

## **THIRD YEAR DEGREE COURSE IN ENGINEERING (REVISED)**

**(Applicable from the Academic Year 2013- 2014)**

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

### **ADMISSION**

1. Admission to Third 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 Examinations)

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 should 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 practical's as a regular student.

#### **SCHEME OF INSTRUCTIONS & 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 calender
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 Laboratory 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/laboratory to deliver the course contents.
9. Institutions will be encouraged to conduct online class tests.

**O.874**

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

**R.1861**

- i. In case a candidate fails in one or more heads of passing at the T.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 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 second 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 from 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 T.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 ATK T at Third Year Engineering Course candidate should clear (pass) as per the provision of R.1864[A] in at least 13 heads of passing out of 17 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-Ticket with 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 a course 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)**

<b>Batch</b>	<b>Year</b>	<b>Subject no</b>
CED	1. First Year UG	<b>Semester-I</b> 1-20 Theory 21-30 practical 31-40 Service Courses 41-49 Electives
MED	2. Second Year UG	
EEP	3. Third Year UG	
ECE	4. Fourth Year UG	
EXE	5. Fifth Year UG	
ETC		<b>Semester-II</b> 51-70 Theory
IEX		
CHE		
CSE		
CTD		
COE		

ITD		71-80 Practical
EED		81-90 Service Courses
EEE		
ARH		91-99 Electives
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 G R A C E M A R K S F O R P A S S I N G I N E A C H H E A D O F P A S S I N G ( T H E O R Y / P R A C T I C A L / O R A L / S E S S I O N A L ) ( E X T E R N A L / I N T E R N A L )**

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 G R A C E M A R K S F O R G E T T I N G H I G H E R C L A S S**

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 Fir st 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 necessar y 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 G R A C E M A R K S F O R G E T T I N G D I S T I N C T I O N I N T H E S U B J E C T O N L Y .**

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, recognized Institution 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 referred 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 EXAMINATION AND THE QUANTUM OF PUNISHMENT 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 to 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 Institution 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.	
<b>17.</b>	<b>PRACTICAL/DISSERTATION/PROJECT REPORT EXAMS.</b>	
	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.	

Dr. Babasaheb Ambedkar Marathwada University Aurangabad

**Faculty of Engineering & Technology**

**Structure of Third Year (Chemical)**

Sr.No.	Semester - I	Contact Hrs/Week				Examination Scheme (Marks)					
Sub Code	Subject	L	T	P	Total	CT	TH	TW	PR	Total	Duration of Theory Exam.
<b>Semester - I</b>											
CHE301	Mass Transfer Operations-I	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 302	Industrial Pollution and Control	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 303	Chemical Reaction Engineering-I	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 304	Material Science and Technology	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 305	Chemical Engineering Thermodynamics	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 321	Lab-1- Mass Transfer Operations-I	-	-	2	2	-	-	-	50	50	
CHE 322	Lab-2- Industrial Pollution and Control	-	-	2	2	-	-	-	50	50	
CHE 323	Lab-3- Chemical Reaction Engineering-I	-	-	2	2	-	-	-	50	50	
CHE 324	Lab-4- Material Science and Technology	-	-	2	2	-	-	50	-	50	
BSH331	Lab-5 –Communication Skills –II	-	-	2	2	-	-	-	50	50	
Total of Part-I		20		10	30	100	400	50	200	750	
<b>Semester-II Part- II</b>											
CHE 351	Mass Transfer Operations-II	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 352	Process Equipment Design and Drawing-I	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 353	Chemical Reaction Engineering-II	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 354	Plant Design and Process Economics	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 355	Chemical Process Industries	4	-	-	4	20	80	-	-	100	3 hrs.
CHE 371	Lab 1- Mass Transfer Operations-II	-	-	2	2	-	-	-	50	50	
CHE 372	Lab 2 - Process Equipment Design and Drawing-I	-	-	2	2	-	-	-	50	50	
CHE373	Lab 3- Chemical Reaction Engineering-II	-	-	2	2	-	-	-	50	50	
CHE374	Lab 4- Plant Design and Process Economics	-	-	2	2	-	-	50	-	50	
CHE375	Seminar-I	-	-	2	2	-	-	-	50	50	
Total of Part-II		20	-	10	30	100	400	50	200	750	
<b>Total of Part-I &amp; II</b>		<b>40</b>		<b>20</b>	<b>60</b>	<b>200</b>	<b>800</b>	<b>100</b>	<b>400</b>	<b>1500</b>	

**Note: 1.** Minimum two tests should be conducted for each theory subject and average of best two tests should be considered.

**2.** If feasible, all the students shall undergo In-plant Training of two to four weeks in concerned Industry, during summer vacation. They should submit a report and give presentation on the same during Final Year.

**L: Lecture hrs/ week, T: Tutorial hrs/ week, P: Practical hrs/ week, TH: University Theory Exam, TW: Term Work, PR: Practical or Oral Exam.**



