GOVERNMENT OF ANDHRA PRADESH

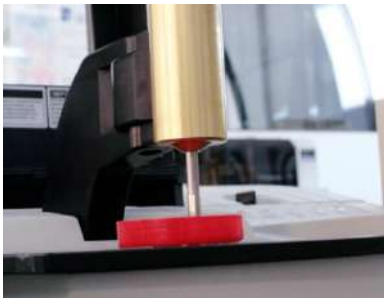
STATE BOARD OF TECHNICAL EDUCATION AND TRAINING

Andhra Pradesh :: AMARAVATI

Globally Competitive

CURRICULUM (C-20)

For Polytechnic Diploma Courses in Andhra Pradesh



3½ YEAR (SW)
DIPLOMA IN
CHEMICAL ENGINEERING (PLASTICS AND POLYMERS)

CURRICULUM -2020

(C-20)

3½ YEAR (SW)

DIPLOMA IN CHEMICAL ENGINEERING (PLASTICS AND POLYMERS)

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING
Andhra Pradesh :: AMARAVATI

CURRICULUM -2020
(C-20)
FOR DIPLOMA COURSES IN ANDHRA PRADESH CURRICULUM – C - 20

PREAMBLE

The proposed programme intends to develop a skilled technician to support the industries both nationally or globally. It also helps to kindle the spirit of entrepreneurship with necessary skills and theoretical inputs aligning with the National policy of 'Make in India'. The programme also provides for accomplishing higher education goals for those who wish to enrich their theoretical concepts further.

The State Board of Technical Education and Training, (SBTET) AP, has been offering Diploma programmes to meet the above said aspirations of the stake holders: industries, students, academia, parents and the society at large. As such, it has been the practice of SBTET, A.P., to keep the curriculum abreast with the advances in technology through systematic and scientific analysis of current curriculum and bring out an updated revised version at regular intervals. Accordingly the SBTET, AP under the aegis of the Department of Technical Education, Andhra Pradesh in it's 57th Board Meeting held on 05-02-2019 (vide item no: 18) resolved to update the Polytechnic Curriculum C-16 with the guidance of National Institute of Technical Teachers Training & Research (NITTTR), Extension Centre, Vijayawada (ECV), to be implemented with effect from the academic year '20-21.

Analysis of Curriculum C-16 (SWOT analysis) started in the month of June-2019. Feedback was collected from all stake holders: Students, Lecturers, Senior Lecturers, Head of Sections and Principals for all programmes for this purpose. A series of workshops with subject experts followed in the subsequent weeks and the draft curricula were prepared for every programme. Finally, an interactive session with representatives from industries, academia and subject experts was held on 04.01.2020 for thorough perusal and critique of draft curricula; and the suggestions received thus received from Industrialists and academia have been recorded , validated by another set of experienced subject teachers from the Department of Technical education for incorporation into the Curriculum C-20.

The design of new Curricula for the different diploma programmes has thus been finalised with the active participation of the members of the faculty teaching in the Polytechnics of Andhra Pradesh, and duly reviewed by Expert Committee constituted of academicians and representatives from industries. Thus, the primary objective of the curriculum change is to produce employable technicians in the country by correlating the growing needs of the industries with relevant academic input.

The outcome based approach as given by NBA guidelines has been followed throughout the design of this curriculum is designed to meet the requirements of NBA Accreditation, too.

The revised New Curriculum i.e., Curriculum–2020 (C-20) is approved by BoG of SBTET for its implementation with effect from 2020-21.

Highlights of Curriculum C-20:

1. Duration of course for regular Diploma and for sandwich Diploma is 3 years and 3½ years respectively.
2. The Curriculum is prepared in Semester Pattern. However, First Year is maintained as Year-wise pattern.
3. 6 Months Industrial training has been introduced for 3 years Diploma Courses and 1 year Industrial Training is introduced for 3 ½ years Sandwich Diploma courses.
4. Updated subjects relevant to the industry are introduced in all the Diploma courses.
5. CISCO course content has been incorporated into the ECE and CME programmes for certification from CISCO in lieu of industrial training when students are unable to get Industrial Training placement in any industry.
6. The policy decisions taken at the State and 1Central level with regard to environmental science are implemented by including relevant topics in Chemistry. This is also in accordance with the Supreme Court guidelines issued in Sri Mehta's case.
7. Keeping in view the increased need of communication skills which is playing a major role in the success of Diploma Level students in the Industries, emphasis is given for learning and acquiring listening, speaking, reading and writing skills in English. Further as emphasized in the meetings, Communication Skills lab and Life Skills lab are continuing for all the branches.
8. CAD specific to the branch has been given emphasis in the curriculum. Preparing drawings using CAD software has been given more importance.
9. Upon reviewing the existing C-16 curriculum, it is found that the theory content is found to have more weightage than the Practical content. In C-20 curriculum, more emphasis is given to the practical content in Laboratories and Workshops, thus strengthening the practical skills.
10. With increased emphasis for the student to acquire Practical skills, the course content in all the subjects is thoroughly reviewed and structured as outcome based than the conventional procedure based.
11. Curricula of Laboratory and Workshops have been thoroughly revised based on the suggestions received from the industry and faculty, for better utilization of the equipment available in the Polytechnics. The experiments /exercises that are chosen for the practical sessions are identified to confirm to the field requirements of industry.
12. An exclusive section for assessing Higher order Thinking skills (HOTS) has been introduced in summative evaluation.

Acknowledgements:

It is pertinent to acknowledge the support of the following in the making of Curriculum C-20. A series of workshops in three phases were conducted by NITTTR, AP Extension Centre, Vijayawada involving faculty from Polytechnics, Premier Engineering Colleges & Industries to analyze the Previous C-16 Curriculum and to design C-20 Curriculum under the guidance of Dr C. R. Nagendra Rao, Professor & Head, NITTTR-ECV. The efforts & support extended by NITTTR to bring out final Curriculum C-20 by incorporating needs, aspiration & expectations of all stake holders is highly appreciated and gratefully acknowledged.

The Members of the working group are grateful to Sri M.M. Nayak, I.A.S., Special Commissioner of Technical Education & Chairman of SBTET, AP. and Sri. G. AnanthaRamu, I.A.S., Principal Secretary, Department of Skill Development and Training for their guidance and valuable inputs during process of revising, modifying and updating the Curriculum C-20.
The Members acknowledge with thanks the guidance & inspiration provided by Sri. V.S. Dutt, Secretary, SBTET, Andhra Pradesh and other officials of Directorate of

Technical Education and the State Board of Technical Education, Andhra Pradesh, experts from industry, academia from the universities and higher learning institutions and all teaching fraternity from the Polytechnics who are directly or indirectly involved in preparation of the curricula.

RULES AND REGULATIONS OF C-20 CURRICULUM

1 DURATION AND PATTERN OF THE COURSES

All the Diploma programs run at various institutions are of AICTE approved 3 years or 3½ years duration of academic instruction.

All the Diploma courses are run on year wise pattern in the first year, and the remaining two or two & half years are run in the semester pattern. In respect of few courses like Diploma in Bio-Medical course, the training will be in the seventh semester. Run-through system is adopted for all the Diploma Courses, subject to eligibility conditions.

2 PROCEDURE FOR ADMISSION INTO THE DIPLOMA COURSES:

Selection of candidates is governed by the Rules and Regulations laid down in this regard from time to time.

a) Candidates who wish to seek admission in any of the Diploma courses will have to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Vijayawada.

Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET).

b) The candidates seeking admission should have appeared for S.S.C examination, conducted by the Board of Secondary Education, Andhra Pradesh or equivalent examination thereto, at the time of applying for the Common Entrance Test for admissions into Polytechnics (POLYCET). In case of candidates whose results of their Qualifying Examinations is pending, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of admission.

c) Admissions are made based on the merit obtained in the Common Entrance Test (POLYCET) and the reservation rules stipulated by the Government of Andhra Pradesh from time to time.

d) For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for POLYCET. A separate notification will be issued for admission into these courses.

i). D.HMCT ii).D. Pharmacy

3 MEDIUM OF INSTRUCTION

The medium of instruction and examination shall be English.

4 PERMANENT IDENTIFICATION NUMBER (PIN)

A cumulative / academic record is to be maintained of the Marks secured in sessional work and end examination of each year for determining the eligibility for promotion etc., A Permanent Identification Number (PIN) will be allotted to each admitted candidate to maintain academic records.

5 NUMBER OF WORKING DAYS PER SEMESTER / YEAR:

a) The Academic year for all the Courses shall be in accordance with the Academic Calendar.

b) The Working days in a week shall be from Monday to Saturday

c) There shall be 7 periods of 50 minutes duration each on all working days.

d) The minimum number of working days for each semester / year shall be 90 / 180 days excluding examination days. If this prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes to complete the syllabus.

