Paper VIII	Environmental Microbiology and Extremophiles	100 (80 + 20*) Marks

**PRACTICAL**

Practical III	Environmental Microbiology and Biodiversity	100 Marks
Practical IV	Microbial Enzymology, Biostatistics and Computer Applications	100 Marks

**M. Sc Part II Microbiology (Semester III)**

**THEORY**

Paper IX	Molecular Biology	100 (80 + 20*) Marks
Paper X	Virology	100 (80 + 20*) Marks
Paper XI	Fermentation Technology	100 (80 + 20*) Marks
Paper XII	Immunology	100 (80 + 20*) Marks

**PRACTICAL**

Practical V	Fermentation Technology	100 Marks
Practical VI	Immunology and Medical Microbiology	100 Marks

**M. Sc Part II Microbiology (Semester IV)**

**THEORY**

Paper XIII	Biotechnology	100 (80 + 20*) Marks
Paper XIV	Clinical Virology	100 (80 + 20*) Marks

Paper XV	Microbial Technology	100 (80 + 20*) Marks
Paper XVI	Medical Microbiology	100 (80 + 20*) Marks

**PRACTICAL**

Practical VII	Applied Microbiology and Biotechnology	100 Marks
Project	Project Work	100 Marks

**\* Internal assessment marks for theory Paper**

**Notes:**

**The practical schedule of M.Sc. (Microbiology) should be as follows:**

- Each practical in M.Sc. Part I should be of 8 hours duration per week (4 hrs /day for two consecutive days).
- Each practical in M.Sc. Part II (Practical II, project work & I) should be of 8 hours duration per week (8 hrs/days) for two days).
- Atleast 70% practicals should be performing during each semester.
- Examination of each practical should be at least for 10 Hr. (Split over two days)

**M.Sc. Part I (Semester I) (MICROBIOLOGY) EXAMINATION**

**PAPER-I**

**MICROBIAL TECHNIQUES**

- Unit-I** : **Biological Relevance of pH and Buffers:-** The pH depends ionization of amino acids and proteins. Isoionic and isoelectric points. Effects of the pH change on non-protein protoplasmic components. The pH and metabolic reactions involving proton.
- Unit-II** : **Absorption and Emission of Radiation:** Principles laws of absorption of radiation, visible ultraviolet and infrared Spectrophotometry. Absorption spectra, fluorescence, fluorometry, flame photometry, NMR, ESR.
- Unit III** : **Isotopic Tracers techniques in Biology:-** Stable and radioactive isotopes, preparation, labeling, detection and measurement of isotopes. Dilution technique, Kinetics of radioactive disintegration.
- Unit-IV** : **Chromatography:** Paper, Column, thin layer, Gas, Ion exchange and affinity chromatography, Gel filtration.
- Unit-V** : **Electrophoresis:** Moving boundary, Zone (paper, gel etc.) electrophoresis. Immunoelectrophoresis, Isoelectric focussing.

**PAPER-II**  
**MICROBIAL ENZYMOLOGY**

**Unit-I : GENERAL INTRODUCTION :**

- a) Introduction of Enzymology, Various terminologies, Properties of enzymes.
- b) Enzymes as catalyst.
- c) Enzyme activity units.

- Unit II:**
- a) Enzyme isolation and purification - Importance of purification, Methods of Purification and fractionation.
  - b) Criteria of purity of enzymes - Tests of homogeneity.
  - c) Classification, of enzymes - IUB nomenclature.
  - d) Constitutive, Inducible and marker enzymes.

**Unit-III: ENZYME KINETICS:**

- a) Importance of Kinetic Study
- b) Effect of Enzyme concentration on progress curves.
- c) Effect of pH and Temperature.
- d) Effect of Substrate concentration - Concepts of ES complex, Steady state and Rapid state equilibrium kinetics, Derivation of Henry - Michaelis - Menten equation of rectangular hyperbola, Significance of Vmax and Km, Transformation of H.M.M. equation to a straight line equation, Construction of Lineweaver - Burk Plot, Single and Double reciprocal plots, Limitations of H.M.M. equation, Sigmoidal saturation kinetics, Co-operatively of an enzyme, Hill's equation, steady kinetics (Haldane and Briggs equation).
- e) Bisubstrate enzyme kinetics.

- Unit- IV**
- a) Types of inhibitors (reversible and irreversible), Kinetics of enzyme inhibition (competitive, non-competitive, uncompetitive and mixed inhibitors), Graphical presentation of inhibition effects.
  - b) Kinetics of reversible reactions (Haldane's relationship)
  - c) Mechanism of action of lysozyme.
  - d) Enzyme activators, Co-enzymes and Co-factors in enzymatic catalysis.

**Unit-V: MECHANISM OF ENZYME ACTION :**

- a) Concept of enzyme and substrate specificity.
- b) Chemistry of active Centre, chemical modification by active site directed reagents.
- c) Factors affecting catalytic efficiency of enzymes-covalent proximate, orientation, distortion or strain, acid-base and nucleophilic effects.

- d) Various theories of mechanism of enzyme action.
- e) Mechanism of action of lysozyme.

**PAPER-III**  
**MICROBIAL PHYSIOLOGY AND PHOTOSYNTHESIS**

- Unit-I : Membrane Transport :** Structure and organization of biological membranes. Types of cellular transport, Passive, facilitated, Active, Group translocation, membrane bound and binding protein transport systems. Carrier models. Liposomes. Ion transduction NaK<sup>+</sup>, ATPase.

- Unit II: Energy metabolism:** ATP cycle, Free energy, standard free energy change, conventions in biochemical energetic, Calculation of DG. Standard free energy of hydrolysis of phosphate, compounds, Reservoirs of high-energy phosphate groups, Energy rich bonds, Biological energy transducer.

- Unit-III : Bacterial and Mitochondrial respiration:** Respiratory chain in mitochondria and bacteria, Oxidation-reduction enzymes. Respiration linked proton translocation.

- Unit- IV : Oxidative phosphorylation:** Coupling of oxidative phosphorylation to electron transport. Uncouplers, inhibitors, Reactions of oxidative phosphorylation, Mechanisms of oxidative phosphorylation. Chemical coupling, Conformational coupling and chemiosmotic coupling mechanism

- Unit -V : Microbial photosynthesis:** Structure of photosynthetic pigments, Primary photochemistry PS I & PS II and electron transport. CO<sub>2</sub> fixation in bacterial photosynthesis, Anoxygenic and oxygenic photosynthesis, Halobacterial photosynthesis

**PAPER-IV**  
**ENVIRONMENTAL MICROBIOLOGY**

- Unit-I : An Introduction :** Definition of environment, Interaction between environment and biota, Concept of the habitat in biosphere, Food Chain, Ecosystem, Community, homeostasis and ecosystem management.

