DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY

CIRCULAR NO. ACAD / NP /S.E./B.E./Syllabi/88/2012

It is hereby notified for the information of all concerned that, the Academic Council at its meeting held on 06-07-2012 has accepted the **syllabi** in following Branches **of SECOND YEAR ENGINEERING** under the Faculty of Engineering & Technology as appended herewith :-

Sr. No.	Revised Syllabi
[1]	Second Year B.E. [CIVIL ENGINEERING],
[2]	Second Year B.E. [MECHANICAL / PRODUCTION ENGINEERING],
[3]	Second Year B.E. [COMPUTER SCIENCE ENGINEERING & I. T],
[4]	Second Year B.E. [ELECTRICAL ENGINEERING /EEP / EE / EEE],
[5]	Second Year B.E. [BIOTECHNOLOGY],
[6]	Second Year B.E. [INSTRUMENTATION],
[7]	Second Year B.E. [ELECTRONICS [EC / ECT / IE / E & C].

This is effective from the academic year 2012-2013 and onwards.

All concerned are requested to note the contents of this circular for their information and necessary action.

University Campus,
Aurangabad-431 004.
REF.NO. ACAD/ NP/ S.E.B.E./
2012/19033-55
A.C.S.S. I.No.81

Date:- 31-07-2012.

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Director,
Board of College and
University Development.

Copy forwarded with compliments to :-

1] The Principals, affiliated concerned Colleges,
Dr. Babasaheb Ambedkar Marathwada University.

Copy to :-

1] The Controller of Examinations,
2] The Superintendent, [Engineering Unit],
3] The Superintendent, [Eligibility Unit] ,
4] The Record Keeper,
Dr. Babasaheb Ambedkar Marathwada University.

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S/310712/-*

Dr BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD

Revised Structure and Syllabus of Second Year Engineering of

BIOTECHNOLOGY

EFECTIVE FROM - 2012-13 & ONWARDS

RULES AND REGULATIONS

FOR

SECOND YEAR DEGREE COURSE IN ENGINEERING (REVISED)

(Applicable from the Academic Year 2012- 2013)

Note:

1. All the Rules and Regulations, hereinafter specified shall be read as a whole for the purpose of interpretation.

ADMISSION

1. Admission to second year engineering shall be carried out as per the rules and regulations prescribed by the competent authority as appointed by the Government of Maharashtra and Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, from time to time.

DURATION AND COURSES OF STUDY

1. The duration of the course is four years. Each of the four academic years shall be divided into two semesters herein after referred to as the semester I and semester II in chronological order. Each semester shall comprise

   Instructions ..... 15 weeks
   Preparation holiday ..... 2 weeks or 15 days
   (Includes practical exams)

2. Candidate who fails to fulfill all the requirements for the award of the degree as specified hereinafter within eight academic years from the time of admission, will forfeit his/her seat in the course and his/her admission will stand cancelled.

RULES AND REGULATION OF ATTENDANCE

1. Candidates admitted to a particular course of study are required to pursue a "Regular course of study" as prescribed by the University before they are permitted to appear for the University Examination.
2. "A regular course of study" means putting in attendance not less than 75% for individual subject.
3. a) In special cases and for sufficient causes shown, the Principal of the institute may, on the specific recommendation the Head of the Department, condone the deficiency in attendance to the extent of 15 % on medical ground subject to submission of medical certificate.

   b) However, in respect of women candidates who seek condonation of attendance due to pregnancy, the Principal may condone the deficiency in attendance to the extent of 25 % (as against 15 % Condonation for other) on medical grounds subject to submission of medical certificate to this effect. Such condonation be availed twice during the entire course of study leading to degree in Engineering and Technology.

4. "Active Participation in N.C.C/N.S.S. Camps or Inter collegiate or Inter University or Inter State or International matches or debates of Educational Excursions or such other Inter University activities as approved by the authorities involving journeys outside the city in which the college is situated will not be counted as absence. However, such 'absence shall not exceed (4) weeks per semester of the total period of instructions. Such leave should not be availed more than twice during the entire course of study.

5. The attendance shall be calculated on individual papers/subjects from the date of commencement of the semester.

6. In case of the candidates who fail to put in the required attendance in a course of study, he/she shall be detained in the same class and will not be recommended to appear for the University examination.

7. A candidate detained in semester I should take readmission in next academic year as a regular student and shall have to complete all the theory and practicals as a regular student.

8. In case a candidate is detained in semester II, he/she shouldl take admission to Semester II of next academic year and complete all the theory and practicals as a regular student of semester II

9. In case of change of syllabus the candidate even if detained in semester II should take readmission in next academic year for Semester I and II as a regular student and complete all the theory and practicals as a regular student.

SCHEME OF INSTRUCTIONS AND EXAMINATION

1. Instructions about the curriculum in the various subjects in each semester of all the four years shall be provided by the University. .

2. The details of instruction period, examination schedule, vacations etc. shall be notified by the Principal of the College as per the University academic calendar

3. The medium of instruction and examination shall be English.

4. At the end of each semester, University examinations shall be held as prescribed in the respective schemes of examination.

5. The examinations prescribed may include written papers, practical and oral, tests, inspection of certified sessional work in Drawing and Laboratories and work done by students in each practical examination, along with other materials prepared or collected as part of Lab work/Project.

6. All the rules for examinations prescribed by the University from time to time shall be adhered to.

7. A candidate shall be deemed to have fully passed the Examination of a semester, if he/she secures not less than the minimum marks/grade as prescribed.

8. Institutions will be encouraged to adopt modern tools in classroom/labs to deliver the course contents.

9. Institutions will be encouraged to conduct online class tests.

O.874

The SecondYear Examination in Engineering will be held in two parts S.E. semester-I and S. E. semester-II. No candidate will be admitted to S.E. semester-I examination unless he/she produce testimonials of having kept one term, for the subject under F.E. semester-I and II satisfactorily in a college of engineering affiliated to this University after passing the First year examination of engineering other examination recognized as equivalent thereto as per the admission rules to second year engineering prescribed by the Government of Maharashtra and Dr. B.A.M.University from time to time.

R.1861

i. In case a candidate fails in one or more heads of passing at the S.E. semester-I Examination after taking that examination at the end of first term as a regular student, he/she will be allowed to appear again for only those heads of passing in which he/she has failed at his/her immediately subsequent semester-I examination.

ii. That the marks obtained by the candidate at semester-I Examination shall be carried forward unless the candidate desires to appear for a paper in which he has failed and then gracing of marks should be done as as a whole for semester-I and semester-II examination taken together.

R.1862

a) Candidates who secure 45% or more but less than 50% marks in the aggregate and pass the examination will be declared to have passed the examination in Pass Division.

b) Candidates who secure 50% or more but less than 60% marks in the aggregate and pass the examination will be declared to have passed the examination in Second Division.

c) Candidates who secure 60% or more but less than 66% marks in the aggregate and pass the examination will be declared to have passed the examination in first Division.

d) Candidates who secure 66% or more marks in the aggregate and pass the examination will be declared to have passed the examination in First Division with Distinction.

e) For calculating the percentage for the purpose of giving weightage while awarding division in Final Examination to the students admitted to first year engineering, the maximum marks prescribed and the marks obtained by the examinee in the particular examinations shall be taken into consideration with the following weightages.

F.E. - 10%
S.E.- 10%
T.E. – 40%
B. E. – 40%

This shall be applicable for the students admitted in first year from academic year 2011-2012 onwards.

f) In case of the students directly admitted to the second year, the weightage while awarding Division in Final Examination the maximum marks prescribed and the marks obtained by the Examinee in the particular examinations shall be taken in to consideration

S.E.- 20%

T.E. – 40%

B. E. – 40%

This shall be applicable for the students admitted in first year from academic year 2012-2013 onwards.

R.1863

In case a candidate fails in the examination but desires to appear again thereat.

a) He may, at his option, claim exemption form appearing in the head or heads of passing in which he has passed.

b) Such exemption, if claimed, shall cover all the heads of passing- in which it can be claimed.

c) Such exemption, if not availed of at the immediately subsequent appearance of the candidate at the examination, shall be deemed to have lapsed.

d) He /She may, at his option claim exemption from appearing in head or heads of passing of his choice and appear in the remaining head or head/s of passing to make-up the deficiency in the aggregate, if he has passed in all the heads of passing but has failed to secure a minimum of 45% of the aggregate marks.

e) The Marks obtained by a candidate for such term work as separately assessed will be carried over unless fresh term work is presented by him. A candidate whose marks are thus carried over shall be eligible for a division provided he/she does not avail himself of exemption in any head of passing excepting term work.

f) For the purpose of deciding whether a candidate claiming exemption in accordance with (a), (b), (c) above or (d) and (e) above has as required by R.260 secures 45% of the total marks obtainable in the whole examination the marks at his/ her previous examination/examination in the head or heads of passing in which he/she is exempted will be carried over. Candidates passing the examination in this manner shall not be eligible for a division or prizes or scholarships at the examination.

R.1864

RULE FOR COMBINED PASSING

1) To pass the examination a candidate must obtain minimum 40% of Marks in each Theory Paper &class test taken together however the candidate must obtain minimum 35% of Marks at the University theory Examination. The candidate must obtain a minimum aggregate of 45% of the total Marks obtainable at the S.E. Semester -I & II Examination taken together.