6 ELIGIBILITY (ATTENDANCE TO APPEAR FOR THE END EXAMINATION)

a) A candidate shall be permitted to appear for the end examination in all subjects, if he or she has attended a minimum of 75% of working days during the year/Semester.

b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or 1st year may be granted on medical grounds.

c) A stipulated fee shall be payable towards condonation for shortage of attendance.

d) Candidates having less than 65% attendance shall be detained.

e) Students whose shortage of attendance is not condoned in any semester / 1st year and not paid the condonation fee in time are not eligible to take their end examination of that class and their admissions shall stand cancelled. They may seek re-admission for that semester / 1st year when offered in the next subsequent academic semester/year.

f) For INDUSTRIAL TRAINING:

i) During Industrial Training the candidate shall put in a minimum of 90% attendance.

ii) If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training at his own expenses.

7 READMISSION

Readmission shall be granted to eligible candidates by the respective Principal/ Regional Joint Director.

a) (i) Within 15 days after commencement of class work in any semester (Except Industrial Training).

(ii) For Industrial Training: before commencement of the Industrial training.

b) Within 30 days after commencement of class work in any year (including D. Pharmacy course or first year course in Engineering and Non Engineering Diploma streams).

Otherwise such cases shall not be considered for readmission for that semester / year and are advised to seek readmission in the next subsequent eligible academic year.

The percentage of attendance of the readmitted candidates shall be calculated from the first day of beginning of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not from the day on which he/she has actually reported to the class work.

8 SCHEME OF Evaluation

a) First Year

THEORY Courses: Each Course carries Maximum marks of 80 with examination of 3 hours duration, along with internal assessment for Maximum of 20 marks. (Sessional marks). However, there are no minimum marks prescribed for sessionals.

Laboratory Courses: There shall be 40 Marks for internal assessment i.e. sessional marks for each practical Course with an end examination of 3 hours duration carrying 60 marks. However, there are no minimum marks prescribed for sessionals.

b) III, IV, V, VI and VII Semesters:

THEORY Courses: End semester evaluation shall be of 3 hours duration and for a maximum of 80 marks.

Laboratory Courses: Each Course carry 60/30 marks of 3hours duration 40/20 sessional marks.

9 INTERNAL ASSESSMENT SCHEME

a) **Theory Courses**: Internal assessment shall be conducted for awarding sessional marks on the dates specified. **Three unit tests shall be conducted for I year students and two Unit Tests for semesters.**

Internal Assessment shall be of 90 minutes duration and for a maximum of 40 marks. For each test

The average of marks of all the test, reduced to 20 shall be taken as final sessional in any case.

b) **Practical Courses**:

(i) **Drawing Courses:**

The award of sessional marks for internal Assessment shall be as given in the following table

Distribution of Marks for the Internal Assessment Marks			
First Year (Total:40 Marks)		**Semesters (Total:40 Marks)**	
Max:20 Marks	**Max:20 Marks**	**Max:20 Marks**	**Max:20 Marks**
From the Average of THREE Unit Tests.	From the Average of Assessment of Regular Class work Exercises.	From the Average of TWO Unit Tests.	From the Average of Assessment of Regular Class work Exercises.

All Drawing exercises are to be filed in **serial order** and secured for further scrutiny by a competent authority

(ii) Laboratory Courses:

Student's performance in Laboratories / Workshop shall be assessed during the year/ semester of study for 40 marks in each practical Course.

Evaluation for Laboratory Courses, other than Drawing courses:

i. Instruction (teaching) in laboratory courses (except for the course on Drawing) here after shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP & NITTTR- ECV and posted in SBTET website.
ii. Internal assessment for Laboratory shall be done on the basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP & NITTTR- ECV and posted in AP, SBTET website.
iii. Question paper for End semester Evaluation shall also be task/s based and shall be prepared and distributed by SBTET as done in case of theory courses be prepared as per SBTET rules in vogue.

c) Internal assessment in Labs / workshops / Survey field work etc., during the course of study shall be done and sessional marks shall be awarded by the concerned Teacher.

d) For practical examinations, except in drawing, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective Head of Section preferably choosing a qualified person from in the order of preference.

i) Nearby Industry
ii) Govt / Semi Govt organization like R & B, PWD, PR, Railways, BSNL,APSRTC, APSEB etc.
iii) Govt / University Engg College.
iv) HoDs from Govt.Polytechnic Internal examiner shall be the person concerned with internal assessment as in (c) above. The end examination shall be held along with all theory papers in respect of drawing.

e) Question Paper for Practicals: Question paper should cover (the experiments / exercise prescribed to test various) skills like handling, manipulating, testing, trouble shooting, repair, assembling and dismantling etc., from more than one experiment / exercise

f) Records pertaining to internal assessment marks of both theory and practical Courses are to be maintained for official inspection.

g) **In case of Diploma programs having Industrial Training, Internal Assessment and Summative Evaluation**, shall be done as illustrated in the following table:

Assessment no	**Upon completion of**	**By**	**Based on**	**Max Marks**
1	12 weeks	1.The faculty concerned and 2. Training Mentor of the industry	Learning outcomes as given in the scheme of assessment ,for Industrial Training	120
2	20-22 weeks			120
3.Final summative Evaluation	23 week	1.The faculty member concerned 2.HoD concerned and 3.An external examiner	1.Demonstration of any one of the skills listed in learning outcomes	30
			2.Training Report	20
			3.Viva Voce	10
TOTAL				**300**

10 MINIMUM PASS MARKS

THEORY EXAMINATION:

For passing a theory Course, a candidate has to secure a minimum of 35% in end examination and a combined minimum of 35% of both Sessional and end examination marks put together.

PRACTICAL EXAMINATION:

For passing a practical Course, a candidate has to secure a minimum of 50% in end examination and a combined minimum of 50% of both sessional and practical end examination marks put together. In case of D.C.C.P., the pass mark for typewriting and short hand is 45% in the end examination. There are no sessional marks for typewriting and Shorthand Courses of D.C.C.P course.

INDUSTRIAL ASSESSMENT:

Pass marks is 50% in assessment at Industry (I and II assessments put together) and also 50% in final summative assessment at institution level

11. PROVISION FOR IMPROVEMENT

Improvement is allowed only after he / she has completed all the Courses from First Year to Final semester of the Diploma.

a) Improvement is allowed in any 4 (Four) Courses of the Diploma.
b) The student can avail of this improvement chance **ONLY ONCE**, that too within the succeeding two examinations after the completion of Diploma. However, the duration including Improvement examination shall not exceed **FIVE** years from the year of first admission.
c) No improvement is allowed in Practical / Lab Courses or Project work or Industrial Training assessment. However, improvement in drawing Course(s) is allowed.
d) If improvement is not achieved, the marks obtained in previous Examinations hold good.
e) Improvement is not allowed in respect of the candidates who are punished under Mal-practice in any Examination.
f) Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.
g) All the candidates who wish to appear for improvement of performance shall deposit the original Marks Memos of all the years / Semesters and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks and Original Diploma Certificate will be issued, else the submitted originals will be returned.

12. RULES OF PROMOTION FROM 1ST YEAR TO 3,^{rd,} 4,th 5th ,6th and 7th SEMESTERS:

A) For Diploma Courses of 3 Years duration

i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds up to 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training, AP from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training AP from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she

a) Puts the required percentage of attendance in the 4th semester
b) Should not have failed in more than four Courses in 1st year

For IVC & ITI Lateral Entry Students:

a) A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester
b) A candidate is eligible to appear for the 4th semester examination if he/she clears at least two Courses in third semester.

iv) A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester examination if he/she
a) Puts the required percentage of attendance in the 5th semester
b) Should get eligibility to appear for 4th Semester examination.

The first backlog exam in 5th semester will be conducted only in instant/supplementary diploma examination.

For IVC& ITI Lateral Entry students:

a) Puts the required percentage of attendance in the 5th semester

v) A candidate shall be sent to Industrial training provided he/she puts in the required percentage of attendance in the 4th semester and pay the examination fee/ promotion fee as prescribed by SBTET.

A candidate is eligible to appear for Industrial Training assessment (Seminar/Viva-voce)

a) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training

For IVC & ITI Lateral Entry students:

a) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training.
b) should get eligibility to appear for 5th Semester Examination.

B) For Diploma Courses of 3 ½ Years duration (MET/ CH/ CHPP/ CHPC/ CHOT/ TT):

i. A candidate shall be permitted to appear for 1st year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.
ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the 1st year and pays the examination fee. A candidate who could not pay the 1st year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.
iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate, who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester exam if he/she

a). Puts the required percentage of attendance in the 4th semester
b). Should not have failed in more than Four backlog Courses of 1st year.