**Concept of sustainable development of ecosystem:** Definition and Need of Sustainable developments. Role of bacterial technology in achieving sustainable development. Improvement and restoration of barren/degraded land. Pollution control, Renewable source of energy and fuel using microorganisms, biodiversity and its conservation

- Unit-II : **Advancement in Biogeochemical cycles :**  
**Nitrogen cycle :** Symbiotic and non-symbiotic  $\text{N}_2$  fixation, Mechanism of nitrogenase, cross inoculation group and host specificity, energy input/output ratio of  $\text{N}_2$  fixation process in crop production, Biochemistry of Nitrate reduction.
- Unit -III : **Phosphorus cycle :** Significance of  $\text{P}$  element, Occurrence and solubilization in nature, role of phosphobacter and mycorrhizae in crop production.  
**Carbon cycle -** General aspects, generation and decay of detritus  $\text{C}$  compounds, features of plant cell wall polysaccharides, cellulose & lignin degrading microorganisms, mechanism of enzymes and its products. Carbonic anhydrase and its role in carbon cycle.  
**Sulphur cycle -** Significance of  $\text{S}$  compound, microbial sulphur metabolism, sulphur oxidizing bacteria and mechanism, distribution of sulphur bacteria in nature, Biochemistry of sulphate reduction.  
**Selenium cycle -** Significance and occurrence, metabolism, deficiency and toxicity.
- UNIT-IV : **Biochemistry and Microbiology of acid mine drainage:** Process of biochemistry, Iron oxidizing bacteria, Microbiology and Biochemistry of Metal and Metalloid transformation-ecological succession and control. Transformation of mercury, arsenic lead and tellurium. Biotransformation of pesticides.
- Unit V **Biodeterioration :** Concept of biodeterioration. Biodeterioration of Wood, Metal, pharmaceutical products and Stone Work.  
**Bioleaching:** Introduction, application of bacterial leaching, leaching techniques, prospective of bioleaching.

**PRACTICAL-I**  
**Soil Microbiology**

1. Study of antagonism in microorganism from soil.
2. Isolation of soil microorganisms.
3. Isolation, Identification, Enumeration of Nitrogen fixing microorganism from soil, rhizosphere, phyllosphere and root nodule.
  - a) Isolation of *Azotobacter* spp and *Azospirillum*
  - b) Isolation and cultivation of *Rhizobium* from soil and roots nodules.
  - c) Nodulation of legume roots - Leonard jar experiment.
  - d) Isolation of cyanobacteria
  - e) Isolation of phosphobacteria from soil.

4. Estimation of nitrogen by kjeldhal method.
5. Preparation of biofertilizer/Biopesticides, enumeration of titer inoculum
6. Application of bioinoculant through seed, seedling and soil test under pot condition.
7. Isolation and microscopic examination of iron and sulphur bacteria.

**PRACTICAL-II**  
**ANALYTICAL BIOCHEMISTRY AND INSTRUMENTATION**

1. Estimation of sucrose in presence of glucose.
2. Determination of pKa of amino acids.
3. Estimation of proteins by biuret method.
4. Estimation of protein by Folin-Ciocalteu method.
5. Ultraviolet spectroscopy of proteins.
6. Absorption spectrum of p-nitro phenol
7. Paper chromatography of amino acids.
8. Paper chromatography of sugars.
9. Paper chromatography of purine and pyrimidine bases.
10. Separation of proteins by paper electrophoresis.
11. Separation of protein by gel electrophoresis.
12. Separation of pigments by adsorption chromatography.
13. Thin layer chromatography.
14. Estimation of DNA.
15. Estimation of RNA.

**Distribution of marks in University Practical Examination:**

1. Long Experiments	-	15 marks.
2. Short Experiment	-	10 marks
3. Viva-voce examination	-	05 marks
4. Spotting	-	05 marks
5. Practical record book	-	05 marks
6. Internal Assessment	-	10 marks

**Total** - **50 marks**

**M.Sc PART I (MICROBIOLOGY) EXAMINATION**

**(Semester –II)**

**PAPER-V**

**BIostatISTICS, BIOINFORMATICS  
 AND COMPUTER APPLICATIONS.**

**UNIT-I : Biostatistics :**

- a) **Introduction:** Definition of Statistics, Statistical application in Biology, Types of statistics used in biology, sample statistics, test statistics, parametric Vs non-parametric

- b) **Sample and Sampling:** Introduction, selection of sample or sampling, theory-qualitative sample, random sample, non-random sample.
- c) **Graphical distribution of data:** Collection of data, classification of data, tabulation of data, graphic representation of data, diagrammatic representation of data
- d) **Measures of Central tendency:** Measures of central tendency, Mathematical averages, - arithmetic mean, Geometric mean, Harmonic mean, Average mean- Median and Mode.
- e) **Measures of Dispersion:** Definition, Range, Mean deviation, standard deviation, Standard error, Coefficients of variability, degree of freedom, confidence limit.

- Unit II:**
- a) **Test of Significance:** Standard error of mean, standard error of standard deviation, student's t-test, chi-square test.
  - b) **Probability:** Definitions, types of probabilities, Rule of probabilities, Random variable, probability distributions, theoretical probability distributions.
  - c) **Correlation:** Meaning of correlation, Definition, Kinds, properties of coefficient of correlation, method of studying.
  - d) **Regression:** Introduction. Difference between correlation and regression, objects of regression analysis, kinds of regression analysis, linear regression, regression equation, coefficient
  - e) **Vital statistics:** Introduction, definition, methods of obtaining vital statistics, principles, measurements of population, measures of vital statistics, measurements of Mortality, life table.

**UNIT-III : Computer Fundamentals:**

Basics of Computers, In-put and Out-put devices. Computer graphics. PC based software packages, Computer application in Microbiology/ Biology. Computer's role, Modern computers, personal computers, hardware, and software, Internet, Modem, freeware, Usenet, file transfer protocol, HTML, Browsers, Home page, URL, Search Engine, IP address.