**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**THIRD YEAR (Chemical) ENGINEERING**

<b>SEMESTER-I</b>	
<b>CHE301 – Mass Transfer Operations-I</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b> <ol style="list-style-type: none"> <li>1. Comparison of different separation techniques.</li> <li>2. Understand principle of different processes.</li> <li>3. Understanding of design of equipment for different process.</li> <li>4. Knowing how to improve performance of given equipment</li> </ol>	
<b>Unit-1</b> <b>Diffusion and Interface Mass Transfer:</b> Fick's law of diffusion, Steady state molecular diffusion, equimolecular counter diffusion, diffusion in stationary gas, Maxwell's law of diffusion, theories of mass transfer, Knudsen diffusivity, Capillary flow. Inter phase mass transfer; diffusion between two phases, local and overall mass transfer coefficients, steady state co-current and counter current processes, stage wise and differential contacts. Concept of theoretical stages, stage efficiency, height of mass transfer units. Diffusion in solids.	14
<b>Unit-2</b> <b>Gas-Liquid Operations:</b> Equipments for Gas – liquid operations; Sparged vessels (bubble columns), Tray Towers, Mechanically agitated vessels for single phase and gas liquid contact, liquid dispersed – scrubbers, venture scrubbers, wetted towers, packed towers. Operating characteristics of equipments.	04
<b>Unit-3</b> <b>Drying:</b> Theory and mechanism of Drying, Determination of batch drying, direct and indirect driers, freeze drying, rate of drying curve, mechanism of batch drying, cross circulation drying, liquid and vapor diffusion, unsaturated surface drying. Drying equipments used in industries. Design and performance of batch and continuous driers.	04
<b>Unit-4</b> <b>Gas Absorption:</b> Equilibrium solubility of gases in liquids. Two component systems, multicomponent systems, ideal liquid solutions, non ideal liquid solutions, choice of solvent for absorption, one component transfer. Material Balances; counter current flow, minimum liquid-gas ratio for absorbers, co-current flow. Counter current multistage operation, one component transferred; dilute gas mixtures, absorption factor, non-isothermal operation, real trays and tray efficiency. Continuous contact equipment; height equivalent to an equilibrium stage (theoretical plate), absorption of one component, overall coefficients and transfer units, overall height of transfer units. Introduction to absorption with chemical reaction.	08
<b>Unit-5</b> <b>Adsorption:</b> Types of adsorption, nature of adsorption, theories of adsorption, adsorption isotherms, adsorption equilibria, single gases and vapor adsorption, adsorption hysteresis, heat of adsorption, effect of temperature and pressure on adsorption, adsorption from dilute and concentrated solutions. Pressure swing and temperature swing adsorption operation. Application to Chromatography and molecular sieves. Adsorption operation equipment. The Freundlich equation, Single stage and multistage operations, Ion Exchange; Principles, Equilibria, rate calculations involved in ion exchange.	06

<b>Unit-6</b>	
<b>Humidification:</b> Humidification / Dehumidification and cooling tower; Definitions, Temperature./ Humidity, Enthalpy Humidity Chart. Method of changing humidity and equipments, cooling tower design, mass and heat balances, performance evaluation of cooling towers.	04

<p>Reference Books:</p> <ol style="list-style-type: none"> <li>1. Unit Operations of Chemical Engineering, W. L. McCabe &amp; J.M. Smith, et al McGraw Hill Publication.</li> <li>2. Chemical Engineering Vol.-I &amp; II, J. F. Richardson J. M. Coulson, Pergamon Press Publication.</li> <li>3. Introduction to Chemical Engineering, W. L. Badger and J. T. Banchero McGraw Hill Publication.</li> <li>4. Mass Transfer operations R. E. Treybal, McGraw Hill Publication.</li> <li>5. Chemical Engineers Hand book, R. H. Perry, McGraw Hill Publication.</li> <li>6. Mass Transfer, T. K. Sherwood et al McGraw Hill Publication.</li> </ol>
<p>Section A: Unit 1, 2, 3</p> <p>Section B: Unit 4, 5, 6</p> <p><b>PATTERN OF QUESTION PAPER</b></p> <p>Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weight age of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.</p> <p>For 80 Marks papers:</p> <ol style="list-style-type: none"> <li>1) Section A &amp; Section B should be of 40 marks each.</li> <li>2) Five questions in each section.</li> <li>3) Out of five four questions asked should be of 15 Marks &amp; one question asked should be 10 Marks.</li> <li>4) 10 marks question will be compulsory.</li> </ol>

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
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**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-I</b>	
<b>CHE302 - Industrial Pollution and Control</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b>	
<ol style="list-style-type: none"> <li>1. To understand and emphasis the importance and need of pollution control</li> <li>1. To understand the methods of control of air pollution</li> <li>2. To understand the methods of control of effluent treatment</li> <li>3. To understand the various pollution such as noise and solid wastes</li> </ol>	
<b>Unit-1</b>	
<b>Introduction to Industrial Pollution:</b> Types of Pollution, Pollution control aspects, Environmental legislation, Water (Prevention and Control of Pollution) Act, 1974 , Air (Prevention and Control of Pollution) Act, 1981, Industrial Waste Water Analysis, Industrial Gaseous Effluent Analysis, General Instruments for Gaseous Pollutants.	08
<b>Unit-2</b>	
<b>Air Pollution:</b> Introduction, Sources, effects, Meteorological aspects of air pollutant dispersion, Temperature lapse rates and stability, wind velocity and turbulence, Plume behavior and estimation, Sampling methods, Characteristics of particulate,	04
<b>Unit-3</b>	
<b>Air Pollution control Methods and Equipments:</b> Collection efficiency calculations of Gravity settling chamber, solid traps, cyclone separator, fiber fabric filter, liquid scrubbers, ESP, Numerical Examples based on settling chamber, cyclone separators, fibre filter, liquid scrubber and ESP.	10
<b>Unit-4</b>	
<b>Water Pollution :</b> Introduction, sources and classification of water pollutants, Waste water sampling and analysis BOD, COD DO, TOC, TDS etc. Water quality standards.	04
<b>Unit-5</b>	
<b>Waste Water Treatments:</b> Primary, Secondary(Biological) and Advanced Waste Water Treatments as Activated Sludge Process; Trickling/Biological Filters; Waste Stabilization Ponds, Anaerobic Treatment etc, Numerical Examples based on removal of BOD.	10
<b>Unit-6</b>	
<b>Control Methods:</b> Removal of chromium, Mercury, Ammonia /Urea, Phenol, lead etc.  Case study of pollution control in various Chemical industrial units:	04

Reference Books:

1. Air pollution control -P. Pratap Mouli & N. Venkata Subbaya, Divya Jyoti Prakashan, Jodhpur .
2. Air Pollution, M.N. Rao, H.V.N. Rao, Tata McGraw – Hill Publishing Co.
3. Fundamentals of air pollution control -Stern. Academic Press.
4. Industrial Water Pollution Control, W.W.Eckenfelder,Jr., McGraw – Hill Book Co.
5. Waste Water Treatment, M. N. Rao & A. K Datta, IBH Pub., New Delhi.
6. Pollution control in Process Industries, S.P. Mahajan. Tata McGraw-Hill Pub. Co. Ltd, N.Delhi.
7. Introduction to waste water treatment -R. S. Ramhalho, Academic Press, New York.
8. Waste Water Engineering: Treatment Disposal Reuse, Metcalf & Eddy, Inc, Tata McGraw Hill.
9. Environmental Pollution Control Engineering, C.S. rao, New Age International (P) Publishers.
10. Sewage Disposal & Air pollution Engineering, S.K. Garg, R. Garg, Khanna Publishers,N.Delhi

Section A: Unit 1, 2, 3

Section B: Unit 4, 5, 6

PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weight age of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

For 80 Marks papers:

- 1) Section A & Section B should be of 40 marks each.
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THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTR-</b>	
<b>CHE303- Chemical Reaction Engineering-I</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b> <ol style="list-style-type: none"> <li>1. To understand the concept and definitions of various rates of chemical reaction.</li> <li>2. To understand and relate terms such as temp with Arrhenius equations.</li> <li>3. To understand the rate equation.</li> <li>4. To understand design of reactors and problems related to it.</li> </ol>	
<b>Unit-1</b>	
<b>Introduction to Reaction Engineering:</b> Classification of reactions, variable affecting rate of reaction, definition of reaction rate. Kinetics of homogeneous reactions, concentration dependant terms of rate equation, elementary and non-elementary reactions, kinetic view of equilibrium for elementary reactions.	08
<b>Unit-2</b>	
<b>Chemical kinetics:</b> Reaction Rates and Its Dependency (Kinetics of Homogeneous Reaction), Molecularity and order of reaction, representation of reaction rates, testing kinetics models, temperature dependency of rate, rate of reaction predicted by theories.	06
<b>Unit-3</b>	
<b>Interpretations of Kinetic Data:</b> Constant volume batch reactor, integral methods of analysis, autocatalytic reactions, first and second order reversible reactions, differentials method of analysis, variable volume batch reactor, temperature and reaction rate, and search for rate equation.	06
<b>Unit-4</b>	
<b>Reactor design:</b> Batch reactor, semi batch reactor, single ideal reactors, performance equations for batch, plug, mixed reactor.	06
<b>Unit-5</b>	
<b>Reactor Design for simple and multiple reactions:</b> Size comparison of single reactors, general graphical comparison, multiple reactor systems, mixed flow reactor of different type in series, reactors of different types in series, recycle reactor, autocatalytic reactions. Reaction in series and parallel, qualitative and quantitative treatment about product distribution, successive irreversible reactions of different orders, semi-parallel reactions, kinetics of series-parallel reactions.	10
<b>Unit-6</b>	
<b>Temperature and Pressure effects:</b> Single reaction and multiple reactions. Optimum temperature progression. Adiabatic and non-adiabatic operations.	04

Reference Books:

1. Chemical Reaction Engineering, O. Levenspiel, Wiley Eastern Ltd
2. Elements of Chemical Reaction Engineering, H. S. Fogler, Prentice- Hall of India Pvt Ltd.
3. The Engineering of Chemical Reactions, L.D.Schmidt, Oxford University Press.
4. Chemical Engineering Kinetics, J.M. Smith, McGraw Hill Book Co.

Section A: Unit 1, 2, 3

Section B: Unit 4, 5, 6

**PATTERN OF QUESTION PAPER**

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THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-I</b>	
<b>CHE304 - Material Science and Technology</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b> 1.	
<b>Unit-1</b>	
<b>Introduction to Materials, Atomic Structure and Chemical Bonding:</b> Variation in bonding character and properties. Scope of materials science and technology and its importance in chemical course. Structure of the Atom, the quantum states. The periodic table, ionization potential, electron affinity and electro negativity. Wave nature of electron and Schrodinger wave equation. Chemical Bonding.: Bond energy, Bond type and bond length, ionic bonding Covalent bonding metallic bonding secondary bonding ( dispersion bonding, dipole bonding and hydrogen bonding) .Variation in bonding character and properties.	10
<b>Unit-2</b>	
<b>Crystal Structure and Determination:</b> Geometry Crystals. the space lattices (a brief mention of the Bravais lattices). Basis, Cubic, and hexagonal crystal structure. Crystal directions (Willer indices and planes) Structure Determination by X-ray diffraction: The Bragg law of X-ray diffraction, the Bragg spectrometer the powder method and structure determination.	06
<b>Unit-3</b>	
<b>Structure of solids and Deformation of Materials:</b> Ionically-bonded structures, properties of ionic solid, covalently- bonded structures, properties of covalent solids, metallicly- bonded structures and their properties, molecularly- bonded structures and their properties. Elastic deformation, inelastic deformation plastic deformation of a single crystal.	06
<b>Unit-4</b>	
<b>Mechanical Properties:</b> Fundamental properties: Fatigue:- Mechanism of fatigue failure, characteristics of fatigue failure. Factors affecting fatigue strength; Creep- types of creep. Creep curve. Design for creep affecting creep, mechanism of creep types of factures, cleavage, brittle cractore and Griffith crack theory: Factors affecting mechanical properties. Changes in mechanical properties by heat treatment.	06