For IVC & ITI Lateral Entry students:

a) Puts the required percentage of attendance in the 4th semester

iv. A candidate shall be promoted to 5th semester industrial training provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

v. Promotion from 5th to 6th semester is automatic (i.e., from 1st spell of Industrial Training to 2nd spell) provided he/she puts the required percentage of attendance, which in this case ie.,90 % of attendance and attends for the VIVA-VOCE examination at the end of training.

vi. A candidate shall be promoted to 7th semester provided he / she puts the required percentage of attendance in the 6th semester and pays the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 7th semester.

vii. A candidate shall be promoted to 7th semester of the course provided he/she has successfully completed both the spells of Industrial Training.

A candidate is eligible to appear for 7th semester examination if he/she

a)Puts in the required percentage of attendance in the 7th semester

b) Should get eligibility to appear for 4th semester Examination.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance in the 7th semester

b) Should not have failed more than four backlog Courses of 3rd Semester

C) For Diploma Courses of 3 ½ Years duration (BM):

The same rules which are applicable for conventional courses also apply for this course. The industrial training in respect of this course is restricted to one semester (6 months) after the 6th semester (3 years) of the course.

i. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds up to 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

ii. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

iii. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

A candidate is eligible to appear for the 4th semester examination if he/she

a) Puts in the required percentage of attendance in the 4th semester
b) Should not have failed in more than Four backlog Courses of 1st year

For IVC & ITI Lateral Entry Students:

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

iv. A candidate shall be promoted to 5th semester provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

A candidate is eligible to appear for the 5th semester exam if he/she

a) Puts in the required percentage of attendance in the 5 th semester.
b) Should get eligibility to appear for 4th Semester examination.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance in the 5th semester.
b) Should not have failed in more than Four backlog Courses of 3rd Semester.

v. A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee.
A candidate who could not pay the 5th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.
A candidate is eligible to appear for 6th semester examination

a) Puts in the required percentage of attendance in 6th semester and
b) should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance in 6th semester.
b) Should get eligibility to appear for 5th Semester Examination.

vi. A candidate shall be promoted to 7th semester provided he/she puts in the required percentage of attendance in 6th semester and pay the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee prescribed by SBTET from time to time before commencement of the 7th semester (Industrial Training).

A candidate is eligible to appear for 7th semester Industrial Training assessment (Seminar/Viva-voce) if he/she

a) Puts in the required percentage of attendance, ie., 90% in 7th semester Industrial Training
b) Should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

a) Puts in the required percentage of attendance, ie., 90% in 7th semester Industrial Training.
b) Should get eligibility to appear for 5th Semester Examination.

Important Note:

Seminar/Viva-voce should not be conducted for Not-Eligible Candidates, till the candidate gets eligibility. However, the record of internal Assessment for Industrial Training for 260 marks shall be maintained at Institution Level for all candidates and the data is to be uploaded only for eligible candidates. For not eligible candidates the data is to be uploaded as and when the candidate gets eligibility.

OTHER DETAILS

a) In case a candidate does not successfully complete the Industrial training, he / she will have to repeat the training at his / her own cost.
b) The First spell of Industrial training shall commence 10 days after the completion of the last theory examination of 4th Semester.
c) The Second spell of Industrial training shall commence within 10 days after the completion of first spell of Industrial training.

13.STUDENTS PERFORMANCE EVALUATION

Successful candidates shall be awarded the Diploma under the following divisions of pass.

a) First Class with Distinction shall be awarded to the candidates who secure an overall aggregate of 75% marks and above.
b) First Class shall be awarded to candidates who secure overall aggregate of 60% marks and above and below 75% marks.
c) Second Class shall be awarded to candidates who secure a pass with an overall aggregate of below 60%.
    i. The Weightage of marks for various year/Semesters which are taken for computing overall aggregate shall be 25% of I year marks + 100% of 3rd and subsequent Semesters.
    ii. In respect IVC & ITI Lateral Entry candidates who are admitted directly into diploma course at the 3rd semester (i.e., second year) level the aggregate of (100%) marks secured at the 3rd and subsequent semesters of study shall be taken into consideration for determining the overall percentage of marks secured by the candidates for award of class/division.
d) Second Class shall be awarded to all students, who fail to complete the Diploma in the regular 3 years/ 3 ½ years and four subsequent examinations, from the year of first admission.

14. EXAMINATION FEE SCHEDULE:

The examination fee should be as per the notification issued by State Board of Technical Education and Training, AP from time to time.

15. STRUCTURE OF EXAMINATION QUESTION PAPER:

I. Formative assessment (Internal examination)

a) For theory Courses:

Three unit tests for first year and two unit tests for semesters shall be conducted with a duration of 90 minutes for each test for maximum marks of 40. It consists of part A and Part B.

Part A contains five questions and carries 16 marks. Among these five questions first question consists of four objective items like one word or phrase answer/filling-in the blanks/true or false etc with one mark for each question. The other four questions are short answer questions and carry three marks each.

Part B carries 24 marks and consists of three questions with internal choice ie., Either/Or type , and each question carries 8 marks.

The sum of marks of 3 tests for I year and 2 tests for semesters shall be reduced to 20 marks in each Course for arriving at final sessional marks.

b) For drawing Courses:

For I year:

Three unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted for first year. It consists of part A and Part B.

Part A consists four questions for maximum marks of 16 and each question carries four marks (4×4 marks=16 marks).

Part B carries maximum marks of 24 and consists of five questions while the student shall answer any three questions out of these five questions. Each question in this part carries a maximum marks of 8, (3×8 marks=24 marks).

The sum of marks obtained in 3 unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20 marks are awarded by the Course teacher based on the student's performance during regular class exercise.

For semester: Two unit tests with duration of 90 minutes and for maximum marks of 40 marks shall be conducted. The sum of marks obtained in 2 unit test marks shall be reduced to 20 marks for arriving at final sessional marks. Remaining 20 marks are awarded by the Course teacher based on the student's performance during regular class exercise

c) For Laboratory /workshop: 50% of total marks for the Course shall be awarded based on continuous assessment of the student in laboratory/workshop classes and the remaining 50% shall be based on the sum of the marks obtained by the students in two tests.

II. Summative assessment (End examination)

The question paper for theory examination is patterned in such a manner that the Weightage of periods/marks allotted for each of the topics for a particular Course be considered. End Examination paper is of 3 hours duration.

a) **Each theory paper consists of Section 'A', 'B' and 'C'**.

Section 'A' with Max marks of 30, contains 10 short answer questions. All questions are to be answered and each carries 3 marks, i.e., 10 x 3 = 30.

Section 'B' with Max marks of 40 contains 5 essay type questions including Numerical questions (without any divisions in the question), with internal choice(Either/or type), each carrying 8 marks, i.e., Max. Marks: 5 x 8 = 40.

Section 'C' with Max marks of 10 contains single essay type, Higher order Thinking skills question (HoTs)including Numerical questions, without choice (without any divisions in the question),

Thus the total marks for theory examination shall be: 80.

b) **For Engineering Drawing Course (107) consist of section 'A' and section 'B'**.

Section 'A' with max marks of 20, contains four (4) questions. All questions in section 'A' are to be answered to the scale and each carries 5 marks, ie. 4 x 5=20.
Section 'B' with max marks of 40, contains six (6) questions. The student shall answer any four (4) questions out of the above six questions and each question carries 10 Marks, ie. 4 x 10 = 40.

c) **Practical Examinations**
For Workshop practice and Laboratory Examinations, Each student has to pick up a question paper distributed by Lottery System.
Max. Marks for an experiment / exercise : 50
Max. Marks for VIVA-VOCE : 10
Total Max. Marks : 60
In case of practical examinations with 50 marks, the marks shall be distributed as
Max. Marks for an experiment / exercise : 25
Max. Marks for VIVA-VOCE : 05
Total Max. Marks : 30
In case of any change in the pattern of question paper, the same shall be informed sufficiently in advance to the candidates.

d) **Note: Evaluation for Laboratory Courses, other than Drawing courses**:

I. Instruction (teaching) in laboratory courses (except for the course on Drawing) hereafter shall be task/competency based as delineated in the Laboratory sheets, prepared by SBTET, AP and posted in its website.
II. Internal assessment for Laboratory shall be done on basis of task/s performed by the student as delineated in the laboratory sheets, prepared by SBTET, AP and posted in its website.
III. Question paper for End semester Evaluation shall be prepared as per SBTET rules in vogue.

16. ISSUE OF MEMORONDUM OF MARKS

All candidates who appear for the end examination will be issued memorandum of marks without any payment of fee. However candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, A.P. for each duplicate memo from time to time.

17. MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA Programmes:

Maximum period for completion of the diploma courses is twice the duration of the course from the date of First admission (includes the period of detention and discontinuation of studies by student etc) failing which they will have to forfeit the claim for qualifying for the award of Diploma (They will not be permitted to appear for examinations after that date). This rule applies for all Diploma courses of 3 years and 3 ½ years of engineering and non-engineering courses.

18. ELIGIBILITY FOR AWARD OF DIPLOMA

A candidate is eligible for award of Diploma Certificate if he / she fulfil the following academic regulations.

i. He / She pursued a course of study for not less than 3 / 3 ½ academic years & not more than 6 / 7 academic years.

ii. He / she have completed all the Courses.
Students who fail to fulfil all the academic requirements for the award of the Diploma within 6 / 7 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

For IVC & ITI Lateral Entry students:

i. He / She pursued a course of study for not less than 2 / 2 ½ academic years & not more than 4 / 5 academic years.
ii. He / she has completed all the Courses.
Students who fail to fulfil all the academic requirements for the award of the Diploma within 4 / 5 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

19. ISSUE OF PHOTO COPY OF VALUED ANSWER SCRIPT, RECOUNTING& REVERIFICATION:

A) FOR ISSUE OF PHOTO COPIES OF VALUED ANSWER SCRIPTS

I. A candidate desirous of applying for Photo copy of valued answer script/s should apply within prescribed date from the date of the declaration of the result.
II. Photo copies of valued answer scripts will be issued to all theory Courses and Drawing Course(s).
III. The Photo copy of valued answer script will be dispatched to the concerned candidate's address as mentioned in the application form by post.
IV. No application can be entertained from third parties.

B) FOR RE-COUNTING(RC) and RE-VERIFICATION(RV) OF THE VALUED ANSWER SCRIPT

i. A candidate desirous of applying for Re-verification of valued answer script should apply within prescribed date from the date of the declaration of the result.
ii. Re-verification of valued answer script shall be done for all theory Courses' and Drawing Course(s).
iii. The Re-verification committee constituted by the Secretary, SBTETAP with Course experts shall re-verify the answer scripts.

I. **RE-COUNTING**
The Officer of SBTET will verify the marks posted and recount them in the already valued answer script. The variations if any will be recorded separately, without making any changes on the already valued answer script. The marks awarded in the original answer script are maintained (hidden).

II. RE-VERIFICATION
(i) The Committee has to verify the intactness and genuineness of the answer script(s) placed for Re-verification.
(ii) Initially single member shall carry out the re-verification.
(iii) On re-verification by single member, if the variation is less than 12% of maximum marks, and if there is no change in the STATUS in the result of the candidate, such cases will not be referred to the next level ie., for 2-Tier evaluation.
(iv) On re-verification by a single member, if the variation is more than 12% of maximum marks, it will be referred to 2-Tier evaluation.

(v) If the 2-Tier evaluation confirms variation in marks as more than 12% of maximum marks, the variation is considered as follows:

a) If the candidate has already passed and obtains more than 12% of the maximum marks on Re-verification, then the variation is considered.

b) If the candidate is failed and obtains more than 12% of the maximum marks on Re-verification and secured pass marks on re-verification, then the status of the candidate changes to PASS.

c) If a candidate is failed and obtains more than 12% of the maximum marks on Re-verification and if the marks secured on re-verification are still less than the minimum pass marks, the status of the candidate remain FAIL only.

(vii) After Re-verification of valued answer script the same or change if any therein on Re-verification, will be communicated to the candidate.

(viii) On Re-verification of Valued Answer Script if the candidate's marks are revised, the fee paid by the candidate will be refunded or else the candidate has to forfeit the fee amount.

Note: No request for Photo copies/ Recounting /Re-verification of valued answer script would be entertained from a candidate who is reported to have resorted to Malpractice in that examination.

20. MAL PRACTICE CASES:

If any candidate resorts to Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per SBTETAP rules and regulations in vogue.

21. DISCREPANCIES/ PLEAS:

Any Discrepancy /Pleas regarding results etc., shall be represented to the SBTETAP within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

22. ISSUE OF DUPLICATE DIPLOMA

If a candidate loses his/her original Diploma Certificate and desires a duplicate to be issued he/she should produce written evidence to this effect. He / she may obtain a duplicate from the Secretary, State Board of Technical Education and Training, A.P., on payment of prescribed fee and on production of an affidavit signed before a First Class Magistrate (Judicial) and non-traceablecertificate from the Department of Police. In case of damage of original Diploma Certificate, he / she may obtain a duplicate certificate by surrendering the original damaged certificate on payment of prescribed fee to the State Board of Technical Education and Training, A.P.

In case the candidate cannot collect the original Diploma within 1 year from the date of issue of the certificate, the candidate has to pay the penalty prescribed by the SBTET AP from time to time.

23. ISSUE OF MIGRATION CERTIFICATE AND TRANSCRIPTS:

The Board on payment of prescribed fee will issue these certificates for the candidates who intend to prosecute Higher Studies in India or Abroad.

24. The following specific changes are discussed and incorporated:

DIPLOMA IN CHEMICAL ENGINEERING (PLASTICS AND POLYMERS)

All the subjects in earlier curricula are reviewed and the following specific changes are incorporated.

i) It is proposed to have 5 theory and 4 practical subjects in III, 5 theory and 5 practical subjects in VII semesters, and 6 theory subjects and 4 practical subjects in IV semester.

ii) The sequence of the core subjects is slightly modified for aiding sequential learning and enhancing application adoptability.

iii) New title is assigned to one subject. The CPD Lab in third semester is renamed as CAD Practice in Chemical Engg. to provide full knowledge to the student on CAD application in chemical Engg.

iv) In Curriculum C-16, CHPP – 307 is E.Tech Lab/ physical, organic and polymer chemistry Lab. With an intention to give more emphasis to practical skills, In C-20, separate slots have been allocated to these labs as CHPP -307 – E. Tech Lab and CHPP -308 – OPC Lab.

v) Introduced new subject Chemical plant equipment drawing, CHPP-706, to enable the student to learn about various equipment and their internal parts for better understanding of working of unit operations used in chemical Engg.

vi) In VII semester, the project work and specialization Labs are combined in the new curriculum as the student coming from the industry for VII study has already exposed to mini project work during his training in V and VI semesters.

Vii) For Engineering Drawing subjects out of 40 sessional marks, 20 marks is awarded by conducting 3 unit tests for first year drawing and 2 unit tests for semester drawings. Another 20 marks shall be awarded by evaluating drawing sheets from time to time during the academic year/semester.

25. GENERAL

i. The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.

ii. All legal matters pertaining to the State Board of Technical Education and Training, AP are within the jurisdiction of Vijayawada.

iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET, A.P is final.

VISION
To develop a complete chemical process technician trained to be competent, ethical and professional leader who keeps pace with advanced process technologies with quality control applied in chemical and allied industries.

MISSION	
M1	To impart high quality –job ready diploma program in chemical engineering
M2	To prepare students for professional career or higher studies
M3	To promote excellence in teaching and industry collaborative activities for fruitful contribution to society

PROGRAMME OUTCOMES(POs)

1. **Basic and discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.
2. **Problem analysis**: Identify and analyse well-defined engineering problems using codified standard methods.
3. **Design / Development of solutions**: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.
4. **Engineering tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.
5. **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society , sustainability, environment and ethical practices.
6. **Project Management**: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well defined engineering activities.
7. **Life-long learning**: Ability to analyse individual needs and engaging updating in the context of technological changes.

PROGRAMME SPECIFIC OUTCOMES(PSOs)

1. An ability to understand the concepts of Chemical Engineering and apply them to various Chemical Engineering industries.
2. An ability to solve complex Chemical engineering problems, using latest analytical skills to arrive appropriate solutions.
3. Wisdom of social and environmental awareness along with ethical responsibility to have a successful career in the field of Chemical engineering and sustain passion and zeal for real-world applications in the field of chemical engineering using optimal resources as an entrepreneur.