**UNIT IV: Bioinformatics :**

- a) Introduction, Definition, Importance, Analytical Approach, Application, Bioinformatics as tool, Role of bio and Cheminformatics in drug designs, Bioinformatics in life sciences, Studying bimolecular structures.
- b) Biological Data base: Sequence database, Nucleic acid database, gene bank, proteins sequence data base, Swiss port, searching sequence data base, non reductant data base, Low annotation data base, specialized sequence data base, structure

data base, motif database, proteome data base, Other data base

- c) Sequence analysis:

**Unit V : Bioinformatics Tools and Application**

- a) Tools for Bioinformatics: Pair wise alignment, Dotplots, scoring matrices, Blosum Matrices, PAM matrix, Gap penalty, Alignment Algorithms EMBOSS,
- b) Proteins structure predictions: Secondary structure predictions, Tertiary structure Prediction, comparative modeling, folds recognition, Ab-initio prediction, Modeler, RASMOL.
- c) Software in Bioinformatics: C/C, BioPerl, Biojava, BioXML, BioCorba, BioPython, BioDas, BioML, Oracle.
- d) Emerging areas in Bioinformatics: DNA microarrays, Functional Genomics, Comparative Genomics, Pharmacogenomics, cheminformatics, Medical informatics, Neural networks, phylogeny, whole cell stimulation, Human genome project.

**PAPER-VI**

**ENZYME TECHNOLOGY**

**Unit-I : MECHANISM OF ENZYME ACTION :**

- a) Enzyme activators, Co-enzymes and Co-factors in enzymatic catalysis.
- b) Concept of enzyme and substrate specificity.
- c) Mechanism of action of lysozyme.

**Unit-II : CONTROL OF ENZYME ACTION :**

- a) Regulation of enzyme activity-Feed-back control, enzyme introduction and repression, covalent modification.
- b) Multienzyme complexes and their significance in metabolic control.
- c) Membrane bound enzyme in metabolic regulation.

**Unit III:**

- d) Isoenzymes and their metabolic significance.
- e) Allosterism - allosteric enzymes and Co-operativity.
- f) Covalently modulated regulatory enzymes.

**Unit IV: COMPARTMENTATION AND IMMOBILIZATION OF ENZYMES:**

- a) Compartmentation of enzyme and substrate and its significance, Shuttle systems.
- b) Naturally occurring Activators, Inhibitors and Co-enzymes.
- c) Methods of enzyme immobilization, Industrial advantages. Immobilized multi-enzyme system.
- d) Kinetics of immobilized enzymes.
- e) Enzyme probes.

**Unit V: ENZYME TECHNOLOGY:**

- a) **Immobilization of Microbial enzymes:** Methods viz, adsorption, covalent bonding, entrapments and membrane confinement and their analytical, therapeutic and industrial application, Properties of immobilized enzymes.
- b) **Enzyme engineering:** Chemical modification and site directed mutagenesis to study the structure, function relationship of industrially important enzymes.
- c) **Application of microbial enzymes:** Microbial enzymes in textile, leather, wood industries and detergents, enzyme in clinical diagnostics, Enzyme sensor for clinical processes and environmental analyses, Enzymes as therapeutic agents.

**PAPER-VII****MICROBIAL METABOLISM**

**UNIT-I : Carbohydrate metabolism :** EMP, ED, HMP, and phosphoketolase pathways in different microorganism. Fate of pyruvate. Gluconeogenesis.

**Tricarboxylic acid cycle:** Discovery, Intracellular location, Reactions of the cycle. Amphibolic nature. Anaplerotic reactions, Glyoxylate pathway.

**UNIT II : Aerobic metabolism of C1 Compounds:** Oxidation of methane, methanol, formaldehyde and formate. Ribulose pathways, Serine pathway, Xylulose monophosphate pathway.

**UNIT-III : Nucleotide metabolism:** Biosynthesis of purine and pyrimidine nucleotides, biosynthesis of deoxyribonucleotides, Regulation of nucleotide synthesis. Catabolism of nucleotides. Formation of coenzyme nucleotides. Inhibitors of nucleotide synthesis.

**UNIT IV Microbial metabolism of aromatic compounds:** Ortho cleavage pathway, meta cleavage pathway, Gentisate pathway, reductive catabolism.

**Catabolism of aromatic amino acids :** Tyrosine, Tryptophan, phenylalanine

**Lipid metabolism :** Biosynthesis of fatty acids, triacylglycerol, phosphoglyceride, sphingomyeline and sphingolipids. Oxidation of saturated and unsaturated fatty acids.

**UNIT-V : Protein metabolism:** Assimilation of inorganic nitrogen, **Biosynthesis of amino acids:** Branched chain amino acids, Aromatic amino acids, Sulphur containing amino acids, Basic amino acids.

**Catabolism of amino acids:** Glutamine, glutamate,

Aspartate, Asparagine, L-alanine, D-alanine, proline, Serine, Glycine, Arginine, polyamines, Valine, Leucine and Isoleucine, Threonine, Lysine, Methionine, Cysteine.

**PAPER-VIII****ENVIRONMENTAL MICROBIOLOGY AND EXTREMOPHILES**

**UNIT-I : Recalcitrant organic compounds and concept of biomagnification:** Definition of recalcitrant organic compounds and their presence in natural ecosystem, concept and consequences of biomagnification, biomagnification of chlorinated hydrocarbons and pesticides. Biodegradation of recalcitrant and toxic chemicals.

**UNIT II : Eutrophication, and its management:** Eutrophication, Microbial changes induced by organic and inorganic pollutants, role of phosphorus and nitrogen in eutrophication, process and control of eutrophication.

**UNIT III : Extremophiles - acidophilic, alkalophilic thermophilic, barophilic and osmophilic microbes - mechanisms and adaptation. Halophiles - membrane variation - electron transport - application of thermophiles and extremophiles.**

**UNIT-IV : Water Microbiology**

a) **Water treatment Process,** Disinfections, kinetics of disinfections, factors affecting disinfecting drinking water, Halogens, (Chlorine, Chloramines, Chlorine di-oxide, Bromine and iodine) ozones, metal ions, Ultraviolet disinfections,

b) **Water distribution systems,**

c) **Concept of indicator organisms,** Total coliform, MTD, MPN, MFT, P-A test, TTC, Fecal coliform, Fecal streptococci, Clostridium perfringens, Heterotrophic plate count, Bacteriophages, other indicator organisms, Standards and Criteria for indicators

**UNIT V Waste water Management:** Introduction to primary, secondary and tertiary treatment, activated sludge process, trickling filters, principles of anaerobic digestion, Methane formation with respect to waste treatment, Oxidation pond and stabilization pond, application of sewage, Aerated lagoons. Biochemistry of nitrate and sulphate reduction with a special reference to waste treatment.

**PRACTICAL-III****ENVIRONMENTAL MICROBIOLOGY AND BIODIVERSITY**

- 1 Isolation of *Salmonella* from polluted water.
2. Isolation of phage from sewage water.