To pass a subject where there is no provision of class test, the candidate must obtain 40% of Marks in the University Examination.

Gracing should be done for the performance at University Examination or University Examination and class test taken together.

Minimum two-class tests should be conducted in a semester for the theory subject if provided. The average performance of the Two-class tests should be forwarded to the University by the college along with the term work marks.

If candidate fails to secure 40% of marks at university theory examination and class test taken together at the regular semester examination, then he/she shall have to appear for university examination from subsequent examination onwards and secure 40% of marks at university examination and earlier obtained class test marks taken together. The improved performance at the university examination should not be Considered for the Merit/Medal/Prize etc.

If the candidate remains absent for the class-test, his performance should be treated as 'Zero' Marks.

Minimum marks required for passing in term work and practical shall be 40%. If a candidate secures less than 40% in any of the term work or fails to submit term work shall be detained in the same class.

RULE FOR A T K T

For securing ATKT at Second Year Engineering Course candidate should clear (pass) as per the provision of R.1864[A] in at least 12 heads of passing out of 16 heads of passing.

R.1865

GENERAL RULES OF EXAMINATION

1. Application for permission to appear at every examination shall be made in the prescribed format accompanied by one passport size full face photograph (not profile) along with the necessary certificates and the prescribed fee, should be submitted to the Principal of the institute on or before the date fixed for this purpose.

2. When a candidate's application is found in order and he/she is eligible to appear at an Examination, the Principal of the institute is empowered to furnish him/her with a Hall-Ticketwith the photograph affixed to it, enabling the candidate to appear in the Examination, and this Hall-Ticket shall have to be produced by the Candidate before he/she is admitted to the premises where the Examination is being held.

3. A Candidate who does not present himself/herself for the examination for any reason whatsoever, excepting shortage of attendance, shall not be entitled to claim refund of the whole or part of the examination fee, for subsequent Examination(s).
4. As engineering is a full time course, no candidate shall be allowed to put in attendance for acourse or appear at examinations for different degrees and different faculties at one and the same time.
5. Students who have appeared once at any examination of the course need not put in fresh attendance, if they wish to reappear at the corresponding examination, notwithstanding the fact that the College may have introduced new subject. They will, however, have to appear at the examinations according to the scheme of examination and syllabi in force

R.1866

EQUIVALENCE OF THE SUBJECTS

Whenever a course or scheme of instruction is changed in a particular year, three more examinations immediately following thereafter shall be conducted according to the old syllabi/regulations. Also candidates not appearing at the examinations or failing in them shall take the examination subsequently according to the changed syllabi/ regulations as per the equivalence of the subjects as prescribed by the University.

Proposed Coding System of Subject/Paper

Six digit code for a subject (UG course)

Batch	Year	Subject no
CED	1. First Year UG	Semester-I
MED	2. Second Year UG	1-20 Theory
EEP	3. Third Year UG	21-30 practical
ECE	4. Fourth Year UG	31-40 Service Courses
EXE	5. Fifth Year UG	41-49 Electives
ETC		Semester-II
IEX		51-70 Theory
PED		71-80 Practical
CSE		81-90 Service Courses
CTD		91-99 Electives
COE		
ITD		
EED		
EEE		
ARH		
BSH		
BTD		

Structure of syllabus of subject

Code No: **Title:**

Teaching Scheme **Examination Scheme**

Theory: hours/week **Class Test: Marks**

Tutorial: hours/week **Theory examination: Maximum hours**
Practical/ TermWork : hours/week **Theory examination: Maximum Marks**
Practical/ Oral examination: Maximum Marks

Objectives: 1
2
3

Unit 1:
Unit 2:
Unit 3:
Unit 4:
Unit 5:
Unit 6:

Text Books: **1**
2

Reference Books: 1
2
3
4

Pattern of Question Paper:

The six units in the syllabus shall be divided in two equal parts i.e 3 units respectively. Question paper shall be set having two sections A and B. Section A questions shall be set on first part and Section B questions on second part. Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 from section A and Question no 6 from section B be made compulsory and should have at least eight bits of two marks out of which five to be solved
4. Two questions from remaining questions from each section A and B be asked to solve having weightage of 15 marks

For 40 marks Paper:

1. Minimum eight questions
2. Four questions in each section

3. Question no 1 from section A and Question no 5 from section B be made compulsory and should have at least five bits of two marks out of which three to be solved.
4. Two questions from remaining questions from each section be asked to solve having weightage of 7 marks.

0.95 GRACE MARKS FOR PASSING IN EACH HEAD OF PASSING (THEROY / PRACTICAL / ORAL / SESSIONAL) (EXTERNAL / INTERNAL)

The examinee shall be given the benefit of grace marks only for passing in each head of passing (Theory/practical/Oral/ Sessional) in external or Internal examination as follows:-

Head of passing	Grace Marks upto
Up to 50	2
051 to 100	3
101 to 150	4
151 to 200	5
201 to 250	6
251 to 300	7
301 to 350	8
351 to 400	9
And 401 and above	10

Provided that the benefit of such gracing marks given in different heads of passing shall not exceed 01 (one) percent of the aggregate marks in that examination.

Provided, further that the benefit of gracing of marks under this ordinance shall be applicable only if the candidate passes the entire examination of semester/year.

Provided further that this gracing is concurrent with the rules and guidelines of professional statutory bodies at the All India level such as AICTE, MCI, Bar Council, CCIM, CCIH, NCTE, UGC etc.

0.96 GRACE MARKS FOR GETTING HIGHER CLASS

A candidate who passes in all the subjects and heads of passing in the examination without the benefit of either gracing is condonation rules and whose total number of marks falls short for securing Second Class/Higher Second class of First Class by marks not more than 01 percent of the aggregate marks of that examination or up to 10 marks, whichever is less, shall be given the required marks to get the next higher class or grade as the case may be.

Provided that benefit of the above mentioned grace marks shall not be given, if the candidate fails to secure necessary passing marks in the aggregate head of passing also, if prescribed in the examination concerned.

Provided further that this gracing is concurrent with the rules and guidelines of professional statutory bodies at the All India level such as AICTE, MCI, Bar Council, CCIM, CCIH, NCTE etc.

0.97 GRACE MARKS FOR GETTING DISTINCTION IN THE SUBJECT ONLY.

A candidate who passes in all the subject/heads of passing in the examination without benefit of either gracing or condonation rules and whose total number of marks in the subject/s falls short by not more than three marks for getting distinction in the subject/s shall be given necessary grace marks up to three in maximum two subjects, subject to maximum 01(one) percent of the total marks of that head of passing whichever is more, in a given examination.

Provided that benefit of the above mentioned grace marks shall be given to the candidate only for such examination/s of which provision for distinction in a subject has been prescribed.

Provided further that this gracing is concurrent with the rules and guidelines of professional statutory bodies at the All India level such as AICTE, MCI, Bar council, CCIM, CCIH, NCTE etc.

0.98 CONDONATION

If a candidate fails in only one head of passing, having passed in all other heads of passing, his/her deficiency of marks in such head of passing may be condoned by not more than 01 percent of the aggregate marks of the examination or 10 percent of the total number of marks of the head of passing in which he/she is failing, whichever is less. However, condonation, whether in one head of passing or aggregate head of passing be restricted to maximum upto 10 marks only.

Condonation of deficiency of marks be shown in the statement of marks in the form of asterisk and ordinance number.

Provided that this condonation of marks is concurrent with the rules and guidelines of

Professional statutory bodies at the all india level such as AICTE, MCI, Bar council, CCIM,CCIH,NCTE etc.

0.106 (A) UNFAIR MEANS COMMITTED BY THE STUDENT

1. The Board of Examinations shall be the competent authority to take disciplinary action against a student for his misconduct due to his unfair means committed by him at the examination conducted by the University.

2. The Principal, of the college or Head of the recognized Institution shall be the competent authority to take disciplinary action against a student for his misconduct due to his unfair means committed by him at the examination conducted by the University, recognizedInstitution of behalf of the University.

3. Definition- Unless the context otherwise requires

(a) Student means and includes a person who is enrolled as such by the University/college/Institution for receiving instruction qualifying for any degree, diploma or

certificate awarded by the University. It includes ex-student and student registered as candidate (examinee) for any of the Degree, Diploma or Certificate examinations.

(b) Unfair Means includes one or more of the following acts or omissions on the part of student/s during the examination period.

i. Possessing unfair means material and or copying there from.
ii. Transcribing any unauthorized material or any other use thereof.
iii. Intimidating or using obscene language or threatening or use of violence against invigilator or person on duty for the conduct of examination or man-handling him/her or leaving the examination hall without permission of the supervisor or causing disturbances in any manner in the examination proceedings.
iv. Unauthorized communicating with other examinees or any one else inside or out side the examination hall.
v. Mutual/Mass copying
vi. Smuggling out, either blank or written or smuggling in of answer books as copying material.
vii. Smuggling in blank or written answer book, forging and forging signature of the Jr. Supervisor therein.
viii. Interfering with or counterfeiting of University/College Institution seal or answer books or office stationary used in the examination.
ix. Impersonation at the University/college/Institution examination.
x. Revealing identity in any form in the answer written or in any other part of the answer book by the student at the University or College or Institution examination.
xi. Or any other similar act/s omission/s which may be considered as unfair means by the competent authority.