DIPLOMA IN CHEMICAL ENGINEERING (PLASTICS AND POLYMERS)
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
C-20, FIRST YEAR

Subject Code	Name of the Subject	Instruction periods / week		Total Period / year	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CHPP -101	English	3	-	90	3	20	80	100
CHPP -102	Engineering Mathematics - I	5	-	150	3	20	80	100
CHPP -103	Engineering Physics	4	-	120	3	20	80	100
CHPP -104	Engineering Chemistry & Environmental Studies	4	-	120	3	20	80	100
CHPP -105	Basics of Chemical and Polymer Engineering	5	-	150	3	20	80	100
CHPP -106	Materials Technology	3	-	90	3	20	80	100
PRACTICAL:								
CHPP -107	Engineering Drawing	-	6	180	3	40	60	100
CHPP -108	Workshop Practice	-	6 (4+2)	180	3	40	60	100
CHPP -109	A: Physics Lab	-	3	45	3 (1.5+1.5)	20	30	100 (50+50)
	B: Chemistry Lab	-		45		20	30	
CHPP -110	Computer Fundamentals Practice	-	3	90	3	40	60	100
TOTAL		**24**	**18**	**1260**		**280**	**720**	**1000**

CHPP-101, 102, 103, 104, 107, 109, 110: Common to all
CHPP-106, 108: Common with DCHE, DCHE (PC/OT),
CHPP-105 not common with any course

Note: 30 students will go to Physics lab and the remaining 30 will go to Chemistry lab

DIPLOMA IN CHEMICAL ENGINEERING (PLASTICS AND POLYMERS)
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
C-20, III SEMESTER

Subject Code	Name of the Subject	Instruction period / week-Mod(non-mod)		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CHPP- 301	Engineering Mathematics - II	4	-	60	3	20	80	100
CHPP -302	Electrical Technology	4	-	60	3	20	80	100
CHPP -303	Organic and Physical Chemistry	5	-	75	3	20	80	100
CHPP -304	Unit Operations-I	6	-	90	3	20	80	100
CHPP -305	Mass and Energy Balance	5	-	75	3	20	80	100
PRACTICAL:								
CHPP -306	CAD Practice in Chemical Engineering	-	3	45	3	40	60	100
CHPP -307	Electrical Technology Lab	-	3	45	3	40	60	100
CHPP -308	Organic and Physical Chemistry Lab	-	6	90	3	40	60	100
CHPP -309	Unit Operations-I Lab	-	6	90	3	40	60	100
TOTAL		**24**	**18**	**630**		**260**	**640**	**900**

CHPP-301 Common to all branches.
CHPP-302, 303, 305, 306, 307, 308 Common to DCHE,DCHE(PC/OT)
CHPP-304, 309 Common to DCHE(PC/OT)

DIPLOMA IN CHEMICAL ENGINEERING (PLASTICS AND POLYMERS)
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
C-20,IV SEMESTER

Subject Code	Name of the Subject	Instruction period / week-Mod(non-mod)		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CHPP - 401	Engineering Mathematics - III	3	-	45	3	20	80	100
CHPP -402	Process Technology	6	-	90	3	20	80	100
CHPP -403	Polymer additives and plastic testing	4	-	60	3	20	80	100
CHPP -404	Polymer products and polymer processing	5	-	75	3	20	80	100
CHPP -405	Basic Mechanical Engineering	4	-	60	3	20	80	100
CHPP-406	Unit Operations-II	5		75	3	20	80	100
PRACTICAL:								
CHPP -407	Unit Operations – II Lab	-	3	45	3	40	60	100
CHPP -408	Communication skills	-	3	45	3	40	60	100
CHPP -409	Polymer testing and polymer technology lab	-	3	45	3	40	60	100
CHPP -410	Process Technology Lab	-	6	90	3	40	60	100
TOTAL		**27**	**15**	**630**		**280**	**720**	**1000**

CHPP-401, 408 common to all branches
CHPP-402,405, 406, 407, 410 common to DCHE(PC/OT)
CHPP-403, 404, 409 not common to any course

DIPLOMA IN CHEMICAL ENGINEERING (Plastics and Polymers)

SCHEME OF INSTRUCTIONS AND EXAMINATIONS
C20/V Semester (Industrial Training)

Sl.No.	*Subject*	*Duration*	*Scheme of evaluation*		
			Item	*Nature*	*Max. Marks*
1	*Industrial Training*	*6 months*	*1.First Assessment at Industry (After 12 Weeks)*	*Assessment of Learning outcomes by both the faculty and training Mentor of the industry*	*120*
			2.Second Assessment at the Industry (After 22 weeks)	*Assessment of Learning outcomes by both the faculty and training Mentor of the industry*	*120*
			Final Summative assessment at institution level	*Training Report*	*20*
				Demonstration of any one of the skills listed in learning outcomes	*30*
				Viva Voce	*10*
TOTAL MARKS					*300*

DIPLOMA IN CHEMICAL ENGINEERING (Plastics and polymers)

SCHEME OF INSTRUCTIONS AND EXAMINATIONS

C20/VI Semester (Industrial Training)

Sl.No.	*Subject*	*Duration*	*Scheme of evaluation*		
			Item	*Nature*	*Max. Marks*
1	*Industrial Training*	*6 months*	*1.First Assessment at Industry (After 12 Weeks)*	*Assessment of Learning outcomes by both the faculty and training Mentor of the industry*	*120*
			2.Second Assessment at the Industry (After 22 weeks)	*Assessment of Learning outcomes by both the faculty and training Mentor of the industry*	*120*
			Final Summative assessment at institution level	*Training Report*	*20*
				Demonstration of any one of the skills listed in learning outcomes	*30*
				Viva Voce	*10*
TOTAL MARKS					*300*

DIPLOMA IN CHEMICAL ENGINEERING (PLASTICS AND POLYMERS)
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
C-20, VII Semester

Subject Code	Name of the Subject	Instruction period / week- Mod(non-mod)		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CHPP -701	Industrial ManagementandEntrepreneurship	5	-	75	3	20	80	100
CHPP -702	Thermodynamics and Reaction Engineering	5	-	75	3	20	80	100
CHPP -703	Instrumentation & Process Control	5	-	75	3	20	80	100
CHPP -704	Unit Operations –III	4	-	60	3	20	80	100
CHPP -705	Plastic Technology	5	-	75	3	20	80	100
PRACTICAL:								
CHPP-706	Chemical Plant Equipment Drawing	-	6	90	3	40	60	100
CHPP -707	Instrumentation, process control & Reaction Engineering Lab	-	3	45	3	40	60	100
CHPP -708	Life skills	-	3	45	3	40	60	100
CHPP-709	Project Work/ plastic technology lab	-	3	45	3	40 (20+20)	60 (30+30)	100 (50+50)
CHPP-710	Unit Operations-III Lab		3	45	3	40	60	100
TOTAL		**24**	**18**	**630**		**300**	**700**	**1000**

CHPP- 708 common to all
CHPP- 702, 703, 706, 707 Common to DCHE, DCHE(PC), DCHE(OT)
CHPP-701, separate(not common with all other branches, common to DCHE, DCHE(PC/OT)
CHPP-704,710 Common DCHE(PC), DCHE(OT)
CHPP-705, 709 not common to any course

FIRST YEAR

FIRST YEAR

Subject Code	Name of the Subject	Instruction periods / week		Total Period / year	Scheme of Examination			
		Theory	Practical/ Tutorial		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CHPP -101	English	3	-	90	3	20	80	100
CHPP -102	Engineering Mathematics - I	5	-	150	3	20	80	100
CHPP -103	Engineering Physics	4	-	120	3	20	80	100
CHPP -104	Engineering Chemistry& Environmental Studies	4	-	120	3	20	80	100
CHPP -105	Basics of Chemical and Polymer Engineering	5	-	150	3	20	80	100
CHPP -106	Materials Technology	3	-	90	3	20	80	100
PRACTICAL:								
CHPP -107	Engineering Drawing	-	6	180	3	40	60	100
CHPP -108	Workshop Practice	-	6 (4+2)	180	3	40	60	100
CHPP -109	A: Physics Lab	-	3	45	3 (1.5+1.5)	20	30	100 (50+50)
	B: Chemistry Lab	-		45		20	30	
CHPP -110	Computer Fundamentals Practice	-	3	90	3	40	60	100
TOTAL		**24**	**18**	**1260**		**280**	**720**	**1000**

CHPP-101, 102, 103, 104, 107, 109, 110: Common to all
CHPP-106, 108: Common with DCHE, DCHE (PC/OT),
CHPP-105 not common with any course

Note: 30 students will go to Physics lab and the remaining 30 will go to Chemistry lab

English

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-101	English	3	90	20	80

S. No.	Unit Title	No of Periods	COs Mapped
1	English for Employability	8	CO1, CO2, CO3, CO4
2	Living in Harmony	8	CO1, CO2, CO3, CO4
3	Connect with Care	8	CO1, CO2, CO3, CO4
4	Humour for Happiness	8	CO1, CO2, CO3, CO4
5	Never Ever Give Up!	8	CO1, CO2, CO3, CO4
6	Preserve or Perish	9	CO1, CO2, CO3, CO4
7	The Rainbow of Diversity	8	CO1, CO2, CO3, CO4
8	New Challenges- Newer Ideas	8	CO1, CO2, CO3, CO4
9	The End Point First!	8	CO1, CO2, CO3, CO4
10	The Equal Halves	8	CO1, CO2, CO3, CO4
11	Dealing with Disaster	9	CO1, CO2, CO3, CO4
Total Periods		**90**	

Course Objectives	To improve the skills of English Language use by enriching vocabulary and learning accurate structures for effective communication.
	To comprehend themes for value based living in professional and personal settings.