3. Assay of bacteriophages.
4. Demonstration of human enteric viruses.
5. Enumeration of coliform and faecal *Streptococci* by MF/MPN technique.
6. Examination and estimation of water for:
  - a) Ammonical nitrogen
  - b) nitrate
  - c) nitrite
  - d) dissolved oxygen
  - e) chlorides
  - f) sulphates
  - g) Chemical oxygen demand
  - h) biochemical oxygen demand
  - i) phosphates
  - j) calcium
  - k) magnesium
  - l) hardness
  - m) Alkalinity
  - n) solids-total dissolved & suspended
7. Enrichment of chemolithotrophs, methylotrophs, thermophiles, halophiles and acidophiles.
8. Enrichment and isolation of aliphatic hydrocarbon, phenol and parathion degraders
9. Study/Educational tour and submission of report.

#### PRACTICAL-IV

#### MICROBIAL ENZYMOLOGY, BIOSTATISTICS AND COMPUTER APPLICATION

1. Assay of following microbial enzymes.
  - a) Amylase
  - b) Lipase
  - c) Protease
  - d) Invertase
2. Isolation and purification of certain microbial enzymes such as: protease, amylase, invertase by salt fractionation, dialysis, ion exchange.
3. Evaluation of kinetic constants of the purified enzymes.
4. Effect of different parameters on enzymes activity such as:
  - a) pH
  - b) temperature
  - c) time
  - d) Enzyme concentration.
5. Effect of inhibitors on enzyme activity.
6. Fluidized bed column reactor using immobilized whole cell to study catabolism.
7. Immobilization of enzymes.
8. Students seminar and submission of report.
- b) BIOSTATISTICS:**
9. Organisation of data - frequency distribution.
10. Summarization of data -p describing a sample :
  - Measures of central tendency - arithmetic mean, mode, median.(for grouped data)
  - Measures of dispersion - variance and standard deviation.
11. Estimation of confidence interval for a normally distributed population.

12. Hypothesis testing - t-test, chi -square test, F-test.
13. Histograms.
- D) COMPUTER SCIENCE AND BIOINFORMATICS :**
- 14) Computer operations getting acquainted with different parts of computers.  
Handling WINDOWS and Internet, E-mail and Internet. Use of CD ROM for literature search.
- 15) Accessign databases for nucleic acids and proteins.

#### Distribution of marks in University Practical Examination:

1.	Long Experiments	-	15 marks.
2.	Short Experiments	-	10 marks
3.	Viva-voce examination	-	05 marks
4.	Spotting	-	05 marks
5.	Practical record book	-	05 marks
6.	Internal Assessment	-	10 marks
<b>Total</b>		<b>-</b>	<b>50 marks</b>

#### M.Sc PART II (MICROBIOLOGY) EXAMINATION

(Semester –III)

paper-IX

**Molecular biology**

- Unit-I : Nucleic Acids :** Importance of nucleic acid in living systems, general composition of nucleic acids, purine and pyrimidine bases, tautomeric forms of bases, reactions of purines and pyrimidines, structure of nucleosides and nucleotides, deoxynucleotides, cyclic nucleotides and polynucleotides. Watson and Crick model for DNA. Different types of DNA and RNA
- Unit- II DNA Replication:**
- i) Enzymes of DNA replication in prokaryotes and eukaryotes, replication mechanisms in prokaryotes, eukaryotes, and phages.
  - ii) DNA repair mechanism
- Unit-III: a) Genetic recombination:** Mechanism of genetic recombination, Transformation, Transudation, Conjugation and Transposable elements
- b) Genetics and Molecular organization:** Genes concept, genome, Multigene families, Pseudogenes, split genes, overlapping genes, genetic code

- d) **Gene mutation:** Insertion deletion, frame shift and suppressor mutation, chemical and physical agents

**Unit-IV: Protein Synthesis:**

- a) **Transcription:** RNA polymerases in prokaryotes and eukaryotes, process of transcription, concept of promoters and promoters types, enhancers and silencers and other regulatory elements, post transcriptional processing of tRNA, mRNA and tRNA, transcripts. Post transcriptional modification, spliceosome assisted and self-splicing of RNA transcripts. RNA dependent synthesis of RNA and DNA.
- b) **Translation:** Protein synthesis, Translational process and control of translation, post-translational modification (covalent modification, phosphorylation, glycosylation, mythelation etc. protein targeting and degradation, non-ribosomal polypeptic synthesis Processing of RNA.

**Unit-V : Regulation of gene expression:** Gene regulation in prokaryotes - operon concepts (Lac operon and trp, arabinose operon), Negative & Positive Control, Sigma factor, Post translational regulation, etc.

**Gene regulation in eukaryotes-** Regulation at transcriptional and translational level, by gene rearrangement

**PAPER-X  
VIROLOGY**

- Unit-I :**
- a) **Introduction to Virology:** Historical aspects: nature of viruses; origin and evolution of viruses, terminology, differentiation with other microorganisms.
- b) **General properties of Viruses:** Morphology, size, host specificity, viral structure, shape, Chemical properties, Susceptibility to physical and chemical agents, Viral Haemagglutination,
- c) **Replication:** Mechanism of virus adsorption and entry into host cell including genome replication, and m-RNA production by animal virus, mechanism of RNA synthesis, mechanism of DNA synthesis, transcription mechanism and post transcriptional processing, translation of virus, protein s, assembly, exit and maturation of progeny virions, multiplication of Bacteriophages.
- d) Viral assay, viral genetics, Nomenclature of viruses.

**Unit- II : Virus-host Interaction:** Epidemiology, pathogenesis, Host response to virus Infections, Laboratory diagnosis of viral infection, Immunoprophylaxis, chemophylaxis and chemotherapy of viral diseases.

**Interferons and Antiviral Agents:** Definition, types of interferons; Nomenclature and classification of interferon. Types of inducer, induction of interferon. Antiviral effect of interferon; Molecular basis of antiviral state: Antiviral protein(s) (AVPS): ds RNA dependent pathways and ds RNA independent pathways. Interference not mediated by interferon (intrinsic factors).