(c) "Unfair means relating to examination" means and includes directly or indirectly communicating or attempting to commit or threatening to commit any act or coercion, undue influence or fraud or malpractice with a view to obtaining wrongful gain to him or to any other person or causing wrongful loss to other person/s.

(d) "Unfair means material" means and includes any material whatsoever, related to the subject of the examination, printed, typed, handwritten or otherwise on the person or on clothes, or body of the student (examinee) or on wood or other material, in any manner or in the form of chart, diagram, map or drawing or electronic aid etc. which is not allowed in the examination hall.

(e) "Possession of unfair means material by a student" means having any unauthorized material on his/her person or desk or chair or table or at any place within his/ her reach, in the examination centre and its environs or premises at any time from the commencement of the examination till its conclusion.

(f) " Student found in possession" means a student reported in writing as having been found in possession of unfair means material by Jr. Supervisor, Sr. Supervisor, member of the Vigilance committee or Examination squad or any other person authorized for this purpose in this behalf, even if the unfair means material is not produced as evidence because of its being reported as swallowed or destroyed or snatched away or otherwise taken away or spoiled by the student or by any other person acting on his behalf to such an extent that it has become illegible.

Provided that report to that effect is submitted by the Sr. Supervisor or chief Conductor or any other authorized person to the Controller of Examinations, Principal or Head of the Institutions concerned or any officer authorized in this behalf.

(g) Material related to the subject of Examination means and includes, if the material is produced as evidence any material certified as related to the subject of examination by a competent person and if the material is not produced as evidence or has become illegible for any of the reasons refereed to in clause (f) above, the presumption shall be that the material did relate to the subject of the examination.

(h) "Chief Conductor", means and includes, Principal of the College concerned, or Head of the recognized institution concerned where concerned examination is being conducted and any other person duly authorized by him or person appointed as In charge of examination, by the authority competent to make appointment to such post.

4. Where the examination of the University courses are conducted by the constituent college/recognized Institute on behalf of the University, the Principal/Head of the concerned college/recognized Institution on receipt of a report regarding use of unfair means by any student at any such examination including breach of the rules laid down by the Management council or by the College/recognized institution for proper conduct of examination, shall have power at any time to institute inquiry and to punish such unfair means or breach of any of the rules by exclusion of such a student from any such examination or any University course in any college/Institution either permanently or for a specified period or by cancellation of the result of the student in the college/recognized Institution examination for which he/she appeared or by deprivation of any college/Institution scholarship or by cancellation of the award of any college/Institution prize or medal to him/her or by imposition of fine not exceeding Rs.300/- or in any two or more of the aforesaid ways.

5. During examination, examinees and other students shall be under disciplinary control of the Chief Conductors.
6. Chief Conductor/s of the examination centre shall in the case of unfair means, follow the procedure as under:-

(a) The student shall be called upon to surrender to the Chief Conductor, the unfair means material found in his or her possession, if any, and his/her answer-book.

(b) Signature of the concerned student shall be obtained on the relevant materials and list thereon. Concerned Senior Supervisor and the Chief Conductor shall also sign on all the relevant materials and documents.

(c) Statement of the student and his undertaking in the prescribed format and the statement of the concerned Jr. Supervisor and Sr. Supervisor shall be recorded in writing by the Chief Conductor (Appendix-III). If the student refuses to make statement or to give undertaking the concerned Sr. Supervisor and / or Chief Conductor shall record accordingly under their signature.

(d) Chief Conductor shall take one or more of the following decisions depending upon seriousness/gravity of the case:-

i) In the case of impersonation or violence, expel the concerned student from the examination and not allow him/her to appear for remaining examination.

ii) Obtain undertaking from the student to the effect that the decision of the concerned competent authority in his/her case shall be final and binding and allow him/ her to continue with his/ her examination.

iii) May report the case to the concerned Police Station as per the provision of Maharashtra Act No. XXXI 1982 – An act to provide for preventing Malpractice's at University Board and other specified examinations (Appendix-III) (Performa A& B).

iv) Confiscate his / her answer books, mark it as suspected unfair means case and issue him/her fresh answer books duly marked.

v) All the material and list of material mentioned in sub-clause (a) and the undertaking with the statement of the student and that of the Jr. Supervisor as mentioned in clause No. (b) & (c) and the answer-book/s shall be forwarded by the Chief conductor along with his report to the concerned Controller of Examinations/Principal/Head of the Institution, as the case may be, in a separate and confidential sealed envelope marked " suspected unfair means case"

vi) In case of unfair means of oral type, the Jr. Supervisor and the Sr. Supervisor or concerned authorized person shall record the facts in writing and shall report the same to the concerned Controller of Examinations/Principal/Head of the Institutions, as the case may be.

PUNISHMENT

The competent authority concerned i.e. the Board of Examinations in the case of University examination, the concerned Principal in the case of college examinations held by the recognized Institutions, after

taking into consideration the report of the committee shall pass such orders as it deem fit including granting the student benefit of doubt, issuing warning or exonerating him/her from the charges and shall impose any one or more of the following punishment on the student/s found guilty of using unfair means:-

(a) Annulment of performance of the student in full or in part in the examination he/she has appeared for.

(b) Debarring student from appearing for any examination of the University or college Institution for a stipulated period not exceeding five year.

(c) Debarring student from appearing for any examination of the University or college Institution for a stipulated period not exceeding five year.

(d) Cancellation of the University or College or Institution scholarship/s or award/s prize or medal etc. awarded to him/her in that examination.

(e) In addition to the above mentioned punishment, the competent authority may impose a fine not exceeding Rs.300/- on the student declared guilty. If the student concerned fails to pay the fine within a stipulated period, the competent authority may impose on such a student additional punishment/penalty as it may deem fit.

(f) The student concerned be informed of the punishment finally imposed on him/her in writing by the competent authority or by the officer authorized by it in this behalf, under intimation to the College/Institution he/ she belongs to.

(g) An appeal against the findings of the committee shall lie with the concerned competent authority whose decision shall be final and binding.

(h) An appeal made in writing within a period of 30 days from the date imposition of the punishment shall be considered by the competent authority on merit and shall be decided on the basis of the evidence available in the case and shall be heard in person in deserving cases, if the competent authority finds substance in the appeal, the competent authority shall supply a typed copy of the relevant extract of fact-finding report of the inquiry committee, as well as documents relied upon (if not strictly confidential). Decision in the appeal shall be informed to the student concerned accordingly.

(i) The court matters in respect of the unfair means cases should be dealt with by the respective competent authority.

(j) As far as possible the quantum of punishment should be as prescribed (Category-wise in Appendix-I

APPENDIX-I

THE BROAD CATEGORIES OF UNFAIR MEANS ADOPTED BY STUDENTS AT THE UNIVERSITY/ COLLEGE/ INSTITUTION EXAMIANTION AND THE QUANTUM OF PUNISHMEN T FOR EACH CATEGORY THEREOF.

Sr. No.	Nature of Malpractices	Quantum of Punishment
1.	Possession of copying material	(Note:- This quantum of punishment Shall apply also ot the following categories of malpractices at Sr. No. 2, to Sr. No.12 in addition to the Punishment prescribed thereat)
2.	Actual copying from the copying material	Exclusion of the student from university or College or Institution examination for one additional examination.
3.	Possession of another students Answer Book	Exclusion of the student from University or College or Intuition examination for one additional examination (Both the students)
4.	Possession of another students Answer book+ actual evidence of Copying	Exclusion of the student from University or College or Institution examination for two additional examination (Both the Students)
5.	Mutual / Mass copying.	Exclusion of the student from University or College or Institution examination for two additional examinations.
6 (a)	Smuggling out or smuggling in of Answer book as copying material.	Exclusion of the student from University or College or Institution examination for two additional examinations.
(b)	Smuggling in of written answer book based on the question paper set at the examination	Exclusion of the student from University or College or Institution examination for three additional examinations
(c)	(c) Smuggling in of written answer book and forging signature of Jt, Supervisor thereon	Exclusion of the student from University or College or Institution. Examination for four additional examinations.