CO No.	Course Outcomes
CO1	Applies perceptions of themes related to societal responsibility of adolescents towards their surroundings.
CO2	Demonstrates knowledge of form and function of 'grammar items' and use them in both academic and everyday situations.
CO3	Demonstrates effective English communication skills with competence in listening, speaking, reading and writing in academic, professional and everyday contexts.
CO4	Displays positivity and values of harmonious living in personal and professional spheres as reflected through communication.

CO-PO Matrix

Course Code CHPP-101	Course Title: English Number of Course Outcomes: 4				No. of Periods: 90
POs	**Mapped with CO No.**	**CO Periods Addressing PO in Column 1**		**Level of Mapping (1,2,3)**	**Remarks**
		Number	**Percentage**		
PO1		Not directly Applicable for English course, however activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.			
PO2					
PO3					
PO4					
PO5	CO1, CO2, CO3, CO4	20	22		>50%: Level 3
PO6	CO1, CO2, CO3, CO4	52	58		21-50%: Level 2
PO7	CO1, CO2, CO3, CO4	18	20		Up to 20%: Level 1

Level 3 – Strongly Mapped
Level 2- Moderately Mapped
Level 1- Slightly Mapped

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO 1					✓	✓	✓
CO 2					✓	✓	✓
CO3					✓	✓	✓
CO 4					✓	✓	✓

NOTE: CO-PO groups shall be fulfilled through activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.

PO5: Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

PO7: Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

Blue Print of Question Paper:

S. No.	Name of the Unit	Periods Allocated	Weightage Allocated	Marks Wise Distribution of Weightage				Question Wise Distribution of Weightage				CO's Mapped
				R	U	Ap	An	R	U	Ap	An	
1	English for Employability	8	17	3	8*			1	1*	1*		CO1, CO2, CO3, CO4
2	Living in Harmony	8		3				1				CO1, CO2, CO3, CO4
3	Connect with Care	8				3						CO1, CO2, CO3, CO4
4	Humour for Happiness	8	14		3	8*			1	1*		CO1, CO2, CO3, CO4
5	Never Ever Give Up!	8			3				1			CO1, CO2, CO3, CO4
6	Preserve or Perish	9	14		8*	3			1*	1		CO1, CO2, CO3, CO4
7	The Rainbow of Diversity	8				3				1		CO1, CO2, CO3, CO4
8	New Challenges - Newer Ideas	8	35		8*	8*+3+3+3	10*		1*	4	1*	CO1, CO2, CO3, CO4
9	The End Point First!	8										CO1, CO2, CO3, CO4
10	The Equal Halves	8										CO1, CO2, CO3, CO4
11	Dealing with Disasters	9										CO1, CO2, CO3, CO4
TOTAL		**90**	**80**	**6**	**30**	**34**	**10**	**2**	**5**	**8**	**1**	

PART-A: 10 Questions 3 marks each =30 Marks
PART-B: 5 Questions 8 marks each =40 Marks
Part-C: 1 Question 10 marks =10 Marks
(Higher Order Question)

All Questions are compulsory : 60 minutes
Internal choice : 90 minutes

No choice, one compulsory question : 30 minutes

NOTE: * indicates questions can be given from any of the corresponding lessons in the blue print.

Question Paper Pattern for Unit Tests

Part A: 16 marks: 4 questions with 1 mark each (FIB, True/false, one word/phrase, etc.)
4 questions with 3 marks each (short answer/ descriptive/ applicative questions)
Part B: 24 marks: 3 questions 8 marks each with internal choice

Learning Outcomes

1. English for Employability

1.1. Explain the need for improving communication in English for employability
1.2. Use adjectives and articles effectively while speaking and in writing
1.3. Write simple sentences

2. Living in Harmony

2.1. Develop positive self-esteem for harmonious relationships
2.2. Use affixation to form new words
2.3. Use prepositions and use a few phrasal verbs contextually

3. Connect with Care

3.1. Use social media with discretion
3.2. Speak about abilities and possibilities
3.3. Make requests and express obligations
3.4. Use modal verbs and main verbs in appropriate form
3.5. Write short dialogues for everyday situations

4. Humour for Happiness

4.1. Explain the importance of humour for a healthy living
4.2. Improve vocabulary related to the theme
4.3. Display reading and speaking skills
4.4. Frame sentences with proper Subject – Verb agreement
4.5. Explain the features of a good paragraph and learn how to gather ideas as a preliminary step for writing a good paragraph.

5. Never Ever Give Up!

5.1. Practice to deal with failures in life.
5.2. Use the present tense form for various every day communicative functions such as speaking and writing about routines, professions, scientific descriptions and sports commentary.
5.3 Write paragraphs with coherence and other necessary skills.

6. Preserve or Perish

6.1. Describe the ecological challenges that we face today and act to save the environment.
6.2. Narrate / Report past events.
6.3. Develop vocabulary related to environment.
6.4. Write e-mails.

7. The Rainbow of Diversity

7.1. Illustrate and value other cultures for a happy living in multi-cultural workspace
7.2. use different types of sentences
7.3. Ask for or give directions, information, instructions
7.4. Use language to express emotions in various situations
7.5. Write letters in various real life situations

8. New Challenges – Newer Ideas

8.1. Explain the functional difference between Active Voice and Passive Voice
8.2. Use Passive Voice to speak and write in various contexts
8.3. List the major parts and salient features of an essay
8.4. Explain latest innovations and get motivated

9. The End Point First!

9.1. Illustrate the importance of setting a goal in life
9.2. Report about what others have said both in speaking and writing
9.3. Write an essay following the structure in a cohesive and comprehensive manner
9.4. Apply the words related to Goal Setting in conversations and in life

10. The Equal Halves

10.1. Value the other genders and develop a gender-balanced view towards life
10.2. Identify the use of different conjunctions in synthesising sentences
10.3. Write various types of sentences to compare and contrast the ideas
10.4. Apply the knowledge of sentence synthesis in revising and rewriting short essays
10.5. Develop discourses in speech and writing

11. Dealing with Disasters

11.1. Speak and write about different kinds of disasters and the concept of disaster management
11.2. Generate vocabulary relevant to disaster management and use it in sentences
11.3. Analyse an error in a sentence and correct it
11.4. Write different kinds of reports

Textbook: INTERACT (A Textbook for I Year English) - Published by SBTET, AP

Reference Books:

Martin Hewings : Advanced Grammar in Use, Cambridge University Press
Murphy, Raymond : English Grammar in Use, Cambridge University Press
Sidney Greenbaum : Oxford English Grammar, Oxford University Press
Wren and Martin (Revised byN.D.V. Prasad Rao)
: English Grammar and Composition, Blackie ELT Books, S. Chand and Co.
Sarah Freeman : Strengthen Your Writing, Macmillan

STATE BOARD OF TECHNICAL EDUCATION –A.P

C20- CHPP-101-ENGLISH

UNIT TEST-1

Time: 90 minutes **Max. Marks: 40**

PART-A **4X4= 16 marks**

Instructions: Answer all the questions. Each question carries FOUR Marks.

1. Rewrite / Fill in the blank as directed. Each question carries ½ Mark. **(CO2)**

a) Write the antonym of 'cruel'
b) Write the synonym of 'love'
c) Give prefix to 'adventure'.
d) Give suffix to ' liberate'
e) It is _____ universal truth. (Fill in with suitable article)
f) The boy is fond ____ ice-cream. (Fill in the blank with proper preposition)
g) He ____not like sweets. (Fill in the blank with correct primary auxiliary verb.)
h) We _____ respect our national flag. (Fill in with a proper modal verb)

2. Rewrite the sentences as directed. Each question carries One mark. 4X1=4 Marks **(CO2)**

a) No other metal is so useful as iron. (Change into superlative degree)
b) Very few students are so clever as Ramesh. (Change into comparative degree)
c) Guess the contextual meaning of the italicized word in the following sentence.
"The CBI officer has *interrogated* the bank employees in connection with the scam."
d) only sings plays Prasanth not also well but cricket. (Rearrange the jumbled words)

3. Fill in the blanks with proper form of the verb given in brackets. 4X1 = 4 marks **(CO2)**
The IPSGM _____(hold) in our college last month. Nearly all the colleges in our zone _____(participate) in the event. The prizes _____ (distribute) by the district collector. Next year, Government Polytechnic, Vijayawada _____ (conduct) the games meet.