**UNIT III : Laboratory Diagnosis of Viral Infections:** Microscopy, Cultivation of Viruses: Animal inoculation, chick embryo and tissue-cultures (MKC, Human Embrogenic Kidney cell culture, Human Amnion cell culture). Serology, detection of viral proteins and genetics material

**UNIT IV : Structure, Pathogenesis, Laboratory Diagnosis & immunology of viruses:** Pox virus, Herpes viruses, Adenoviruses Picorna viruses,

**UNIT V : Structure, Pathogenesis, Laboratory Diagnosis & immunology of viruses:** Orthomyxoviruse, Paramyxoviruses, Arboviruses, Rubella, Arenaviruses, Rabdoviruses, Hepatitis virus. **Miscellaneous virus**

**PAPER-XI**

**FERMENTATION TECHNOLOGY**

**UNIT-I : Bioreactors:** Design and type of fermentors, unit operation and techniques, batch and continuous fermentations, evolution of bio-kinetics constants. Significance of bio-kinetic constants, Computer control of fermentation process.

**UNIT II :a) Industrial production:** Penicillin, streptomycin, and tetracycline.

- b) **Anticancer drug:** interferons, anthracycline, L-apspariginas es. Biotechnological application for the production of rare biological molecules, antibiotics, vaccines, steroids, hormones and diagnostic kits

**Unit-III : Food and beverage production.**

- a) Cottage & cheddar cheese, Yoghurt and *Dahi*
- b) Mycotoxin production
- c) Oriental food fermentations: 1) Koji 2) Soya Sauce 3) Miso,
- d) Single cell proteins, mycoproteins.
- e) Types of different alcoholic beverages and production of whisky.

**UNIT IV: Food Technology:**

- a) Starter culture for food industries,

- b) Production and preservation of following fermented foods:
- Soya souse fermentation by moulds,
  - Fermented vegetables ó Sauerkraut
  - Fermented Meat ó Sausages
  - Production and application of Bakers Yeast
  - Application of microbial enzymes in food industries.
- c) Food borne infection and intoxications, bacterial with examples of infective and toxic types: *Clostridium*, *Salmonella*, *Shigella*, *Staphylococcus*, *Compylobacter*, *Listeria*.
- d) **Quality assurance:** Microbiological quality of standard of food, Government regulatory practices and policies. FDA, EPA, HACCP, ISI.

**Unit-IV: A) Biomass Production :**

- i) **Bacterial biomass- production:** a) *Bacillus megatherium* b) *Acinebacter cerificans*.
- ii) **Fungal biomass production:** *Paecilomyces varioti* by Pekilo process & *Candida utilis* from hydrocarbon.
- B) Prebiotics and probiotics**
- Importance of probiotics
  - Sources of Prebiotics
  - Probiotics organisms
  - Desirable characteristics
  - Benefits of probiotics consumption

**PAPER-XII**  
**IMMUNOLOGY**

- Unit-I :** **Basic Immunology-** Anatomic organization of the immune system cell types and organs. Effect of mechanisms involved in specific and nonspecific immune mechanisms. characters. Immune Response- primary, Secondary, Immunological memory.
- Unit- II** **Antigens, and Immunogenicity,** variation in antigenic Antibody and Immunoglobulins- Structure and functions of IgG, IgA, IgM, IgD, & Ig E., Antigen-Antibody reactions.
- Unit-III :** **Clinical Immunology** - Complement system; classic and alternate pathways and functions,. Cell mediated immunity. Immunological tolerance and Immunosuppression. Tumors Immunological. Autoimmunity and Autoimmune diseases,
- Unit- IV :A)** Hypersensitivity, Immune deficiency diseases, MHC class Molecules.

- B) Conventional vaccines, peptide vaccine, subunit vaccine, genetically engineered vaccines, production and application of lymphokines. Antibody diversity, Immunogenetics.

**Unit-V : Immunobiotechnology & Hybridoma Technology:**

Immuni zation of animals, isolation of stimulated spleen cells, myeloma cell lines used as fusion partners, fusion method, detection and application of monoclonal antibodies,

**PRACTICAL-V**  
**APPLIED MICROBIOLOGY**

**a) Applied microbiology**

- Isolation of antibiotic producing organism from soil.
- Microbiological assay of antibiotics and purification by ion-exchange resin.
- Determination of k<sub>la</sub> for fermenter.
- Preparation of yoghurt, koji, cheese. Idli
- Preparation of Flavor and aroma.
- Solid state fermentation of some product.
- Microbiological assay of amino acids .
- Microbiological assay of vitamins.

**b) Plant tissue culture:**

- Preparation of media for plant cell culture.
- Callus from explants.
- Haploid cell culture.
- Proto-plast culture.
- Educational tour and submission of report.

**PRACTICAL-II**  
**IMMUNOLOGY AND CLINICAL MICROBIOLOGY**

- Diagnostic methods for isolation and Identification of pathogenic microorganisms from the following specimens:  
(a) Blood (b) Urine (c) Cerebrospinal fluid (d) Throat (Swabs)  
(e) Sputum (f) faeces (g) Pus and wound (infection) fluid.
- Isolation and identification of following pathogenic bacteria:**  
(a) *Staphylococcus aureus* (b) *Streptococcus pyogenic*  
(c) *Streptococcus pneumonia* (d) *Salmonella typhi* and *paratyphi*  
A.B.C. (e) *Shigella* Species (f) *Escherichia coli* (g) *Proteus vulgaris*  
(h) *Pseudomonas aeruginosa* (i) *Vibrio cholera* (j) *Mycobacterium tuberculosis* (k) *Clostridium titanicae*
- Serology:**  
a) VDRL Test b) RPR test c) Kahn test d) Widal test  
e) C-Reactive protein f) Anti streptomycin-o g) R.A. Factor

- h) ELISA test i) Surface visual B-96 test (ELISA)  
j) Latex agglutination test (pregnancy test)
- 4. Diagnostic Immunology:**
- Double diffusion methods of ouchterolony
  - immunoelectrophoresis
  - Quantitative determination of plasma protein by immunoelectrophoresis.
  - Single radial immunodiffusion.
  - Estimation of antigen-antibody response by immunodiffusion technique.
  - Estimation of antigen- antibody response by immunoelectrophoresis.
- 5. Preparation of monoclonal antibodies.**
- 6. Hematology:**
- Estimation of HB, b) PCV c) Blood cell counts W.B.C. & R.B.C.
  - ESR e) blood smear examination f) bleeding time g) clotting time
  - prothrombin time i) prothrombin determination j) Lab. diagnosis of leukaemias.
- 7. Study of medical Parasitology:**
- E. histolytica* b) *Trypanosomes*
  - Leishmania and d) Plasmodium
- 8. Stool Examination for:**
- Ova, cysts of intestinal parasite blood cell and pus cells b) Occult blood, c) Characteristics of the stool in amoebic and bacillary dysentery.
- 9. Antibiotic and chemotherapeutic agents:**
- Antibiotic sensitivity test.
  - Assay of antibiotic level in the body fluids.
- 11. Routine examination of urine.**
- 12. Student seminar and submission of report.**

**Distribution of marks in University Practical Examination:**

1. Long Experiments (At least two)	-	15 marks.
2. Short Experiments	-	10 marks
3. Viva-voce examination	-	05 marks
4. Spotting	-	05 marks
5. Practical record book	-	05 marks
6. Internal Assessment	-	10 marks
<b>Total</b>	-	<b>50 marks</b>

**M.Sc Part II (Semester IV)**

**Paper XIII**

**BIOTECHNOLOGY**

**Unit-I : Genetic Engineering**

- Enzymes used in recombinant DNA technology:** Endonucleases, ligases, Enzymes to modify DNA molecules.
- Vectors:** Plasmids, plant vector, bacteriophages, cosmids, phagmides, animal viruses, plants viruses, special vectors.