<b>Unit-5</b>	
<b>Electrical and magnetic Properties of Materials:</b> Introduction to Magnetism and Magnetic Properties. ( Definitions and brief explanations) Magnetization and Classification of magnetic materials, hysteresis. Introduction to Superconductivity: Definition and brief explanation, Critical transition temperature. Type I and type II superconductors. Applications.	04
<b>Unit-6</b>	
<b>Selection of Materials of Construction for Chemical Process Industries:</b> Factors determining choice of materials, General factors, Corrosion: Definition, units of measurement Eight forms of corrosion sub types, mechanisms and examples) prevention of corrosion. Engineering Materials Metals and alloys and their applications ( ferrous and nonferrous) Non-metallic materials: Polymeric materials and applications, Ceramics (Clays, Refractories and Glasses), Others ( e.g. Graphite)	08
Reference Books:	
<ol style="list-style-type: none"> <li>1. V. Raghavan, Physical Metallurgy: Principles and Practice, Prentice Hall of India, New Delhi, 1983</li> <li>2. V. Raghavan Materials Science and Engineering, Addison Wesley New York, 1989</li> <li>3. M.G.Fontana, Corrosion Engineering, Tata Mcgraw Hill, 1985</li> <li>4. J.F. Schackelford, Introduction to Material Science for Engineers, 2<sup>nd</sup> ED, McMillan New York, 1990</li> <li>5. L.H.Vlac, Elements of Material Science and Engineering: A first Course, 4th ED, Prentice Hall of India , New Delhi 1997</li> <li>6. W.D. Callister, Jr.Materials Science and Engineering, John Wiley New York, 1997</li> <li>7. Z.D. Jastrzebski, The Nature and properties of Engineering Materials, John Wiley 1987</li> <li>8. R. Perry and D.W.Green, Perrys Chemical Engineers Handbook, 7th Ed, 2001</li> </ol>	
<b>Section A: Unit 1, 2, 3</b>	
<b>Section B: Unit 4, 5, 6</b>	
<b>PATTERN OF QUESTION PAPER</b>	
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**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-I</b>	
<b>CHE305 - Chemical Engineering Thermodynamic</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b> <ol style="list-style-type: none"> <li>1. 1 To know Property relationship between different thermodynamic properties.</li> <li>2. Able to relate different thermodynamic properties.</li> <li>3. Can deduce criteria for any Chemical process regarding Phase and Chemical Equilibrium.</li> <li>4. Able to evaluate values of different state functions of thermodynamic system.</li> </ol>	
<b>Unit-1</b>	
<b>Thermodynamic Properties of Homogeneous system:</b>  Non-ideal behavior: Thermodynamic energy properties, Fugacity and fugacity coefficient, calculation of fugacity for pure substances, fugacity in ideal solutions, standard states, property changes of mixing, the excess Gibbs free energy, activity coefficients for Homogeneous system.	08
<b>Unit-2</b>	
<b>Partial Thermodynamic Properties:</b>  Relations among partial properties for constant composition solutions, Ideal solutions, fundamental residual property relation, Excess property relations, Evaluation of partial properties, Property changes of mixing, heat effect of mixing process, Equilibrium and stability, system of limited Liquid phase miscibility	08
<b>Unit-3</b>	
<b>Thermodynamic Analysis of processes:</b>  Second law for steady state flow process, calculation of ideal work, lost work, thermodynamic analysis of steady state flow processes.	04
<b>Unit-4</b>	
<b>Phase Equilibrium:</b> Nature and criteria of equilibrium, the Phase Rule, vapor -liquid equilibrium, Raoult's law, phase diagrams for miscible systems, VLE calculations for miscible systems for low to moderate pressures, activity coefficients from experimental data, Gibbs Duhem equation. Prediction and correlation of activity coefficients, group contribution methods for activity coefficients (ASOG, UNIFAC, UNIQUAC).	08
<b>Unit-5</b>	
<b>Vapour Liquid Equilibrium:</b>  Properties of fluid from Virial equation of states, Properties of fluid from cubic equation of states, vapour/ liquid equilibrium from cubic equation of states.	04

## Unit-6

### Chemical Reaction Equilibria:

The reaction coordinate, application of the criteria for equilibrium to chemical reactions. Standard Gibbs free energy change & equilibrium constant, effect of temperature on equilibrium constant evaluation of equilibrium constant and composition. Equilibrium conversions for single reactions (single phase and heterogenous reactions). The phase rule for reacting systems. Introduction to multi reaction equilibria.

08

### Reference Books:

1. Chemical Process Principles Part - II O. A. Hougen et al John Wiley Publication.
2. Chemical Engineering Thermodynamics, T. E. Daubert McGraw Hill Publication.
3. Chemical Engineering Kinetics, J. M. Smith, McGraw Hill Publication.
4. Introduction to Chemical Engineering Thermodynamics by G.N. Pandev & J.C. Chaudhary.
5. Chemical Engineering Thermodynamics Dodge.
6. Introduction to Chemical Engineering Thermodynamics J.M. Smith & H. C. Van Ness McGraw Hill Publication.

### Section A: Unit 1, 2, 3

### Section B: Unit 4,5,6

### PATTERN OF QUESTION PAPER

Six units in the syllabus shall be divided in to equal parts i.e. three units in each part.

#### Question

paper shall be set having two sections A and B, as per weightage of units. Section A question Shall be set on first part and section B on second part. Question paper should cover entire syllabus.

### For 80 Marks papers:

- 1) Section A & Section B should be of 40 marks each.
- 2) Five questions in each section.
- 3) Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.

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**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-I</b>	
<b>CHE321:Lab-I:Mass Transfer Operation-I</b>	
<b>Practical: 2Hrs/week</b>	<b>Examination Scheme</b> <b>Practical/Oral : - 50 Marks</b> <b>Term Work: ---</b>
<b>List of Experiments: (Any eight of the following)</b> <ol style="list-style-type: none"><li>1. Mass transfer coefficient</li><li>2. Diffusion co-efficient of liquid</li><li>3. Tray dryer</li><li>4. Batch drying</li><li>5. HTU/NTU.</li><li>6. Humidification (Cooling tower)</li><li>7. Adsorption.</li><li>8. Ion exchange.</li><li>9. Dehumidification</li><li>10. Gas absorption with reaction.</li><li>11. Wetted wall column.</li><li>12. Fixed bed absorber</li><li>13. Vapor Liquid equilibria</li></ol>	