4. Rewrite the following sentences after making necessary corrections: 4X 1= 4 Marks **(CO3)**

a) The police has arrested the culprit.
b) Three hundred miles are a long distance.
c) The Principal along with the Heads of Sections have visited the laboratories.
d) Either he or I is to blame.

PART-B **3X8=24 Marks**

Instructions: Answer all the questions and each question carries EIGHT marks.

5. Write a dialogue of at least five turns between a shopkeeper and customer about buying a mobile phone. **(CO3)**

5. Make an analysis and write a paragraph in around 100 words about your strengths and weaknesses in learning and using English and also the measures to improve it. **(CO3)**

6. Write a paragraph in about 100 words on how to overcome low esteem and negativity. **(CO3, CO4)**

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STATE BOARD OF TECHNICAL EDUCATION –A.P

C20-CHPP-101-ENGLISH

UNIT TEST-II

Time: 90 minutes **Max. Marks: 40**

PART-A **4X4= 16 Marks**

Instructions: Answer all the questions. Each question carries FOUR marks.

1. Match the words in column A with their corresponding meanings in column B **(CO2)**

Column A	**Column B**
a) Deserve	i) continuous
b) hidden	ii) protect
c) Preserve	iii) worthy
d) Incessant	iv) praise
	v) unseen
	vi) affection

2. Rewrite as directed: **(CO3)**
   a) You ask your Mom to give you another chocolate. (Change into a request)
   b) The baby fell down and got injured. (Change into an exclamatory sentence)
   c) The match was very interesting. (Frame a question using 'how')
   d) Hemanth submitted his project report last week. (Frame Yes-No question)

3. Fill in the blanks with appropriate forms of verbs given in brackets: **(CO2)**
   a) The Sun _____ (set) in the west.
   b) Balu _____ (sing) for over fifty years in the films.
   c) We _____ (see) a camel on the road yesterday.
   d) They _____(enter) the stadium before the gates were closed.

4. Change the voice of the following: **(CO2)**
   a) Marconi invented the radio.
   b) Sravanthi has been offered a job.
   c) Pragathi can type the letter.
   d) The Chief Guest will be received by the Final year students.

PART-B **3X8=24 Marks**

Answer all the questions. Each question carries EIGHT marks.

5. Write a letter to your younger brother motivating him to deal with failures and hurdles in life. **(CO3)**

6. Write an essay in around120 words on the role of robots in the modern world. **(CO3)**

7. Read the following passage and answer the questions that follow: **(CO3)**

   The greatest enemy of mankind, as people have discovered, is not science, but war. Science merely reflects the social forces by which it is surrounded. It was found that when there is peace, science is constructive when there is war, science is perverted to destructive end. The weapons which science gives us do not necessarily create war. These make war increasingly more terrible. Until now, it has brought us on the doorstep of doom. Our main problem,

therefore, is not to curb science, but to substitute law for force, and international government for anarchy in the relations of one nation with another. That is a job in which everybody must participate, including the scientists. Now we are face to face with these urgent questions: Can education and tolerance, understanding and creative intelligence run fast enough to keep us side by side without our mounting capacity to destroy? That is the question which we shall have to answer, one way or the other, in this generation. Science must help us in the answer, but the main decision lies within ourselves. The hour is late and our work has scarcely begun.

a. What is the chief enemy of man?
b. What does science reflect?
c. When is science perverted?
d. What makes war more terrible?
e. Why do we need international government?
f. What are the four aspects that may stop destruction?
g. Have we really started our work to fight the problem discussed?
h. Pick the word from the passage that would mean: 'replace with other one'

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STATE BOARD OF TECHNICAL EDUCATION –A.P

C20-CHPP-101-ENGLISH

UNIT TEST-III

Time: 90 minutes **Max. Marks: 40**

PART-A **4X4 = 16 Marks**

Instructions: Answer all the questions. Each question caries Four marks.

1. Give the meaning of the word in italics: **(CO3)**
   a) When the girls laughed in the class, the teacher was *furious.*
   b) He was *rusticated* from the school for his misbehaviour.
   c) Vikramaditya was a *benevolent* Indian King.
   d) We should not show any *discrimination* between boys and girls.
2. Change the speech of the following: **(CO2)**
   a) He said, "I am sorry."
   b) The teacher said to the boys, "Why are you late?"
   c) Sushma said that she had submitted her report recently.
   d) Pratap requested Priya to give him her pen.
3. Rewrite as directed: **(CO2)**
   a) Though he was weak, he took the test. (change into a simple sentence)
   b) You must work hard to achieve success. (change into a complex sentence)
   c) If you run fast, you will catch the bus. (change into a compound sentence)
   d) The fog disappeared when the Sun rose. (Split into two simple sentences)
4. Locate eight errors from the following passage and correct them. **(CO2)**

   Once upon a time there live a king who was very kind to his people. In his council of ministers, there is a wise man. He had a son called Sumanth who was a educated and highly learned. Once the wise minister fall sick. All the physicists in the country could not heal him. Then Sumanth will go in search of medicine in Himalayas. He bring the special medicinal roots to cure his father's sickness. Sumanth looked before his father carefully and healed him. The king rewarded Sumanth with rich gifts.

PART- B **3X8 = 24 Marks**

Instructions: Answer all the questions and each one carries eight marks.

5. Read the following paragraph and make notes first and then its summary. **(CO3)**

   Astronauts are people who travel on space ships. They need to have a very clean home. They travel far from Earth. We need clean kitchens everywhere on earth and in space. Astronauts have to solve two problems: how to get food and how to keep their spaceship clean. Here is how they solved the food problem. At first, the astronauts took tubes of food with them into space. They would squeeze a tube and eat semi-liquid food. It did not taste great, but since they did not need to take dishes or silverware with them, they had no dishes to wash. Today's spaceships have a bigger menu. Astronauts can eat from bowls. In fact, they take cereal and other standard foods with them. The foods are packaged in special containers to keep them fresh. They use knives, forks, and spoons. One unusual item on their table is a pair of scissors. They use the scissors to open the food packages. They can eat right from the package. They have a kitchen on the spaceship. Its oven can heat food to 170 degrees. The kitchen has water

and sets of meals that come on trays. The astronauts choose their menu before they go into space. They take a lot of food with them. The astronauts keep bread and fresh fruits and vegetables in a special food locker. How do they keep the kitchen clean? They do not have to worry about mice or other rodents. They make sure that there are no rodents before the ship leaves. But sometimes mice travel on the ship. Those mice are part of experiments. They live in cages. How do astronauts keep their trays clean? That is another health problem the astronauts solve. They need to stay healthy in space. To carry a lot of water to wash trays would be a lot of extra weight. They pack wet wipes in plastic bags. They use them to clean trays. So, their kitchen is clean and they stay healthy.

6. Write an essay in about 120 words on the importance of goal setting and your short and long term goals. **(CO3,CO4)**
7. Write a report about the bush fire that raged in Australia recently by using the following clues: forest, natural disaster, wild fire, dried leaves, no rain fall, wild animals, burnt alive, loss of flora and fauna, fire fighters, uncontrollable, moderate rains, environmental pollution, measures to protect...etc. **(CO3)**

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STATE BOARD OF TECHNICAL EDUCATION- A.P

Model Question Paper

C20-CHPP-101- ENGLISH

Time: 3hrs **Max.Marks:80**

PART-A **10X3=30 Marks**

Instructions: Answer all the questions. Each question carries Three marks.

1. a) Fill in the blanks with suitable articles: **(CO2)**
   I have seen _____ European at _____local market.
   b) Fill in with proper form of adjective given in the bracket: **(CO2)**
   China is the _____country in the world. (populous, more populous, most populous)
   c) i) Choose the synonym from the following for the word : 'filthy' **(CO3)**
   dirty / clean / hygienic / tidy
   ii) Choose the antonym from the following for the word: 'exterior' **(CO3)**
   external / internal / open / interior

2. a) i) Give prefix for the word: 'popular' **(CO2)**
   ii) Write suffix for the word : 'king' **(CO2)**
   b) He was married _____ her _____ January 2015. (Fill in with appropriate preposition) **(CO3)**
   c) Match the words in column A with their corresponding meanings in column B: **(CO2)**

Column-A	**Column-B**
i) Dynamic	a) tasty
ii) Gloomy	b) active
	c) sad
	d) proud

3. a) The old man *hunted* for his spectacles. (Give the contextual meaning of the word in italics) **(CO3)**
   b) The committee / have submitted / its report / to the President. (identify the part which contains an error) **(CO3)**
   c) recently has a scooter purchased Shanthi. (Rearrange the jumbled words to make a meaningful sentence.) **(CO3)**

4. a) Use the following primary auxiliary verb in sentence of your own: **(CO2)**
   ' does'
   b) Fill in the blank with proper modal auxiliary verb based on the clue in the bracket: **(CO2)**
   Harish _____ speak four languages. (ability)
   c) Rakesh wants two hundred rupees from his father. (Write the sentence how he requests his Father) **(CO2)**

5. Fill in the blanks with suitable form of the verb given in brackets: **(CO2)**
   a) He _____ (go) for a walk daily.
   b) The bus _____ (arrive) just now.
   c) We _____ (live) in Chennai since 2005.