**UNIT II : Genes cloning in prokaryotes & Eukaryotes:** Isolation of gene, Methods of gene transfer, Selection and screening of recombinant DNA, nucleic acid hybridization and dot curves, southern, northern and western blotting techniques, dot and slot blots, colony hybridization.

**UNI III : Cloning strategies:**

- Cloning from m-RNA and genomic DNA, synthesis of gene, gene probes, gene banks, gene libraries, mapping of gene, DNA sequencing, RFLP, DNA finger printing, site direct mutagenesis.
- Polymerase chain reaction & gene amplification.

**Unit-IV : Plant Biotechnology:**

- Culture media and plant cell culture
- Tissue culture, micropropagation and somaclonal variation
- Production and use of haploid cell culture
- Protoplast culture, regeneration and somatic hybridization
- Gene transfer method in plants, transgenic plants and animals.

**Unit-V : Application of Biotechnology:**

- Application in agriculture, plants and animal improvement.
- Enzyme biotechnology
- Protein engineering, immunotoxins and drug designing
- Metabolic engineering for over production of metabolites.
- Use of microbes in industry and agriculture
- Application to medical sciences, gene therapy, genetic counseling, diagnosis of diseases and phenomenon of ageing.
- Control of environmental pollution, recovery of minerals and restoration of degraded lands

**PAPER-XIV****CLINICAL VIROLOGY**

- Unit-I :** **Plant Viruses:** Classification, life cycle and replication of tobacco mosaic virus (TMV), PVX, PVY, CMV, TSWV, CaMV, Cynophages, Mycoviruses
- Unit-II :** **Bacterial Viruses:** Life cycle, Structure and replication of following RNA and DNA phages: Ox 174 phage, T4 phage; Lambda phage. (Lyric and glycogenic Cycle); Ft phage; MS2, f2, QB phages and Mud phage and O6 phage.
- Unit- III :** a) **Oncogenic Viruses (Tumor Viruses) :** Classification of viruses characteristics of virus transformed cell or tumor cell.  
i) DNA - Containing Tumor Viruses :  
ii) RNA - Containing Tumor Viruses : Retroviruses (oncornaviruses) .
- Unit- IV :** a) **AIDS viruses: Retro viruses, HIV**
- Unit- V :** **Viroids and Prions.**

**PAPER-XV****MICROBIAL TECHNOLOGY**

- Unit - I :** Isolation and screening of microorganisms, maintains of isolates/ strains, Inoculum developments, sterilization, strain improvement, process development, Downstream processing, In situ recovery of products. General scale up procedure  
Solid-state fermentations  
Manufacturing cost estimation  
Principal and general consideration in down stream processing.
- Unit-II:** a) **Fermentation of acids:** Aspartic acid, L glutamic acid and Gluconic acid.  
b) **Modern trends in Microbial Productions:** Bioplastic (PHB, PHA) Biopolymer (Dextran, alginates, xanthan, Pullulan)
- Unit- II** **Fermentation Of enzymes and Amino acids:** Amylase, Protease. Riboflavin, cyanocobalamine,
- Unit- III :** **Enzyme biotechnology:** Immobilization of enzymes - (glucose -isomerase) Methods, bioreactors and application in industry. Enzyme electro catalysis. Biosensors- Bioelectodes, Optrons, Immunological biosensors.
- Unit-IV :** **Fuel Biotechnology:** Biofuels, Energy crops, Biogas, Bioethanol, Biobutanol, Biodiesel, Biohydrogen.

**Unit- V : Biofertilizers and Biopesticides.**

- a) Basic concept: PSM, N<sub>2</sub> Fixer, S-solubilizers etc, K-solubilizers  
b) Biomass production  
c) Formulation (Carrier based, dried, liquid, and mixed inoculum)  
d) Application methods  
e) Inoculation quantity concept.  
f) Biopesticides: Bacterial, fungal, viral etc.  
g) Biocontrol mechanism,  
h) Preparation and application of Biopesticides

**PAPER-XVI****MEDICAL MICROBIOLOGY**

- Unit-I :** **Pathogenic bacteria and laboratory diagnosis:**  
*Staphylococci, Streptococci including pneumococci, Mycobacterium tuberculosis and M. leprea*
- Unit-II** **Pathogenic bacteria and laboratory diagnosis:**  
*Escherichia, Klebsiella, Proteus, Salmonella, Shigella, Pseudomonas, Bordetella, Haemophilus, Vibrio, Campylobacter, Treponema, Borrelia, Leptospira, Corynebacteria, Mycoplasma and Rickettsia.*
- Unit-III** **Pathogenic fungi and their laboratory diagnosis:**  
*Microsporium, Trichophyton, Epidermophyton, Candida albican, Cryptococcus neoformans, Blastomyces dermatitidis and Histoplasma capsulatum.*
- Unit- IV** **Parasites and their laboratory diagnosis:**  
*Entamoeba histolytica, Leishmania donovani, Trypanosoma spp., Plasmodia species, Taenia saginata, Taenia solium Echinococcus granulosus, Hymenolepsis nana, Ascaris lumbricoides, Enterobius vermicular and Wuchereria bancrofti.*
- Unit V :** **Clinical Microbiology:** Normal microbial flora of human body, sore throat and pneumonia, UTI, Diarrhaial diseases, Meningitis, Bacterimia, septicimia, Infective Endocarditis, PUO, STD, Hospital acquired infections, , Prophalalytic imuunization, antimicrobial therapy, Antimicrobial sensitivity testuing, Hospital waste management, Vechicals and vectors.