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**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-I</b>	
<b>CHE322:Lab-II:Industrial Pollution and Control</b>	
<b>Practical: 2Hrs/week</b>	<b>Examination Scheme</b> <b>Practical/Oral : - 50 Marks</b> <b>Term Work: ---</b>
<b>List of Experiments: (Any eight of the following)</b> <ol style="list-style-type: none"><li>1. Measurement of pH</li><li>2. Volatile matter</li><li>3. Total solids</li><li>4. Hardness.</li><li>5. Alkalinity.</li><li>6. Dissolved oxygen.</li><li>7. BOD</li><li>8. COD</li><li>9. Chlorides</li><li>10. Turbidity.</li></ol>	

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**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-I</b>	
<b>CHE323:Lab-III:Chemical Reaction Engineering-I</b>	
<b>Practical: 2Hrs/week</b>	<b>Examination Scheme</b> <b>Practical/Oral : - 50 Marks</b> <b>Term Work: ---</b>
<b>List of Experiments: (Any eight of the following)</b> <ol style="list-style-type: none"><li>1. Interpretation of batch reactor data.</li><li>2. To study the kinetics of liquid phase irreversible reaction in a batch reactor.</li><li>3. To study the kinetics of liquid phase reversible reaction in batch reactor.</li><li>4. Conversion in CSTR.</li><li>5. Conversion in PFR.</li><li>6. Conversion in multiple reactors: CSTR followed by PFR.</li><li>7. Conversion in multiple reactors: PFR followed by CSTR</li><li>8. Effect of mixing in a Batch reactor.</li><li>9. To carry out second order reaction in CSTR and to find the value of rate constant.</li><li>10. To determine the pseudo first order rate constant.</li><li>11. To study the kinetics of liquid phase reaction by dilatometer method.</li></ol>	

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<b>SEMESTER-I</b>	
<b>CHE324:Lab-IV:Material Science and Technology</b>	
<b>Practical: 2Hrs/week</b>	<b>Examination Scheme</b> <b>Practical/Oral : --</b> <b>Term Work: 50 Marks</b>
<b>List of Experiments / Assignments : (Any eight of the following)</b>  Term work should consist of at least one assignment (detailed note on a topic or numerical problems where applicable) on each of topics through above.  In addition, at least two chemical process industries as case studies for materials of construction in various equipments.	

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<b>SEMESTER-I</b>	
<b>BSH331:Communication skills-II</b>	
<b>Teaching Scheme</b> Practical: 2Hrs/week	<b>Examination Scheme</b> Online Exam. : 50 Marks Duration of paper: 01 Hr
<b>Unit-I</b>	
<ul style="list-style-type: none"> <li><input type="checkbox"/> Fast calculation techniques, Number system ,ratio ,proportion, variations averages,</li> <li><input type="checkbox"/> Simple interest ,compound interest, profit, loss</li> <li><input type="checkbox"/> Work and time speed and distance</li> <li><input type="checkbox"/> Set theory and vann diagram, permutation and combination</li> <li><input type="checkbox"/> Probability, alphanumeric series, logical deduction, reasoning, coding and decoding and blood relation</li> <li><input type="checkbox"/> Data interpretation</li> </ul>	
<b>Unit-II</b>	
<ul style="list-style-type: none"> <li><input type="checkbox"/>The key components of non verbal communication i.e. eye contacts, body language, vocal tone and volume.</li> <li><input type="checkbox"/>Team work and team bulding, The basics of team intelligence, Diversity awareness, Gender issues</li> <li><input type="checkbox"/> Group discussion ,unstructured group discussions and actual group discussions</li> <li><input type="checkbox"/> Presentation skills ,self confidence and decision making</li> </ul>	
<b>Unit-III</b>	
<ul style="list-style-type: none"> <li><input type="checkbox"/> Adapting to corporate life</li> <li><input type="checkbox"/> Phone etiquettes, Email etiquettes, clothing etiquettes, Dinning table etiquettes</li> <li><input type="checkbox"/>Getting ready for an interviews, corporate dressing, writing reports and proposals,minutes writing,</li> </ul>	
<b>Reference books</b>	
<ol style="list-style-type: none"> <li>1. Gopal Swamy Ramesh,Mahadevan Ramesh ,”The Ace of soft skills” Pearson publication</li> <li>2. Bansal Harison,”Spoken English”</li> <li>3. Orientblackswan, “English for Engineers and Technologist”</li> <li>4. Jerry Wiessman , “Presenting to Win” Pretince Hall publications</li> <li>5. Willium sanborn Pfeiffer,T.V.S,Padamaja, “Technical Communication”</li> <li>6. M.Tyra, “Magical book on Quikermaths” BSC publishing co.pvt.ltd.</li> </ol>	

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**THIRD YEAR (Chemical) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE351 – Mass Transfer Operations-II</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b> <ol style="list-style-type: none"> <li>1. Knowing how to evaluate the effectiveness of process.</li> <li>2. Understand principle of different processes.</li> <li>3. Understanding of design of equipment for different process.</li> <li>4. Knowing how to improve performance of given equipment</li> </ol>	
<b>Unit-1</b>	
<b>Distillation:</b> Vapor liquid equilibrium for ideal and non-ideal binary system T- x-y and P-x-y diagrams, Thermodynamically estimation of VLE using vapor pressure data and relative volatility, Azeotropes .Vapor liquid equilibrium for multi-component mixture differential simple distillation, equilibrium distillation.	08
<b>Unit-2</b>	
<b>Rectification:</b> Minimum and optimum reflux ratio, McCabe Thiele, Ponchan Savarit and Fenskey’s method, calculation of number of theoretical plates, plate efficiency, design of plate tower and packed tower, steam distillation, azeotropic and extractive distillation, molecular distillation ,introduction to multi components ,distillation introduction to reactive distillation ,design and opting characteristic of multistage distillation column and accessories	08
<b>Unit-3</b>	
<b>Crystallization:</b> Principles and theory of Crystallization, crystal formation and crystal growth calculation of yield of crystals, crystallization equipment, concept of MSMPR, design calculation.	04
<b>Unit-4</b>	
<b>Liquid-Liquid Extraction:</b> Solvent extraction, choice of solvent, ternary liquid equilibria, coordinate systems, staged calculation for single stage, multistage cross current, multistage counter current extraction, multistage counter current extraction with reflux.	08
<b>Unit-5</b>	
<b>Extractors Design:</b> spray column, packed and plate column, multistage extraction columns, mixer settlers, analysis on solvent free basis, performance evaluation of extractors, concept of HTU and HETP.	08
<b>Unit-6</b>	
<b>Leaching:</b> Principles, steady state operation, unsteady state operation, single and multistage operations, leaching calculation.	04