7.	Attempt to forge the signature of the Jr. Supervisor on the answer book or Supplement.	Exclusion of the student from the University or College or Institution examination for four additional examinations.
8	Interfering with or counterfeiting of University / College/ Institution seal or Answer books or office stationary used in the examination	Exclusion of the student from University or College or Institution examination for four additional examinations.
9.	Answer book main or supplement written outside the examination hall or any other insertion in answer book.	Exclusion of the student from University or College or Institution examination for four additional examinations.
10.	Insertion of currency notes/to bribe or attempting to bribe any of the persons/s connected with the conduct of Examination	Exclusion of the student from University or College or Institution Examination for four additional examinations. (Note:- This money shall be created to the Vice-Chancellor's Fund)
11.	Using obscene language/violence/ threat at the examination centre by a student at the University/ College / Institution Examination to Jr./ Sr. Supervisor/ Chief Conductor or Examiners.	Exclusion of the student from University or College or Institution examination for four additional Examinations.
12.(a)	Impersonation at the University/ College / Institution examination	Exclusion of the Student from University or College or Institution examination for five additional examinations, (Both the students if impersonator is University or College or Institute student)
(b)	Impersonation by a University/ College/ Institute student at S.S.C./ H.S.C./ any other Examinations.	Exclusion of the Student from University or College or Institution examination for five additional examinations
13.	Revealing identity in any form in the answer written or in any other part of the Answer book by the student at the University or College or Institution Examination	Annulment of the performance of the student at the University or College or Institution Examination in full.
14.	Student found having written on palms or on the Body, or on the clothes while in the	Annulment of the performance of the student at University or College or

	Examination	Institution Examination in full.
15.	All other mal-practices not covered in the aforesaid categories.	Annulment of the performance of the student at the University or college or Institution Examination in full and severe punishment depending upon the gravity or the offence.
16.	If on previous occasion a disciplinary action was taken against a student for malpractice used at examination and he/she is caught 'again for malpractices used at the examinations, in this event he/she shall be dealt with severely. Enhanced punishment can be imposed on such student. This enhanced punishment may extend to double the punishment provided for the offence when committed at the second or subsequent examination.	
17.	**PRACTICAL/DISSERTATION/PROJECT REPORT EXAMS.**	
	Student involved in malpractices at practical/ dissertation/ project report examination shall be dealt with as per the punishment provided for the theory examination.	
18.	The competent authority in addition to the above mentioned punishments may impose a fine not exceeding Rs. 300/- on the student declared guilty.	
	Note:- The term annulment of performance in full' includes performance of the student of the theory as well as annual practical examination, but does not include performance at term work, project work and dissertation examination unless malpractice used thereat.	

FACULTY OF ENGINEERING AND TECHNOLOGY

Revised Syllabus

Second Year of Engineering in Biotechnology

Sub No	Semester I	Contact Hrs/Week				Examination Scheme					
	Subjects	L	T	P	Total	CT	TH	TW	P	Total	Duration of Theory Examination
BSH201	Engineering Mathematics – III	4		-	4	20	80	-	-	100	3 Hrs
BTD202	Biochemistry	4	-	-	4	20	80	-	-	100	3 Hrs
BTD203	Microbiology	4	-	-	4	20	80	-	-	100	3 Hrs
BTD204	Molecular Biology	4	-	-	4	20	80	-	-	100	3 Hrs
BTD205	Process Calculations	4	-	-	4	20	80	-	-	100	3 Hrs
BTD221	Biochemistry Lab	-	-	4	4	-	-	25	50	75	-
BTD222	Microbiology Lab	-	-	4	4	-	-	25	50	75	-
BTD223	Molecular Biology Lab	-	-	4	4	-	-	50	50	100	-
	Total	**20**		**12**	**32**	**100**	**400**	**100**	**150**	**750**	-

Sub No	Semester II	Contact Hrs/Week				Examination Scheme					
	Subjects	L	T	P	Total	CT	TH	TW	P	Total	Duration of Theory Examination
BSH251	Engineering Mathematics – IV	4		-	4	20	80	-	-	100	3 Hrs
BTD252	Cell Biology	4	-	-	4	20	80	-	-	100	3 Hrs
BTD253	Metabolic Pathways And Regulation	4	-	-	4	20	80	-	-	100	3 Hrs
BTD254	Bioinstrumentation	4	-	-	4	20	80	-	-	100	3 Hrs
BTD255	Momentum And Heat Transfer	4	-	-	4	20	80	-	-	100	3 Hrs
BTD271	Cell Biology Lab	-	-	4	4	-	-	25	50	75	-
BTD272	Bioinstrumentation Lab	-	-	4	4	-	-	-	50	50	-
BTD273	Momemtum And Heat Transfer Lab	-	-	2	2	-	-	-	50	50	-
BSH275	Communication Skill	-	-	2	2	-	-	50	-	50	-
BTD274	Computational Techniques	-	-	2	2	-	-	25	-	25	-
	Total	**20**		**14**	**34**	**100**	**400**	**100**	**150**	**750**	-

L: Lecture hours per week **P:** Practical hours per week **CT:** Class Test **TH:** University Theory Examination

TW: Term Work **P:** Practical/Oral Examination **T:** Tutorial hours per week

BSH201: Engineering Mathematics III

Teaching Scheme
Theory: 04 hours/week
Tutorial: ------

Examination Scheme
Class Test: 20 Marks
Theory Examination: 03 hours
Theory Examination: 80 Marks

Objectives: 1) To develop Logical understanding of the subject
2) To develop mathematical skill so that students are able to apply mathematical methods & Principal's in solving problems from Engineering fields
3) To produce graduates with mathematical knowledge & computational skill.

Unit 1: Linear Differential Equations : Linear Differential Equations with constant coefficients General method, shortcut methods to find particular integral, Homogenous Linear differential equations (Cauchy's & Legendre's form), method of variation of parameters. (6)

Unit 2: Application of LDE: To Electrical circuits & to Mechanical system (Analogous study of two systems),To Civil Engineering, Free oscillations / vibrations, Forced oscillation /vibrations, Damped Free oscillations / vibrations, Damped Forced oscillations/vibrations (6)

Unit 3: Statistics & Probability: Measures of Dispersion, Moments, coefficient of skewness and Kurtosis, Probability distribution for random variables, Binomial, Poisson and Normal distributions, Curve fitting: Principle of least squares, Fitting of linear curve, parabola, exponential curve. (8)

Unit 4: Vector Differentiation: Differentiation of vectors, Gradient of scalar point function, Directional derivative, Divergence of vector point function, Curl of a vector point function. Irrotational and solenoidal vector field (6)

Unit 5: Vector Calculus (Integral calculus): The line integral, Surface integral, volume integral, Gauss Divergence theorem, Stoke's theorem, Green's theorem (6)

Unit 6: Numerical Methods: Solution of transdental equations by Newton Raphson method, Gauss Seidel method to solve simultaneous linear equations, Lagranges Interpolation formula for unequal intervals, Numerical Differentiation: - Newton's forward and Newton's backward difference formulae, Solution of ordinary differential equation by Euler's modified method, and Runge-Kutta IVth order method . (8)

Note: All Theorems are without proofs

Section A: Unit 1, 2, 3

Section B: Unit 4, 5, 6

RECOMMENDED BOOKS:

1. A Text Book of Engineering Mathematics (Volume-I, II,III) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publications, New Delhi.

3. Advanced Engineering Mathematics by H.K. Das, S. Chand & Company.

4. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

5. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd.

6. Engineering Mathematics A Tutorial Approach by Ravish R Singh, Mukul Bhat ,Mc Graw Hill

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 and 6 be made compulsory and should have at least ten bits of two marks out of which FIVE to be solved.
4. Two questions from remaining questions from each section be asked to solve having weightage of 15 marks

BTD201: Biochemistry

Teaching Scheme
Theory: 04 hours/week

Examination Scheme
Class Test: 20 Marks
Theory Examination: 03 hours
Theory Examination: 80 Marks

SECTION A

UNIT I: INTRODUCTION (WATER AND BIOLOGICAL CHEMICALS)

Physical properties of water: Structure, solvency, hydrophobic effect, osmosis and diffusion; chemical properties of water: Ionization, acid-base nature, buffer; biological buffer systems.Chemical bonding: covalent, dipole, ionic, hydrogen, Hydrophobic, Bond energy (04)

UNIT II: CARBOHYDRATES

Definition, classification, and application of carbohydrates.

Monosaccharide: optical isomerism of monosaccharide, various conformations of glucose: linear, ring, Haworth; classification of monosaccharide, sugar derivatives of monosaccharide.

Oligosaccharide: Disaccharides (Sucrose, lactose, maltose), artificial sweeteners (saccharin and aspartame).

Polysaccharide: Classification, homo-polysaccharide (starch, cellulose, hemicelluloses, chitin) Hetero-polysaccharides (hyaluronic acid and chondrotin)

Reactions of carbohydrates: oxidation, reduction with HCN, alanine, phenyl hydrazine, hydroxylamine and fermentation.

Glycoproteins- proteoglycan (10)

UNIT III: LIPIDS

Definition, application, classification, lipids and biological membranes (fluid mosaic model), lipid micelles. (04)

SECTION B

UNIT IV: NUCLEIC ACID

Definition, functions of nucleic acid, experimental evidence of nucleic acid as genetic material (Harshy and Chase experiment and Avery Mc Load Experiment); Chemistry of

nucleic acids: nucleosides, nucleotides, formation of phosphodiesters bond; DNA: Properties, absorbance, ionic interaction, denaturation, molecular weight, viscosity, sedimentation, size and shape. Structure: Watson and Crick model, Chargaff's rule, alternative forms of DNA. RNA: Structure and types of RNA i.e., m-RNA, t-RNA, r-RNA. (08)

UNIT V: VITAMINS AND COENZYMES

Definition of vitamins, classification of vitamins, characteristics of vitamins, Fat soluble Vitamins (A, D, E, K), water soluble vitamins (B_1, B_6, B_{12}, and C)

Coenzymes as vitamins, its types i.e., 1) Involved in 'H' transfer-NAD, FAD. 2) Involved in Group transfer- Biotin, Thiamin, ATP as a coenzyme. (06)

UNIT- VI: AMINO ACIDS AND PROTEINS

Amino Acids: Physical and electrochemical properties, classification- side chain, numbers of amino and carboxyl groups, polarity of side chain, nonstandard amino acids, non-protein amino acids.