**PRACTICAL-VII****APPLIED MICROBIOLOGY AND BIOTECHNOLOGY  
RECOMBINANT DNA TECHNOLOGY**

- 1) Agarose gel Electrophoresis
- 2) Restriction Digestion of DNA
- 3) DNA Ligation
- 4) DNA Molecular size Determination
- 5) DNA Fingerprinting
- 6) Southern hybridization
- 7) Restriction Mapping
- 8) In vitro Transcription
- 9) Southern Blotting
- 10) Northern Blotting
- 11) Plasmid preparation
- 12) Genomic DNA isolation.
- 13) Gene Cloning
- 14) Bacterial Gene expression.
- 15) Bacterial Transformation
- 16) Bacterial Conjugation
- 17) Bacterial Transduction
- 18) Whole Blood DNA extraction.
- 19) Educational tour and submission of report.

**Project work (Marks 50)****Distribution of marks in University Practical Examination:**

1. Long Experiments (At least two)	-	15 marks.
2. Short Experiments	-	10 marks.
3. Viva-voce examination	-	05 marks
4. Spotting	-	05 marks
5. Practical record book	-	05 marks
6. Internal Assessment	-	10 marks
<b>Total</b>	<b>-</b>	<b>50 marks</b>

**Distribution of marks in Project work Examination:**

1. Valuation project	-	40 marks
1. Internal Assessment	-	10 marks
<b>Total</b>	<b>-</b>	<b>50 marks</b>

**Project Work -****Examination of Project Work :**

1. The examination should be held at the centres of practical examination.
2. There shall be panel of examiners including Head of the department and the Supervisor of the Student.
3. There should be at least 2 to 3 external examiners for a batch of up to 10 Students or 3 to 5 external examiners for a batch of more than 10 Students.
4. The Students should submit the project reporty within 20 days after the last/final theory paper in University examination.
5. The date of Viva-voce examination on project work should be within the 30 days after the completion of theory examination

**Distribution of marks in Project work examination:**

1. Evaluation of Project	20 marks
2. Viva--voce (Jointely by internal and external examiners)	20 marks
3. Internal Assessment	10 marks
<b>Total</b>	<b>50 marks</b>

**Books recommended for M.Sc. Part-I & Part-II (Microbiology)**

1. Biophysical Chemistry - Upadhyay & Nath (Himalaya Pub.)
2. Practical Biochemistry - Plummer (TMH Pub.)
3. Principal of Biochemistry - Lehninger (CBS Pub.)
4. Practical Biochemistry - Jayraman (Wiley Estern Pub.)
5. Physical Biochemistry - Morrison (Oxford)
6. Enzyme - Dixon & Webb
7. Fundamentals of Enzymology - Lewis (Oxford)
8. Bacterial metabolism - A.H. Rose
9. Biochemistry - West & Toad
10. Out line of Biochemistry - Corn & Stump. (Wiley Eastern Pub.)
11. Soil Microbiology - Alexander (Wiley Eastern Pub.)
12. Genes VIII - Lewin (Oxford)
13. Element of Biotechnology - P.K. Gupta. (Rastogi Pub.)
14. Fundamentals of Biotechnology - Purohit & Mathur (Agro Bot. Pub.)
15. Essentials of molecular biology - Freifelder D. (Narosa Pub.)
16. A textbook of biotechnology - Duby (S. Chand Pub.)
17. Molecular Biology - Freifelder D. (Narosa Pub.)
18. Microbial Genetics - Freifelder D. (Narosa Pub.)

19. Text Book of Molecular Biology - Shastry & Other (Macmillan)
20. Hand Book of Tissue Culture (ICAR Pub.)
21. A textbook of Biotechnology - H.D. Kumar (E.W. pub.)
22. Basic Biotechnology Rev. Iganacimuthu (TMH Pub.)
23. Plant viruses - Mandahar (S. Chand & Co.)
24. Microbiology Lewis. (Harper)
25. Microbiology - Fundamentals & Application - Purohit. (Agro Botanical Pub.)
26. Industrial Microbiology - Casida (Wiley Eastern pub.)
27. Press Scott and Dunnø Industrial Microbiology.
28. Microbiology - Anantnarayan & Panikar (Orient Longman)
29. A text book of Microbiology, ô P. Chakraborty (Central Pub.)
30. Medical Microbiology - Ichhapunani & Bhatia (J.P. Brothers)
31. Essential of Medical Mycology - Evans & Genitals (Churchill and Livingston)
32. Genetics by Strickbeger (Prentice Hall)
33. A short textbook of recombinant DNA technology Watson. (Black Well)
34. Molecular Biotechnology - Prime Rose - (Black Well.)
35. Immunology by Shetty - (Wiley Eastern Pub.)
36. Molecular biology of genes. Watson - (Begamin Cumming))
37. Recombinant DNA technology - Rodriguez (Begamin Cumming)
38. Advances in molecular genetics. Puhlar. (Begamin Cumming)
39. Molecular cloning - A lab manual. (Cold spring harbor lab pub.)
40. Concept of molecular biology - Rastogi (Wiley Eastern Pub.)
41. Genetic Engineering - Sandhy Mitra (Macmillan)
42. Elementary Microbiology Vol. I Vol. II (Fundamental of microbiology and microbial world) Ed. by H.A. Modi. (Akta Prakashan)
43. Applied microbiology. Ed. by H.A. Modi. (Akta Prakashan)
44. Environmental Microbiology. Ed. by H.A. Modi (Akta Prakashan)
45. Fundamentals of Dairy Microbiology by J.B. Prajapati (Akta Prakashan)
46. Bio-Fertilizer. By Vyas & Modi (Akta Prakashan)
47. Biochemistry. By D. Das (Academic Pub.)
48. Biophysics & Biophysical Chemistry. By D. Das. (Academic Pub.)
49. Modern Immunology. By A. Das Gupta (Jaypee Pub.)
50. A textbook of microbiology by P. Chakraborty (New Central Book Agency)
51. Principal of gene manipulation by Old & Prim Rose (black well pub.)
52. Agricultural microbiology by Rangaswami & Bagyaraj (PHI)