**Reference Books:**

1. Chemical Engineering Vol. 2-Richardson and Coulson.
2. Mass Transfer Operation- Treybal, McGraw Hill
3. Absorption and extraction- Sherwood and Pigford
4. Elements of Fractional Distillation-Robinson and Gilliland
5. Unit operations of Chemical Engineering by W.L. McCabe and J.C. Smith, McGraw Hill

**Section A: Unit 1, 2, 3****Section B: Unit 4, 5, 6****PATTERN OF QUESTION PAPER**

Six units in the syllabus shall be divided into equal parts i.e. three units in each part. Question paper shall be set having two sections A and B, as per weight age of units. Section A question shall be set on first part and section B on second part. Question paper should cover entire syllabus.

**For 80 Marks papers:**

- 1) Section A & Section B should be of 40 marks each.
- 2) Five questions in each section.
- 3) Out of five four questions asked should be of 15 Marks & one question asked should be 10 Marks.
- 4) 10 marks question will be compulsory.

**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE352 – Process Equipment Design and Drawing-I</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b> <ol style="list-style-type: none"> <li>1. Understand the basic of design and drawing.</li> <li>2. Understand principle of equipment design.</li> <li>3. Understanding of design of equipment for different process.</li> <li>4. Knowing how to improve performance of given equipment</li> </ol>	
<b>Unit-1</b>	
<b>Design preliminaries:</b> Theories of failure of materials, corrosion, material of construction and selection criteria. Lining and coating of vessels, testing procedures.	06
<b>Unit-2</b>	
<b>Pressure Vessel:</b> Classification of Pressure Vessel, Codes and Standards for the Pressure Vessels. Design of vessels subjected to internal pressure, external pressure and combined loading, closures for vessels, selection of economic head. Estimation of equipment weight. Vessels subjected to high pressure, their fabrication techniques. Optimal proportions of vessels etc.	08
<b>Unit-3</b>	
<b>Accessories:</b> Classification of flanges, procedure for classification, gasket design flange rating, types of nozzles, reinforcement of nozzles, jackets for vessels, coils for heating, cooling.	06
<b>Unit-4</b>	
<b>Supports:</b> Classification of supports for vessels, design procedure for skirt support, bracket support, skirt-bearing plate, anchor bolts, bolt chair. Design of tall vertical vessels.	06
<b>Unit-5</b>	
<b>Equipment Design:</b> Mechanical Design of Agitators, Cyclone, Internal coil vessels and accessories. Design of Coupling, Stuffing Box and Gland. Process Hazards and Safety Measures in Equipment design.	06
<b>Unit-6</b>	
<b>Storage Tank:</b> Optimal proportions of storage tank, loss mechanism in storage tank, estimation of volume of storage tank, mechanical design of storage tank, wind girders, roof of storage tank, roof curb angles, ovalizations of storage tanks, estimations of nozzles, diameter of drain, storage tank dike.	08

Reference Books:

1. Equipment Design, L. E. Brownell & E. H. Young Wiley Eastern Ltd. Publications.
2. Process Equipment Design, M. V. Joshi & V. V. Mahajani Macmillan India Ltd. Publication.
3. Process Design of Equipments, S.D. Dawande, Central Techno Publication.
4. Introduction to Chemical Equipment Design, B. C. Bhattacharyya, CBS Publishers & Distributors.
5. Machine Drawing, N. D. Bhatt, Charotar Publishing House.
6. Machine Drawing, N. Siddheshwar et al Tata McGraw Hill Publishing Co.
7. Chemical Engineering and Design, R C Volume 6

Section A: Unit 1, 2, 3

Section B: Unit 4, 5, 6

PATTERN OF QUESTION PAPER

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Marks.

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**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,  
AURANGABAD FACULTY OF ENGINEERING AND TECHNOLOGY  
THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE353- Chemical Reaction Engineering-II</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b> <ol style="list-style-type: none"> <li>1. Comparison of ideal and non- ideal reaction flow patterns for given reaction.</li> <li>2. Know about RTD and T &amp; P on reaction.</li> <li>3. Able to relate different reaction schemes i.e. fluid-fluid, fluid- particle etc.</li> <li>4. Selection of proper catalyst for given reaction.</li> </ol>	
<b>Unit-1</b>	
<b>Non-ideal flow and mixing :</b> Concept of RTD, different curves, Models for non-ideal flow and applications to reactor design. <b>Mixing of fluids :</b> Self mixing of a single fluid and mixing of two miscible fluids.	10
<b>Unit-2</b>	
<b>Non-catalyzed Fluid-Particle Reaction:</b> Contacting Pattern for Two-Phase Systems, Fluid Particle Reactions. Progressive Conversion Model, Unreacted Core Model for Spherical Particle of Unchanging Size, Rate of Reaction for Shrinking Spherical Particles, Determination of Rate Controlling Steps, Mathematics of Progressive Conversion Model Reactors for Fluid-Particle non catalytic reactions.	06
<b>Unit-3</b>	
<b>Fluid-Fluid Reaction(without catalyst):</b> Rate Equation for Instantaneous, Fast, Intermediate, Slow, Reaction and Infinitely Slow Reaction, Film Conversion Parameter, Slurry Reaction Kinetics. Applications to design - Tower for Fast and 'slow Reaction, Mass Transfer with Chemical Reaction.	06
<b>Unit-4</b>	
<b>Catalysts:</b> Introduction, Classification, Characteristics, Preparation and Deactivation of Catalyst. Promoters and Inhibitors. Determination of surface Area, Pore Volume etc of Catalyst. Selection & preparation catalysts for industrial reactions like NH <sub>3</sub> , H <sub>2</sub> SO <sub>4</sub> , Water gas shift reaction, etc. Adsorption Process and its classifications. Types of Adsorption Isotherm.	06
<b>Unit-5</b>	
<b>Kinetics of Catalyzed Reactions:</b> The Rate equation, Various resistances in catalyst pellets. Effectiveness Factor. Heat effects during reaction, Resistances for isothermal particles.	06
<b>Unit-6</b>	
<b>Heterogeneous Catalytic Reactors:</b> Design, Mechanism, Construction and applications of : Moving Bed Reactors like Slurry Bed Reactors, Trickle Bed Reactors. Isothermal and Adiabatic Fixed Bed Reactors.	06