Peptides: formation and biological role of peptides, chemical bonds in protein structure

Proteins: Classification based on shape, composition and solubility, biological functions, physical properties of protein, protein organization- primary structure, secondary structure, tertiary and quaternary structure, protein folding and denaturation.

Determination of amino acids sequence- Sanger method and Edman degradation, dansyl chloride (08)

RECOMMENDED BOOKS

1. Principles of Biochemistry, A. L. Lehninger, D.L. Nelson and M.M. Cox.
2. Outline of Biochemistry, Cohn and Stump – Wiley Eastern Ltd.
3. Review of Biochemistry, Harpers – Prentice Hall
4. Biochemistry, Lubert Stryer
5. An introduction to practical biochemistry by David T Plummer, Tata McGraw Hill.
6. Lab. Manual in biochemistry by J.Jayaraman, New Age International publishers.
7. Basic separation techniques in biochemistry R.O Okatare, New age international publishers.
8. Practical manual of biochemistry by S.P. Singh, CBS publishers and distributors.

GENERAL INSTRUCTIONS

- THEORY EXAM:
  - Minimum ten questions
  - Five questions in each section
  - Question no 1 from section A and question no 6 from section B having weightage of 10 marks each be made compulsory and should have atleast eight bits of two marks out of which five to be solved.
  - Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

BTD202: Microbiology

Teaching Scheme

Theory: 04 hours/week

Examination Scheme

Class Test: 20 Marks

Theory Examination: 03 hours

Theory Examination: 80 Marks

SECTION A

UNIT I: INTRODUCTION TO MICROBIOLOGY

Microbiology: scope, applications, evolution, taxonomy, concept and application of microbiology, microbial dimensions, life style of microorganisms, history of microbiology by citing relevant research of levwenhock, Louis pasture, John Tyndall, Robert Koch and Edward Jenner and W.M.Stanley.

Origin and evolution of microbes: theory of spontaneous generation, Haeckets classification, Wittaker's five kingdom system, Woese- Fox system, Cavalies-Smith's eight kingdom system,

Microbial taxonomy- taxonomy and systematic, binomial system, major character used in taxonomy, types of taxonomy –numerical, phonetic. (08)

UNIT II: TOOLS USED IN MICROBIOLOGY

Isolation and cultivation of pure culture, study of microbial structure.

Microscopy- different types i.e. Light microscope, Bright field microscope, dark field microscope, phase-contrast microscope, differential interference contrast microscope, fluorescence microscope, electron microscope, SEM, confocal microscopy and scanning probe microscopy.

Preparation and staining of microbes: Fixation, dyes, simple staining, differential staining, acid-fast negative staining, spores staining, flagella staining. (06)

UNIT III: MICROBIAL NUTRITION

Chemical elements as nutrition, nutritional classification of microbes, media used for cultivating microbes, media used for cultivating microbes i.e. bacteria, fungi, protozoa, algae, anaerobes; selective media, differential media, enrichment media and microbiological assay media. Physical conditions for microbial cultivations- temperature, gases (aerobic,

facultative, anaerobic and microaerophilic), pH, osmotic pressure and hydrostatic pressure. Bacterial growth curve, generation time and synchronous culture. (08)

SECTION B

UNIT IV: BACTERIA

General cellular organization of prokaryotic cells, generalized structure of bacterial cell, external structure- flagella, fimbriae, pilli, glycocalyx; Cell envelope- Gram staining technique, cell wall structure of positive and negative bacteria, cell membrane structure, internal structure-cytoplasm, ribosome, inclusion bodies, endospore; Bacterial shapes, arrangement and size. Bacterial genetics – conjugation, transduction and transformation and lac operon system. (08)

UNIT V: VIRUSES

Viruses of bacteria: bacteriophage, its morphology and structure, replication of bacteriophage, lysogeny;

Viruses of plants and animals: structure and composition, morphology, viral replication, cultivation of animal viruses and plant viruses, effect of viral infection on cells, viroids, DNA viruses : EPV, adenoviruses; RNA viruses: HIV; plant virus: TMV.(06)

UNIT VI: FUNGI

Morphology, reproduction- asexual and sexual, physiology, cultivation and its classification. (04)

RECOMMENDED BOOKS

1. Microbiology by Prescott Harley Klein, McGraw Hill
2. Microbiology by Pelczar, Reid et al – TMH publications
3. General Microbiology by Stenier R.Y. et al, McMillan Press. Inc.
4. Microbiology – Fundamentals and Applications by Purohit
5. Text Book Of Microbiology by Ananthanarayan
6. Biology of Microorganisms by Madigam M.T., et.al., Brock, J Prenctice Hall Inc.
7. Microbial Biotechnology and Fundamentals of applied Microbiology by Glazer A. N., et. al., Freeman.
8. Experiments in Microbiology by Singer.

9. General Microbiology by Schiegel.
10. Foundations in Microbiology by Talaro.
11. Microbiology: a laboratory manual by Cappucinno; 4th edition.
12. Microbiology: an Introduction by Tortora Funke Case, the Benjamin/Cummings Publishing Company,INC.
13. Principles of Virology by S.J. Flint.
14. Microbiological applications laboratory manual in general microbiology by Benson, McGraw Hill

GENERAL INSTRUCTIONS

- **THEORY EXAM**
  - Minimum ten questions
  - Five questions in each section
  - Question no 1 from section A and question no 6 from section B having weightage of 10 marks each be made compulsory and should have atleast eight bits of two marks out of which five to be solved.
  - Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

BTD203: Molecular Biology

Teaching Scheme
Theory: 04 hours/week

Examination Scheme
Class Test: 20 Marks
Theory Examination: 03 hours
Theory Examination: 80 Marks

SECTION A

UNIT I: CHROMOSOME AND NUCLEOSOME

Chromosome sequence and diversity, nucleosome, nucleosome assembly, chromatin structure, Histone Codes, Size of vertebrate genome (06)

UNIT II: DNA REPLICATION

Semiconservative DNA replication, role and mechanism of DNA polymerase, replication fork, initiation of DNA replication and finishing of replication, similarities and dissimilarities in prokaryotic and eukaryotic replication (09)

UNIT III: MUTATION AND REPAIR OF DNA

Replication errors, DNA damage, DNA repair (05)

SECTION B

UNIT IV: TRANSCRIPTION

Role of RNA polymerase, transcription in prokaryotes and eukaryotes, posttranscriptional modification of m-RNA i.e. capping, tailing and splicing (04)

UNIT V: TRANSLATION

Role of m-RNA r-RNA, t-RNA and ribosome during translation, steps involved in translation: initiation, elongation and termination of translation, similarities and dissimilarities in translation between prokaryotes and eukaryotes. (08)

UNIT VI: TOOLS USED IN STUDY OF NUCLEIC ACIDS

Gel electrophoresis, Pulsed field gel electrophoresis, Denaturing gradient gel electrophoresis, measuring the concentration of DNA and RNA by UV spectroscopy, radio labeling and

detection of radio labeled nucleic acid, florescence in the detection of nucleic acids, chemical tagging with biotin and digoxigenin.(08)

RECOMMENDED BOOKS

1. Molecular Biology of the Gene by J. D. Watson, T. A Banker, S. P. Bell, A. Gann, M. Levine and R. Losick, 5th edition, Pearson eduction Inc
2. Molecular Biology: Understanding the Genetic Revolution By David P. Clark, Nanette J. Pazdernik, 2nd edition, Academic Press Elsevier, USA
3. Molecular Biology By Philip C. Turner Taylor And Francis Group New York
4. Molecular Biology By G.P. Gupta, discovery publishing house, New Delhi

GENERAL INSTRUCTIONS

- **THEORY EXAM**
  - Minimum ten questions
  - Five questions in each section
  - Question no 1 from section A and question no 6 from section B having weightage of 10 marks each be made compulsory and should have atleast eight bits of two marks out of which five to be solved.
  - Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

BTD204: Process Calculations

Teaching Scheme
Theory: 04 hours/week

Examination Scheme
Class Test: 20 Marks
Theory Examination: 03 hours
Theory Examination: 80 Marks

SECTION A

UNIT I: UNITS AND DIMENSIONS

Dimensions and units, fundamental quantities, derived quantities & conversions. Basic chemical calculations, mole, atomic weight and molecular weight, equivalent weight, solids, liquids and solutions, physical properties of solutions.

UNIT II: MATERIAL BALANCE I

Material balances without chemical reactions, process flow sheet, material balances, graphical solution of problems, recycling and bypassing operations, material balances of unsteady-state operations.

Unit III: MATERIAL BALANCE II

Material balances involving chemical reactions, electrochemical reactions, recycling, parallel and bypassing operations, metallurgical applications.

SECTION B

UNIT IV: ENERGY BALANCE I

Energy balances, energy and thermochemistry, heat capacity, heat capacity of gases at constant pressure, sensible heat changes in liquids, heat capacity of gaseous mixtures, heat capacity of liquid mixtures, latent heats, enthalpy changes for pure substances and their mixtures in ideal states, equilibrium flash calculations of a multicomponent system.

UNIT V: ENERGY BALANCE II

Enthalpy changes accompanying chemical reactions, absolute enthalpy, heat of reaction, adiabatic reactions, thermochemistry of mixing processes, dissolution of solids, liquid-liquid mixture, gas-liquid system, heat of solution by partial molal quantities.