53. An introduction to recombinant DNA by A.E.H. Emery (ELBS)
54. Concepts in Biotechnology by D. Bakasubramuniam and other (University Press.)
55. Introduction to genetics Engineering by D.S.T Nicholl (Cambridge)
56. Genetics by P.K. Gupta (Rastogi Pub.)
57. Genetics by Sandhya Mitra (TMH)
58. Applied plant biotechnology by Iganacimuthu (TMH)
59. Immunodiagonostics S.C. Rastogi (Wiley Eastern Pub.)
60. Immunology by Roitt. (Black well)
61. A textbook of Microbiology. R.C.Dubey and D.K.Maheshewari. (S.Chand & Company)
62. Genetics - A.V.S.S. Sambamurty (Narosa Pub.)
63. Concept of Molecular Biology. P.S. Varma & V.K. Agrawal. (S.Chand & Company)
64. General Microbiology S.B. Sullia and S. Shantharam. (Oxford & IBH)
65. Modern Concept of Biotechnology. H.D.Kumar (Vikas Pub.)
66. Fundamentals of Enzymology - Price and Steven (Oxford Sci.Pub.)
67. Gene VII - Lewis (Oxford Science Publication)
68. Molecular Cell Biology, Berk, Lipursky, Baltimore, Darnell and Matsudaira (W.H. Freeman and Company)
69. Biotechnology - Rhem and Reead
70. Standard method s of Biochemical analysis - S.R. Thimmaiah (Kalyani Publisher).
71. Laboratory Manual of Bacterial Genetics - Institute of Microbial Technology - Chandigarh.
72. A textbook of Industrial Microbiology - Wulf Crueger and Annekiese Cruger (Panima Publishing Corporation)
73. An Introduction to electrophoresis - K. Anbalgan (The Electrophoresis Institute, Salem Dist.S. India.)
74. Waste water microbiology - Gabrian Bitton (John Wiley & Sons)
75. Environmental Microbiology - Ralph Mitchell (John Wiley and Sons).
76. Microbial Biotechnology - Fundamentals of applied Microbiology - Alexander N. Glazer, and Hiroshi Nikoidu (W.H. Freeman and Company)
77. Gene structure and expression - John D. Hawkins (Cambridge University Press)
78. Biotechnology - John G. Smith, (Cambridge University Press)
79. Plant Biotechnology - S. Ignacimuthu S.J. (Oxford and IBH, New Delhi)
80. Advanced molecular biology - R.M.Twyman (Viva book Pvt.Ltd.)

81. Introductory Microbiology - J.Heritage, E.G.V. Evans and R.A.Killington (Cambridge University Press)
82. General Microbiology - Schiegel (Cambridge University Press)
83. Gene Structure - Hawkins (Cambridge University Press)
84. Modern Concepts of Biotechnology - H.D.Kumar, (Vikas Publishing Pvt.Ltd.)
85. A textbook of Microbiology - R.C.Dubey and D.K.Maheshewari (S.Chand & Company)
86. Biotechnology - Applications and Research - Edited by Paul Cheremisinoff and Robert Ouellete (Technomic Pub.Co.Inc.)
87. Basic and Clinical Immunology - Daniel Stites, Abba Terr & Tristram Parslow (Prentice Hall International INC)
88. A Text Book of Biochemistry with Clinical correlation - Edited by Thomas Devlin (John Wiley and Sons, INC).
89. Microbiology Laboratory - Fundamentals and Application, George Wistreich (Prentice Hall)
90. Microbiology - A Laboratory Manual - James Cappucino and Natalic Sherman (The Benjamin / Cummings Pub.Co.Inc.)
91. Foundations in Microbiology - Kathleen Talaro & Arthur Talaro (Wm.C. Brown Publishers)
92. Principles of Microbiology - Ronald Atlas Mosby.
93. Fundamentals of Microbiology - Alcamo (Benjamin / Cummings Pub.Co.Inc.)
94. Sale and Molecular Biology - Concepts and experiments - Gerald Karp (John Wiley and Sons, INC).
95. Cellular and Molecular Immunology - Abul Abbas, Andrew Lichman & Jordan Pober (W.B.Saunders Co.)
96. Biochemistry-Zubay (Wm C.Brown Publishers)
97. Life-An Introduction to Biology - Beck, Liem & Simpson (Harper Collins Publishers)
98. Genetics - A. V.S.S. Sambamurthy (Narosa Publication)
99. Water Pollution - V.P.Kudesia, (Pragati Prakashan Meerut)
100. Physicochemical Examination of Water, Sewage and Industrial waste - N. Maniwasakam (Pragati Prakashan, Meerut)
101. Textbook of Biochemistry - O.P.Agrawal, G.R.Agrawal (Goel Publishing House, Meerut)
102. Textbook of Medical Mycology - Jagdish Chander (Interprint, New Delhi)
103. An introduction to Plant tissue and Cell culture - N.C.Kumar (Emkay Publication Delhi)
104. Short Protocols in Molecular Biology - Edited by Ausubel, Brent, Kingston, Moore, Seidman, Smith and Struhl (John Wiley and Sons)

105. Molecular Cell Biology - Darnell, Lodish and Baltimore, (Scientific American Books)
106. Technological Applications of Biocatalysts - Published on behalf of Open University and University of Greenwich (Butterworth-Heinemann).
107. Microbiology-Principle and Explorations - J.G.Black (John Wiley and Sons)
108. Techniques for engineering Genes - Published on behalf of Open University and University of Greenwich (Butterworth-Heinemann).
109. Biotechnological Innovations in Energy and Environmental management - Published on behalf of Open University and University of Greenwich (Butterworth-Heinemann).
110. Medical Microbiology- Mims, Playfair, Roitt, Wakelin and Williams (Mosby)
111. Principles of Enzymology for the Food Sciences (John Whitaker, Marcel Dekker, Inc.)
112. Biostatistics - A Foundation for analysis in Health Sciences - W.D.Daniels, John wiley and Sons.
113. Basic Statistics - C, Dunn
114. How Computers Works - Ron White, Techmedia.
115. How the Internet works - Preston Gralla, Techmedia.
116. Bioinformatics - 1998 - Baxevanis
117. Bioinformatics - 2000 - Haggins & Taylor OUP.
118. Fundamentals Biostatistics- Sadguru Prakash, Emkay Publication, New Delhi.
119. Bioinformatics for Beginners - Dr.K.Mani & N. Vijayraj (Kalai Kathir Achchagani Pub. Coimbatore)
120. Instant Notes - Bioinformatics - West head, Parish and Twyman (Viva Publication) New Delhi.
121. Schaum's Outlines - Biochemistry, Kuchel & Ralston (TMH Edition)
122. Schaum's outlines - Microbiology (TMH Edition)
123. Schaum's outlines - Molecular and cell Biology (TMH Edition)
124. Principles of Genetics - R.H.Tamarin (TMH Edition)
125. Biotechnology DNA - Protein A Laboratory project in molecular Biology. Thiel, Bissen & Lyons (TMH Edition)
126. General Enzymology, Kulkarni and Deshpande, Himalaya Publishing House.
127. Modern Approaches to Soil and Agriculture and Environmental Microbiology, Shiva Aithal and Nikhilesh Kulkarni, Himalaya Publishing House.

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