Reference Books:

1. Chemical Reaction Engineering, O. Levenspiel, Wiley Eastern Ltd
2. Elements of Chemical Reaction Engineering, H. S. Fogler, Prentice- Hall of India Pvt Ltd.
3. The Engineering of Chemical Reactions, L.D.Schmidt, Oxford University Press.
4. Chemical Engineering Kinetics, J.M. Smith, McGraw Hill Book Co.
5. Principles of Reaction Engineering, S.D. Dawande, Central Techno Publications.

Section A: Unit 1, 2, 3

Section B: Unit 4, 5, 6

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**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE354 – Plant Design and Process Economics</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b> 1 To understand the factors affecting plant design. 2 To understand the basis of sizing of equipments and costing. 3 To understand the theory and principle of depreciation. 4 To study PERT and CPM	
<b>Unit-1</b>	
<b>Process Design and Development:</b> Design Project procedure, literature survey, study and comparison of different process, development of a project from laboratory and pilot plant data, scale up methods, principles of similarity criteria and scale equations for important equipment, regime concent	06
<b>Unit-2</b>	
<b>Plant Design:</b> Plant layout, plant location, site selection & preparation, Design report, , Process auxiliaries, selection of utilities like refrigerant, chilled water, air etc. Cooling water, steam, hot water, dowtherm, molten salt baths. Sizing and costing of major equipments like reactors, H.E., multiple effects evaporator, distillation equipment.	08
<b>Unit-3</b>	
<b>Techno-economic Feasibility reports:</b> Cost and asset accounting procedure ,Cost estimation, Cash flow, factor affecting cost and investment, Capital investment, cost index, cost factor, types of insurance, Total product cost, taxes and insurance,. Interest and investment cost.	08
<b>Unit-4</b>	
<b>Depreciation:</b> Types of depreciation, service life, salvage value, present value and methods of determining depreciation, single unit and group depreciation. Causes of Obsolescence and Inadequacy.	05
<b>Unit-5</b>	
<b>Optimum Design:</b> Procedure with one variable, break even chart, Optimum economic diameter optimum reflux ratio in distillation and Heat transfer, optimization, direct search, linear programming, dynamic programming, project organization, project scheduling,	05
<b>Unit-6</b>	
<b>PERT &amp; CPM techniques:</b> Project management, Element and Development of Network, Time estimate and Time computations, Network analysis, Cost Model (Reference to Indian conditions should be made wherever required)	08

Reference Books:

1. Chemical Engineering, Plant Design by Vilbrandt F. O. and Dryden .E. E., McGraw Hill,
2. Plant Design and Economics for Chemical engineers by Peters M. S. and Timmerhaus K. D., McGraw Hill.

Chemical Process Economics: Happel & Jordon D.G.

The Chemical Economy Reaben B.G. Burstall ML. Longman.

Section A: Unit 1, 2, 3

Section B: Unit 4, 5, 6

PATTERN OF QUESTION PAPER

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**Dr. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, AURANGABAD**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE355: Chemical Process Industries</b>	
<b>Teaching Scheme: 4Hrs/week</b> <b>Theory Exam: 03 hrs</b>	<b>Examination Scheme</b> <b>Theory Examination : 80 Marks</b> <b>Class Test : 20 Marks</b>
<b>Objective:</b> <ol style="list-style-type: none"> <li>1. Process flow-sheet in details for given chemicals.</li> <li>2. Know about all the properties of given chemical.</li> <li>3. Understanding of unit operations involved sequentially in manufacturing.</li> <li>4. Aware of engineering problems associate with the manufacturing process</li> </ol>	
<b>Unit-1</b>	
<b>Introduction to Process Industries:</b> Development and salient features of Chemical process Industries in India. Material Resources and shortcomings. Challenge faced by Chemical Industries in India and Future Trends and role of Chemical Engineer.	04
<b>Unit-2</b>	
<b>Inorganic Chemical Industries:</b> Nitrogen Industries- Ammonia , Ammonium Nitrates, Ammonium sulphate , Urea, Nitric Acid. Phosphorus Industries-Phosphorous, Phosphoric Acid, Super Phosphate. Chlor- Alkali Industries- Caustic Soda, Chlorine, Hydrochloric Acid.	08
<b>Unit-3</b>	
<b>Manufacture Processes:</b> Soda Ash, Bleaching Powder, Sodium Bicarbonate, Sulfuric Acid. Electrolytic Industries: Manufacture of Sodium, Sodium Chlorate and perchlorates. Industrial Gases: Manufacture of Oxygen, Nitrogen, Fuels and Fuel gases, Fuel Cells, Natural Gases, Water Gas, Producer Gas.	08
<b>Unit-4</b>	
<b>Organic chem. Industries:</b> Overview of present day organic processing in India including perspectives of agro and other raw material resources as starting materials for industries such as vegetable oils and fats, sugar industries- starch, paper.  Manufacturing industries: phenol, purified terephthaline acid, acetaldehyde, acetic acid, caprolactum, vinyl choride, chlorobenzene, nitrobenzene.	08
<b>Unit-5</b>	
<b>Manufacturing industries</b> -Ethylene, propylene, butanes, butadiene, benzene, toluene, xylene, Styrene, cumene. <b>Synthesis of polymers:</b> Poly ethylene, LDPE, HDPE, Polyester fiber, Nylon, PVC, Other Products: Paints, Varnishes, Soap and Detergents.	08