UNIT VI: UNIT OPERATIONS AND ITS STOICHIOMETRY

Stoichiometry and unit operations, distillation, absorption and stripping, extraction and leaching, crystallization, psychrometry, drying, evaporation. Combustion, fuels, calorific value of fuels, coal, liquid fuels, gaseous fuels, air requirement and flue gases.

RECOMMENDED BOOKS

1. Stoichiometry, Bhatt and Vora.
2. Basic Principles and Calculations in Chemical Engineering, D.M. Himmelblau, 6th edition, Prentice Hall India, 1997.
3. Kinetics and Energetics in Biotechnology, J.A. Rocks, Elsevier, Amsterdam, 1983.
4. Biochemical Calculations, I.H. Segel, Wiley, 1976.
5. Stoichiometry and Process Calculations, B. Lakshmikutty, K. V. Narayanan

GENERAL INSTRUCTIONS

- **THEORY EXAM**
  - Minimum ten questions
  - Five questions in each section
  - Question no 1 from section A and question no 6 from section B having weightage of 10 marks each be made compulsory and should have atleast eight bits of two marks out of which five to be solved.
  - Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

BTD221: Biochemistry Lab

Teaching Scheme

Practical: 04 hours/week

Examination Scheme

Practical/Oral Examination: 50 Marks

Term Work: 25 Marks

PRACTICALS

1) Qualitative test for carbohydrates.
   i. Molish test
   ii. Fehlings test,
   iii. Benedicts test,
   iv. Bradfort test
   v. Picric acid test
   vi. Selivanoff's test
   vii. Iodine test for starch, dextrin and insulin
   viii. Osazone test
   ix. Nylander test.
2) Qualitative test for Lipids
   i. Solubility
   ii. emulsification
   iii. saponification
   iv. salkowski test for cholesterol
   v. Lebermann- Burchard test
   vi. Formaldehyde-H_2SO_4 test
3) Qualitative test for proteins:
   i. Millon's test
   ii. Folins test
   iii. Biuret test
   iv. Xanthoprotein test
   v. Ninhydrin
   vi. Detection of 'S' in amino acids
   vii. Test for determination of tryptophan
   viii. Glyoxylic Acid test
   ix. Lead acetate test
   x. Neuramann's test for casein

4) Isolation of casein from milk

5) Glucose Determination by glucose oxidase

6) Determination of acid value

7) Determination of saponification value

8) Paper chromatography

9) TLC

10) Preparation of buffers.

11) Determination of pH using indicators

- **PRACTICAL EXAM**: Any 9 practicals should be conducted from the above list. The practical examination shall consist of performing an experiment based on the practical work done during the course i.e. major and minor experiment during examination, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

BTD222: Microbiology Lab

Teaching Scheme

Practical: 04 hours/week

Examination Scheme

Practical/Oral Examination: 50 Marks

Term Work: 25 Marks

PRACTICALS

1. Study of laboratory instruments and equipments (microscope, incubator, autoclave, oven, laminar air flow)
2. Stage micrometry
3. Staining of microorganism
    a. Simple staining
    b. Negative staining
    c. Gram staining
    d. Endospore staining
    e. Motility
4. Isolation of microbial culture
    a. Pour plate technique
    b. Spread plate technique
5. Isolation of pure culture from mixed culture
    a. Quadrant method
    b. T method
6. Preparation and sterilization of maintenance media for bacteria and fungus
7. Biochemical test for identification of microorganism
    a. Catalase test
    b. Oxidase test
    c. MR-VP test
    d. Indol test
    e. Gas production

PRACTICAL EXAM:

Any 6 experiments should be performed from the above list. The practical examination shall consist of performing an experiment based on the practical work done during the course i.e. major and minor experiment during examination, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

BTD203: Molecular Biology Lab

Teaching Scheme

Practical: 04 hours/week

Examination Scheme

Practical/Oral Examination: 50 Marks

Term Work: 50 Marks

LIST OF EXPERIMENTS

1. Isolation of Bacterial DNA / Plant / Mammalian (any one species)
2. Isolation of bacterial Total RNA / mRNA
3. Isolation of plasmid
4. Quantitative determination of DNA and RNA by spectrophotometric method
5. Determination of melting temperature (Tm) and base composition of DNA from thermal denaturation characteristics Spontaneous mutation in bacteria by Fluctuation test.
6. Induced mutation using chemical mutagens.
7. Induced mutation using physical mutagens
8. Auxotroph enrichment by ampicillin method.
9. Dark Repair mechanism in *E.coli.*
10. Light repair mechanism in *E.coli.*
11. Blue white screening
12. Spontaneous Mutations

PRACTICAL EXAM:

Any 10 experiments should be performed from the above list. The practical examination shall consist of performing an experiment based on the practical work done during the course i.e. major and minor experiment during examination, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

BSH251: Engineering Mathematics IV

Teaching Scheme
Theory: 04 hours/week
Tutorial: 1 hours/week/batch of 30 students

Examination Scheme
Class Test: 20 Marks
Theory Examination: 03 hours
Theory Examination: 80 Marks

Objectives:

1) To develop Logical understanding of the subject
2) To develop mathematical skill so that students are able to apply mathematical methods & Principal's in solving problems from Engineering fields
3) To produce graduates with mathematical knowledge & computational skill.

Unit 1: Function of complex variable (Differential calculus): Introduction, Analytic function Cauchy Riemann equations in Cartesian and Polar form, Harmonic function, Taylor's series & Laurent's series (without proof), Conformal mapping (geometrical representation of function of complex variable), bilinear transformation. (7)

Unit 2: Function of complex variable (Integral calculus): Line integral, contour integral: Cauchy's integral theorem, Cauchy's integral formula (without proof), Residues, Cauchy's residue theorem, Integration along unit circle and along upper half of semi circle. (7)

Unit 3: Application of PDE: solutions of partial differential equation by method of separations of variables, Application to vibration of string, one dimensional heat flow equations, Laplace equation in two dimensions with boundary conditions. (6)

Unit 4: Laplace transform: Definition, Transforms of elementary functions, Properties & theorems of Laplace transforms(without proof), transforms of periodic function, Heaviside unit step function, displaced unit step function, Dirac delta function, error function, Bessel' function of zero order. (6)

Unit 5: Inverse Laplace transform and its applications : Inverse Laplace transforms by using properties, ii) partial fractions, iii) Convolution theorem, Applications to solve linear

differential equations with constant coefficients (Initial value problems). Simultaneous Linear differential equations . (6)

Unit 6: Fourier Transform and its applications: Fourier integral, Fourier sine and cosine integral, complex form of Fourier integral, Fourier transforms Fourier sine and cosine transform and inverse Fourier transforms Finite Fourier sine and cosine transforms. Solution of one dimensional heat equation by using Fourier transform. (8)

Note: All Theorems are without proofs

Section A: Unit 1, 2, 3

Section B: Unit 4, 5, 6

RECOMMENDED BOOKS:

1. A Text Book of Engineering Mathematics (Volume-I, II,III) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan, Pune.

2. Higher Engineering Mathematics by B. S. Grewal, Khanna Publications, New Delhi.

3. Advanced Engineering Mathematics by H.K. Das, S. Chand & Company.

4. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill).

5. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley Eastern Ltd.

6. Engineering Mathematics A Tutorial Approach by Ravish R Singh, Mukul Bhat ,Mc Graw Hill

Pattern of Question Paper:

The units in the syllabus shall be divided in two equal sections. Question paper shall be set having two sections A and B. Section A questions shall be set on first three units (1,2,3) and Section B questions on remaining three units (4,5,6) . Question paper should cover the entire syllabus.

For 80 marks Paper:

1. Minimum ten questions
2. Five questions in each section
3. Question no 1 and 6 be made compulsory and should have at least ten bits of two marks out of which FIVE to be solved.
4. Two questions from remaining questions from each section be asked to solve having weightage of 15 marks

BTD251: Cell Biology

Teaching Scheme
Theory: 04 hours/week

Examination Scheme
Class Test: 20 Marks
Theory Examination: 03 hours
Theory Examination: 80 Marks

SECTION A

UNIT I: CELLS AND ORGANISMS

Essential properties of living cell, prokaryotic cells, eukaryotic cells, cell lineages in eukaryotes, classification of organisms, Cell models: *E. coli*, yeast, drosophila, zebrafish. (04)

UNIT II: BIOMEMBRANE AND TRANSPORT ACROSS THE MEMBRANE

Structure of cell membrane, components, properties and its functions. Principle of membrane transport, classes of membrane transport proteins, transporter and channel, types of transporter mediated movements (uniport, symport and antiport), endocytosis, passive diffusion, facilitated diffusion, carrier proteins, active transport, ion channels and its type (P, F & ABC), two examples of neurotransmitter release, glucose transport. (10)

UNIT III: CELL TRAFFECKING

Overview : role of various cell organelles in protein sorting and transport, intracellular vesicular traffic- formation of vesicles from lipid bilayer (biomembrane), biosynthesis, secretary and endocytic pathway, clathrin coat mediated transport of LDL, pinocytosis, phagocytosis, autophages, exocytosis, oligosaccharide processing in golgi apparatus during vesicular transport (glycosylation) (06)

SECTION B

UNIT IV: CELL CYCLE

Cell cycle and its different phases, mitosis, meosis and its regulation (i.e. check points of cell cycle) (04)

UNIT V: CELL SIGNALING

Basic characteristics of cell signaling system; different receptor classes and respective signaling molecule (in brief);

endocrine, paracrine, autocrine, synaptic signaling; G-protein coupled receptor (structure and function), secondary messengers- examples: G-protein in ion channel regulation, G-protein in adenyl cyclase inhibition, cytokine receptors: JAK-STAT pathway; phospholipid based secondary messengers; role of Ca^{++} as intracellular messenger; receptor tyrosine kinase. (10)

UNIT VI: APOPTOSIS

Necrosis, apoptosis, cellular rationale behind apoptosis, morphological features of apoptosis, pathways i.e., intrinsic and extrinsic of apoptosis, role of caspases in apoptosis. (06)

RECOMMENDED BOOKS

1. Molecular Biology of the Cell, Alberts B et al., Garland Publishing House Inc.
2. Molecular Cell Biology, Lodish et al.
3. Molecular Cell Biology, Karp
4. Biomembranes – Molecular Structure and Functions, Gennish R B, Springer
5. Mechanism Receptor regulation, G. Fossil, S.T. Crooke (Eds), Plenum press,1985
6. Reproduction in eukaryotic cells, D M Proscot, Academic Press
7. Developmental Biology, S F Gilbert, Sinauer.Inc.
8. Cell and Molecular Biology, Shheler.
9. Cell Biology, Sadava and Smith.

GENERAL INSTRUCTIONS

- **THEORY EXAM**
  - Minimum ten questions
  - Five questions in each section
  - Question no 1 from section A and question no 6 from section B having weightage of 10 marks each be made compulsory and should have atleast eight bits of two marks out of which five to be solved.
  - Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

BTD252: Metabolic Pathways & Regulation

Teaching Scheme

Theory: 04 hours/week

Examination Scheme

Class Test: 20 Marks

Theory Examination: 03 hours

Theory Examination: 80 Marks

SECTION A

UNIT I: METABOLIC CONCEPT AND BIOENERGETICS

Terminology in metabolism; function of metabolism; catabolism and anabolism; types of chemical reaction s in metabolism; oxidation-reduction reaction, ligation reaction, isomerisation reaction, group transfer reaction, hydrolytic reaction, addition of functional groups; mode of regulation; Thermodynamic principle, first and second laws of thermodynamics, concept of energy. ATP as universal currency of free energy in biological system; role of high energy phosphates as the energy currency of the cell. (05)

UNIT II: CARBOHYDRATE METABOLISM

Glycolysis: preparatory phase & pay off Phase, energetics, Regulation of glycolysis, Fate of pyruvate

Citric Acid Cycle: Production of acetyl CoA, The citric acid cycle, regulation, energetics.

Pentose phosphate pathway: The pathway & role of NADPH in regulation.

Gluconeogenesis: The pathway & energetics (Reciprocal regulation of glycolysis and gluconeogenesis) (08)

UNIT III: LIPID METABOLISM

Biosynthesis of fatty acids, production of malonyl co-A; biosynthesis of long chain fatty acid, biosynthesis of unsaturated fatty acids, biosynthesis of eicosanoids; biosynthesis of membrane phospholipids, biosynthesis of cholesterol, biosynthesis of sphingolipids; oxidation of even chain, saturated fatty acids, (knoop's β-oxidation pathway);oxidation of unsaturated fatty acids; oxidation of odd chain fatty acids. (07)

SECTION B

UNIT IV: AMINO ACIDS

Overview of amino acids, biosynthesis of amino acids, metabolic precursors of amino acids, nitrogen cycle, fixation of ammonia into amino acids.

Biosynthesis of amino acids: α-ketoglucarate precursor; 3-phosphoglycerate precursor, oxaloacetate and pyruvate precursor, Phospho enolpyruvate, Erythrose-4-PO_4 Precursor. Ribose-5-PO_4. Regulation of amino acids biosynthesis

Amino acid catabolism: 1) Degraded to acetyl Co A, 2) Converted to α- ketoglutarate 3) Converted to succinyl Co A, 4) Converted to oxaloacetate

Inborn error of amino acid catabolism: Alkaptonuria, phenylketonuria.(10)

UNIT V: ELECTRON TRANSPORT CHAIN

Oxidative phosphorylation, electron transfer reaction of mitochondria, ATP synthesis, regulation of oxidative phosphorylation, mitochondria in thermogenesis, steroid synthesis (06)

UNIT VI: NUCLEIC ACID

Biosynthesis of purines, pyrimidines, synthesis of deoxyribonucleotides, Salvage pathways for nucleotide synthesis. Regulation of nucleotide synthesis. (04)

RECOMMENDED BOOKS

1. Principles of Biochemistry by Lehninger, Nelson & Cox.
2. Outlines of Biochemistry by Cohn and Stumpf
3. Biochemistry by Lubert Stryer, Jeremy M. Berg, John L. Tymoczko
4. Harper's Biochemistry by R.K. Murray, D.K. Granner et al.
5. Immobilized Enzymes by M. Treven
6. Molecular Cell Biology by Bruce Albert

GENERAL INSTRUCTIONS

- **THEORY EXAM**
  - Minimum ten questions
  - Five questions in each section
  - Question no 1 from section A and question no 6 from section B having weightage of 10 marks each be made compulsory and should have atleast eight bits of two marks out of which five to be solved.
  - Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

BTD253: Bioinstrumentation

Teaching Scheme

Theory: 04 hours/week

Examination Scheme

Class Test: 20 Marks

Theory Examination: 03 hours

Theory Examination: 80 Marks

SECTION A

UNIT I: UV-VISIBLE SPECTROSCOPY

Classification of instrumental techniques, spectroscopy its types atomic and molecular, properties of electromagnetic radiations, electromagnetic spectrum, different types of molecular energies, interaction of electromagnetic radiation with matter, origin of spectrum. Concept of photometer, spectrophotometer, colorimeter, theory of spectrophotometry, colorimetry, derivation of beer-Lamberts law, instrumention, applications.

UV Spectroscopy: theory, types of transmission in organic and inorganic molecules, chromophore, bathochromic and hypsochromic shift, hyperchromic and hyperchromic effect, oxochrome, instrumentation and applications (09)

UNIT II: ATOMIC ABSORPTION SPECTROSCOPY & FLAME PHOTOMETERS

Principle, grotrian diagram, difference between ASS and FES, instrumentation, application. Flame photometry: Introduction disadvantages, principle, instrumentation and application (06)

UNIT III: MASS SPECTROSCOPY

Introduction, theory, instrumentation, types of ions produced in MS, general rules for interpretation of mass spectra and applications. (05)

SECTION B

UNIT IV: INFRARED ABSORPTION SPECTROSCOPY

Introduction, nomenclature of IR spectra, theory, instrumentation, modes of vibration of atoms in polyatomic molecules, application of IR, factors affecting vibrational frequencies, position and intensity of bands (07)

UNIT V: NUCLEAR MASS SPECTROSCOPY

Introduction, quantum description, chemical shift, spin-spin coupling, coupling constant, instrumentation, solvents used in NMR, interpretation and application, C^{13} NMR (07)

UNIT VI: XRAY ABSORPTION DIFFRACTION

Theory, instrumentation, X ray absorption apparatus, non dispersive X rays absorption methods, methods of x ray diffraction, applications (06)

RECOMMENDED BOOKS

1. Instrumental methods of chemical analysis by Gureep Chatwal and Sham K Anand, Himalaya publishing house
2. Willard and Merrit, InstrumentalMethods and Analysis
3. Instrumental methods of chemical analysis by By Dr. B. K. Sharma published by Goel publishing house Meerut
4. Instrumental Methods of Chemical Analysis by Galen Ewing Mc Graw Hill
5. Principles of instrumental analysis by Douglas A. Skoog, F. James Holler, Timothy A. Nieman, Saunders College Pub
6. Physical Chemistry by Peter William Atkins, Julio De Paula, W.H. Freeman
7. Chemical Principles by Peter Atkins, Loretta Jones, W. H. Freeman

GENERAL INSTRUCTIONS

- **THEORY EXAM**
  - Minimum ten questions
  - Five questions in each section
  - Question no 1 from section A and question no 6 from section B having weightage of 10 marks each be made compulsory and should have atleast eight bits of two marks out of which five to be solved.
  - Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

BTD254: Momentum & Heat Transfer

Teaching Scheme
Theory: 04 hours/week

Examination Scheme
Class Test: 20 Marks
Theory Examination: 03 hours
Theory Examination: 80 Marks

SECTION A

UNIT I: FLUID STATICS AND FLUID FLOW PHENOMENON

Nature and properties of fluids, static fluid properties, hydrostatic equation, hydrostatic equation in centrifugal field. Measurement of fluid pressure – manometers.

Types of fluid flow – shear stress and shear rate fields, viscosity and momentum flux. Viscosity of gases and liquids, eddy viscosity. Turbulence and nature of turbulence, Reynolds number, flow in boundary layers.Basic equations of incompressible flow- conservation of mass, momentum and energy. Unidimensional flow- derivation of Bernoulli equation. Application of basic equations of fluid flow to bioprocesses.