<b>Unit-6</b>	04
<p><b>Fermentation Industries:</b> Absolute Alcohol, Beer, Wine, Vinegars, Citric Acid.</p> <p><b>Rubber Industries:</b> Natural Rubber, Synthetic Rubber (SBR, Polymeric Oils, Rubber Based on Silicon)</p>	
<p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Shreve's Chemical Process Industries, G. T. Austin., McGraw Hill Publication.</li> <li>2. Dryden's Outlines of Chemical Technology, Edited by M. Gopal Rao Affiliated East West Press Pvt. Ltd.</li> <li>3. A Text Book of Chemical Technology, S. D. Shukla &amp; G. N. Pandey, Vikas Publishing House</li> </ol>	
<p><b>Section A: Unit 1, 2, 3</b>  <b>Section B: Unit 4,5,6</b>  <b>PATTERN OF QUESTION PAPER</b>  Six units in the syllabus shall be divided in to equal parts i.e. three units in each part.  Question paper shall be set having two sections A and B, as per weightage of units. Section A question Shall be set on first part and section B on second part. Question paper should cover entire syllabus.  <b>For 80 Marks papers:</b></p> <ol style="list-style-type: none"> <li>1) Section A &amp; Section B should be of 40 marks each.</li> <li>2) Five questions in each section.</li> <li>3) Out of five four questions asked should be of 15 Marks &amp; one question asked should be 10 Marks.</li> </ol>	

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**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE371:Lab-I:Mass Transfer Operation-II</b>	
<b>Practical: 2Hrs/week</b>	<b>Examination Scheme</b> <b>Practical/Oral : - 50 Marks</b> <b>Term Work: ---</b>
<b>List of Experiments: (Any eight of the following)</b> <ol style="list-style-type: none"><li>1. Flash/Equilibrium distillation</li><li>2. Batch distillation</li><li>3. Steam distillation</li><li>4. Tie line extraction</li><li>5. Kunni extraction column</li><li>6. Packed extraction column(Liquid –Liquid )</li><li>7. Spray extraction column</li><li>8. Solid-Liquid extraction</li><li>9. Ternary Phase Diagram</li><li>10. HETP</li><li>11. Packed Bed Distillation column</li><li>12. Batch crystallizer</li></ol>	

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**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE372:Lab-II: Process Equipment Design and Drawing-I</b>	
<b>Practical: 2Hrs/week</b>	<b>Examination Scheme</b> <b>Practical/Oral : - 50 Marks</b> <b>Term Work: ---</b>
<b>List of Experiments: (Any Five of the following)</b> <ol style="list-style-type: none"><li>1. Pressure Vessels</li><li>2. Heads and Closures.</li><li>3. Vessel supports</li><li>4. Vacuum Producing Devices, Steam Traps, Pressure Relief Devices.</li><li>5. Process Flow Diagrams.</li><li>6. Reaction Vessel with all internals.</li><li>7. Agitators</li><li>8. Tall vessels with internals e.g. Packed/ plate column.</li></ol>	

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**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE373:Lab-III:Chemical Reaction Engineering-II</b>	
<b>Practical: 2Hrs/week</b>	<b>Examination Scheme</b> <b>Practical/Oral : - 50 Marks</b> <b>Term Work: ---</b>
<b>List of Experiments: (Any eight of the following)</b> <ol style="list-style-type: none"><li>1. The kinetics of liquid phase reversible reaction with homogenous catalyst in a batch reactor.</li><li>2. The temperature dependency of liquid phase irreversible reaction.</li><li>3. Mass transfer with chemical reaction.</li><li>4. RTD in CSTR.</li><li>5. RTD in PFR.</li><li>6. RTD in packed bed reactor.</li><li>7. Characterization of catalysts.</li><li>8. CSTRs in series.</li><li>9. Heterogeneous catalytic reaction.</li><li>10. Catalyst Preparation</li><li>11. Neutralization Reaction</li></ol>	

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**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE374:Lab-IV:Plant Design and Process Economics</b>	
<b>Practical: 2Hrs/week</b>	<b>Examination Scheme</b> <b>Practical/Oral : --</b> <b>Term Work: 50 Marks</b>
<b>List of Experiments / Assignments : (Any eight of the following)</b>  Term work should consist of at least one assignment (detailed note on a topic or numerical problems where applicable) on each of topics through above.  In addition, at least two chemical process industries as case studies for materials of construction in various equipments.	

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**THIRD YEAR (CHEMICAL) ENGINEERING**

<b>SEMESTER-II</b>	
<b>CHE375- Seminar-I</b>	
<b>Teaching Scheme: NA</b> <b>Practical: 2Hrs/week</b>	<b>Examination Scheme:</b> <b>Theory Examination : NA</b> <b>Class Test : NA</b> <b>Practical/Oral : 50 Marks</b> <b>Term Work: NA</b>
<p style="text-align: center;"><b>Topics &amp; Contents</b></p> <p>The student shall study special topic beyond the scope of the syllabus under the subjects of Chemical Engineering or inter discipline branch from current literature, by referring the current technical journal or reference books, under the guidance of the teacher.</p> <p>The student shall prepare his report together with design, computation, process flow-sheet etc, if any, and deliver talk on the topic to other students of his class in the presence of his guide and internal examiner. The student is permitted to use audio-visual aids or any other such teaching aids.</p> <p>Practical Examination The term work for this head will consists of the report written in a technical reporting manner and presentation of the talk on the subject and will be assessed by the two internal examiners appointed by the HOD of concern department of the institution one of whom will be his guide and the other internal teacher of the concerned branch.</p>	