UNIT II: FLOW OF FLUIDS

Flow of incompressible fluids through circular conduits. The friction factor, relation between skin friction parameters, laminar flow in pipes. Laminar and turbulent flow equations – average velocity, kinetic energy correction factor. Maximum and average velocity. Effect of roughness parameter. The friction factor chart (Moody's diagram).

UNIT III: FLUID FLOW MACHINERY

Centrifugal pumps: Developed head, power requirement, suction lift & cavitation, NPSH. Agitation & Mixing of liquids: Mixers & mixing, Agitators & agitation. Flow patterns in agitated vessels. (04 Hrs)

SECTION B

UNIT IV: HEAT TRANSFER MEDIA AND CONDUCTION

Heat Transfer Media: Characteristic properties, classification, selection and application. Nature of heat flow, modes of heat transfer, Fourier's Law, steady state and unsteady state conduction in plane wall, cylindrical wall, spherical wall, with and without heat generation, lumped parameter analysis, transient heat flow in a semi-infinite solid.

Insulation, Fins and Heat Transfer Augmentation: Thermal insulation, types and selection, optimum and economic thickness of insulation for high and low temperatures. (06 Hrs)

UNIT V: CONVECTION

Convective heat transfer for flow through and outside pipes, laminar heat transfer on a flat plate. Natural convection, fluid flow and heat transfer across cylinders and spheres Heat transfer with phase change, heat transfer in boiling liquids and condensation of vapors. Reynolds Analogy between Heat Transfer and Momentum Transfer.

UNIT VI: RADIATION

Heat transfer by radiation, Absorptivity, Reflectivity, Transimitivity, Kickoff's Law, Stefan Boatman's Law, Black and Gray body radiations, Opaque Body. Combined heat transfer by conduction-convection and radiation.

RECOMMENDED BOOKS

1. Unit Operations of Chemical Engineering, W. L. McCabe & J.M. Smith, et al McGraw Hill Publication.
2. Fluid and Particle mechanics by Michele S J
3. Fluid Mechanics by A K Jain Khanna Publication
4. Process Heat Transfer, D. Q. Kern McGraw Hill Publication.
5. Chemical Engineering Vol.-I J. F. Richardson J. M. Coulson, Pergamon Press Publication.
6. Heat Transfer by J P Holman, McGraw Hill Publication.
7. Fundamentals of Heat Transfer F. Krieth, M. S. Bohn et al Harper & Row Publishers, New York.
8. Heat Transmission W. H. Mc Adams McGraw Hill Publication.
9. Engineering Heat Transfer Gupta and Prakash.

GENERAL INSTRUCTIONS

- **THEORY EXAM**
  - Minimum ten questions
  - Five questions in each section
  - Question no 1 from section A and question no 6 from section B having weightage of 10 marks each be made compulsory and should have atleast eight bits of two marks out of which five to be solved.
  - Two questions from remaining questions from each section A and B be asked to solve each having weightage of 15 marks

BTD271: Cell Biology Lab

Teaching Scheme

Practical: 04 hours/week

Examination Scheme

Practical/Oral Examination: 50 Marks

Term Work: 25 Marks

LIST OF EXPERIMENTS

1. Cell isolation and cell culture
2. MTT assay and cell viability
3. XTT test
4. Transport across membranes
5. Effect of detergent on membrane permeability
6. Isolation of cellular organelles (nucleus, mitochondria, lysozymes)
7. Study of marker enzyme from isolated organelles
8. Preparation of liposomes
9. Growth and assay of Siderophores.
10. Staining Nucleus by using basic dyes and Feulgen technique
11. Study of Meiosis stages.
12. Study of Mitosis stages in onion root tips

PRACTICAL EXAM: Any 10 experiments should be performed from the above list. The practical examination shall consist of performing an experiment based on the practical work done during the course i.e. major and minor experiment during examination, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

BTD272: Bioinstrumentation Lab

Teaching Scheme
Practical: 04 hours/week

Examination Scheme
Practical/Oral Examination: 50 Marks

PRACTICALS

1. Introduction to lab instruments and equipments
    a. Centrifuge
    b. Colorimeter
    c. pH meter
2. Preparation of buffers
3. Absorbance curve of 2 dyes
4. Demonstration of Beer's law
5. To check the validity of Beer's law for the colorimetric estimation of glucose by DNSA
6. Estimation of barbiturates with UV spectrophotometer
7. TLC lipid &/ Chlorophyll
8. Analysis of aspirin and determination of percent purity
9. Calculation of molar extinction coefficient
10. Calibration of laboratory glasswares

PRACTICAL EXAM : Any eight experiments should be performed from the above list. The practical examination shall consist of performing an experiment based on the practical work done during the course i.e. major and minor experiment during examination, the record of the experiments submitted by the candidate and viva-voce based on the syllabus

BTD273: Momentum & Heat Transfer Lab

Teaching Scheme

Practical: 04 hours/week

Examination Scheme

Practical/Oral Examination: 50 Marks

LIST OF EXPERIMENTS

1. To perform an experiment on flow of water through pipe.
2. To perform an experiment on flow of water through helical coil.
3. To perform an experiment on flow of water through spiral coil.
4. To study the characteristics of centrifugal pump.
5. To study the velocity profile of fluid in pipe/duct.
6. Determination of viscosity.
7. Verification of Bernoulli's theorem.
8. Reynold's Experiment (Verification of NRE).
9. Conductivity of metals and/or insulator
10. Forced convection apparatus.
11. Natural convective apparatus.
12. Emmisivity of test plate.
13. Stefan Boltzman apparatus.
14. Temperature profile in a metal rod.
15. Pool boiling phenomena and critical heat flux.

PRACTICAL EXAM : Minimum 10 experiments, based on the syllabus, should be conducted during the course and record (Journal) for the same shall be submitted. Atleast four (04) experiments be performed on topics in momentum transfer & four (04) experiments are to be performed on topics in heat transfer. The practical examination shall consist of performing an experiment based on the practical work done during the course, the record of the experiments submitted by the candidate and viva-voce based on the syllabus.

Communication Skills

Teaching Scheme
Practical: 02 hours/week

Examination Scheme
Term Work: 50 Marks

Computational Techniques

Teaching Scheme

Practical: 02 hours/week

Examination Scheme

Term Work: 25 Marks

LIST OF EXPERIMENTS

1. Basics of C language
2. Decision control structure
3. Loop control structure
4. Case control structure
5. Functions
6. Data types revisited
7. C Processor
8. Arrays
9. Puppetting on strings
10. Solution of linear algebraic equations, Gauss-Jordan elimination.
11. Integration, classical formulas, elementary algorithms.
12. Root finding and nonlinear sets of equations
13. Minimization, golden section search in one dimension
14. Ordinary differential equations, Runge-Kutta methods.

General Instructions

Every week, students will be expected to write code in a programming language of their choice (recommended 'C') to obtain numerical solutions for problems discussed in the class. At least eight problems and minimum 20 programs will be solved during the course of the semester.

Practical Exam

The students will provide an algorithm and write code to obtain a numerical solution for one problem based on the subject matter covered during the semester. This will be followed by an oral examination. The students will also maintain a journal to record their programming assignments throughout the semester.

RECOMMENDED BOOKS:

1. Numerical Recipes in C by W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery.
2. Let Us 'C' by Yashwant Kanetkar

BSH 275 **Basics of Communication Skills**

Teaching Scheme	Examination Scheme
Practical: 2 Hrs/ Week	Term Work: 50 Marks

Course Curriculum

Unit I **Grammar and Usage** 7 Hrs

- Overview of basic Mid-level English Grammar.
- Parts of Speech
- Prepositions and Conditionals.
- Tense and concept of time.
- Sentence Construction (Concord).
- Vocabulary: Words, Idioms, Phrases, Antonyms and Synonyms.

Unit II **Speaking Skills** 5 Hrs

- Training in Sound Recognition
- Stress and Intonation pattern in spoken communication
- Rhythm and effective English communication
- Sound Recognition Exercise (Language Lab Exercise).
- Common Errors in English.

Unit III **Listening and Reading Skills** 3 Hrs

- Active and Passive Listening.
- Note taking tips
- Techniques of reading
- Types and Techniques – skimming and scanning of reading

Unit IV **Writing Skills** 5 Hrs

- Identification of different writing styles (Four Writing Styles).
- Business Letters
- E-mail Writing
- Report Writing
- Job Applications
- Resume Preparation
- Drafting: Memo, Circulars, Notices, Agendas etc.

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Term Work: The Term Work consists of 10 Experiments from the above said syllabus.

Texts:

1. Farhathullah, T. M. **Communication Skills for Technical Students**. Kolkata: Orient Blackswan (2008).
2. Bansal R.K. and J. B. Harrison. **Spoken English**. Chennai: Orient Longman Ltd. (1997).
3. A. V. Martinet and A. J. Thomson. **A Practical English Grammar**. Oxford: University Press (1986).

References:

- Murphy, Raymond. **Essential English Grammar**. Cambridge: University Press (2000).
- Hewings, Martin. **Advanced English Grammar**. Cambridge: University Press (2003).
- Apte, Madhavi. **A Course in English Communication**. New Delhi: Prentice Hall of India Pvt. (2008).

Web Links:

- http://www.bmconsultantsindia.com/advanced-english-speaking.html
- http://englishtrainer.blogspot.in
- http://www.englishclub.com/learn-english/language-skills.htm