6. Change the voice of the following sentences: **(CO2)**
   a) English is spoken all over the world.
   b) They watched a movie yesterday.
   c) The Chief Minister will inaugurate the exhibition.

7. a) It is a beautiful rainbow. (Change into an exclamatory sentence) **(CO3)**
   b) C.V. Raman won the Nobel Prize in 1930. (Frame a question using 'When') **(CO3)**
   c) He can swim across the river. (change into 'Yes / No' question) **(CO3)**

8. Change the speech of the following: **(CO2)**
   a) He said, "I will go to Delhi tomorrow."
   b) Ravi said to Ashok, " Where are you going?"
   c) She told him to mind his own business.

9. Rewrite as directed: **(CO2)**
   a) In spite of being busy he attended the meeting. (Rewrite the sentence using 'though')
   b) She is poor. She is honest. (combine the two sentences using 'but')
   c) On seeing the tiger, he climbed a tree. (split into two simple sentences)

10. Rewrite the following sentences after making necessary corrections: **(CO2)**
    a) We have gone to picnic yesterday.
    b) Suresh watched T.V when I went to his house.
    c) They left Gujarat before the earthquake occurred.

PART-B **5X8=40**

Instructions: Answer the following questions. Each question carries EIGHT marks.

11. Write a paragraph in about 100 words on what you do daily. **(CO3,CO4)**

OR

Write a paragraph in about 100 words on the uses and misuses of social media.

12. Construct a dialogue of at least five turns between an American and you about places worth visiting in your city. **(CO3,CO4)**

OR

Compose a dialogue of at least five turns between two friends, one favouring homemade food and the other, fast foods.

13. Write a letter to your parents about your preparation for year-end examinations. **(CO3,CO4)**

OR

Write a letter to the editor of a newspaper about the inconvenience caused due to loud speakers in your area.

14. Write an essay in about 120 words on measures to prevent water pollution.

OR

Write an essay in about 120 words on importance of gender equality.

15. Read the following passage and answer the questions that follow: **(CO3)**

A farmer in ancient China had a neighbour who was a hunter, and who owned ferocious and poorly trained hunting dogs. They jumped over the fence frequently and chased the farmer's lambs. The farmer asked his neighbour to keep his dogs in check, but this fell on deaf ears. One day the dogs again jumped the fence, attacked and severely injured several of the lambs.

The farmer had had enough, and went to town to consult a judge who listened carefully to the story and said: "I could punish the hunter and instruct him to keep his dogs chained or lock them up. But you would lose a friend and gain an enemy. Which would you rather have, friend or foe for a neighbour?" The farmer replied that he preferred a friend. "Alright, I will offer you a solution that keeps your lambs safe, and which will keep your a neighbour a friend." Having heard the judge's solution, the farmer agreed.

Once at home, the farmer immediately put the judge's suggestions to the test. He took three of his best lambs and presented them to his neighbour's three small sons, who were beside themselves with joy and began to play with them. To protect his son's newly acquired playthings, the hunter built a strong kennel for his dogs. Since then, the dogs never again bothered the farmer's lambs. Out of gratitude for the farmer's generosity toward his sons, the hunter often shared the game he had hunted with the farmer. The farmer reciprocated by sending the hunter the cheese he had made. Within a short time the neighbours became good friends.

a) What kind of dogs does the neighbour have?
b) When did the farmer consult the judge?
c) What would be the consequence if the judge punished the neighbour?
d) What was the solution suggested by the judge?
e) What did the neighbour's sons do with the gifts they received?
f) How did the dogs stop bothering the farmer's lambs?
g) What items are exchanged happily between the two neighbours?
h) Pick the word from the passage that would mean: 'a closed shelter for dogs'.

OR

Read the following short poem and answer the questions that follow:

Crisp in the winter's morning,
Softly all through the night,
What is this without warning,
Falling and white?

I have never seen snow,
But I can imagine it quite –
Not how it tastes, but I know,
It falls and is white.

One morning I'll open the door,
To bring in the morning's milk,
And all around there'll be snow –
Fallen and still.

How I'll roll in the stuff!
How I'll tumble and spin!
Until the neighbours cry,
Enough! And send me back in.

Q.1.What is the poem about?
2. How does snow fall?
3. Did you ever touch snow? How did you feel?
4. a) Pick the word from the poem that means 'slip and fall'
b) Write the antonym for the word 'soft'

SECTION – C **1X10=10 Marks**

16. Write a report on the blood donation camp organized by International Red Cross Society in your college. Use the following clues: date, time, place, arrangements, donors, equipment, doctors, response, sponsors, snacks, volunteers, help others, save lives…etc.

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Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
CHPP-102	Engineering Mathematics-I	5	150	20	80

S.No.	Unit Title	No. of periods	COs mapped
1	Algebra	31	CO1
2	Trigonometry	44	CO2
3	Co-ordinate Geometry	23	CO3
4	Differential Calculus	33	CO4
5	Applications of Differentiation	19	CO4, CO5
	Total Periods	**150**	

Course Objectives	(i) To apply the principles of Algebra, Trigonometry and Co-Ordinate Geometry to real-time problems in engineering. (ii) To comprehend and apply the concept of Differential Calculus in engineering applications.

Course Outcomes	CO1	Identify various functions, resolve partial fractions and solve problems on matrices.
	CO2	Solve problems using the concept of trigonometric functions, their inverses and complex numbers.
	CO3	Find the equations and properties of straight lines, circles and conic sections in coordinate system.
	CO4	Evaluate the limits and derivatives of various functions.
	CO5	Evaluate solutions for engineering problems using differentiation.

ENGINEERING MATHEMATICS – I
COMMON TO ALL BRANCHES
Learning Outcomes
UNIT - I

C.O. 1 Identify various functions, resolve partial fractions and solve problems on matrices.

L.O. 1.1 Define Set, ordered pairs and Cartesian product - examples.

1.2 Explain Relations and functions – examples

1.3 Find Domain & Range of functions – simple examples.

1.4 Classify types of functions (into, many-to-one, one-one, onto and bijective).

1.5 Define inverse functions - examples.

1.6 Define rational, proper and improper fractions of polynomials.

1.7 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$i)\quad \frac{f(x)}{(ax+b)(cx+d)}$ $ii)\quad \frac{f(x)}{(ax+b)^2(cx+d)}$

$iii)\quad \frac{f(x)}{(x^2+a^2)(bx+c)}$ $iv)\quad \frac{f(x)}{(x^2+a^2)(x^2+b^2)}$

1.8 Define a matrix and order of a matrix.

1.9 State various types of matrices with examples (emphasis on 3rd order square matrices).

1.10 Compute sum, scalar multiplication and product of matrices. Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.

1.11 Define the transpose of a matrix and write its properties;

1.12 Define symmetric and skew-symmetric matrices with examples Resolve a square matrix into a sum of a symmetric and skew- symmetric matrices and provide examples.

1.13 Define determinant of a square matrix, minor, co-factor of an element of a 3x3 square matrix with examples. Expand the determinant of a 3 x 3 matrix using Laplace expansion formula. State and apply the properties of determinants to solve problems.

1.14 Distinguish singular and non-singular matrices. Define multiplicative inverse of a matrix and list properties of adjoint and inverse. Compute adjoint and multiplicative inverse of a square matrix.

1.15 Solve system of 3 linear equations in 3 unknowns using Cramer's rule and matrix inversion method.

UNIT - II

C.O.2 Solve problems using the concept of trigonometric functions, their inverses and complex numbers.

L.O. 2.1 Define trigonometric ratios of any angle.

2.2 List the values of trigonometric ratios at specified values.

2.3 Draw graphs of trigonometric functions.

2.4 Explain periodicity of trigonometric functions.

2.5 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B).

2.6 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

2.7 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.

2.8 Solve simple problems on compound angles.

2.9 Derive the formulae of multiple angles 2A, 3A etc and sub multiple angles A/2 in terms of angle A of trigonometric functions.

2.10 Derive useful allied formulas like $\sin^2 A = (1 - \cos 2A)/2$ etc.

2.11 Solve simple problems using the above formulae

2.12 Derive the formulae on transforming sum or difference of twotrigonometric ratios into a product and vice versa, examples on these formulae.

2.13 Solve problems by applying these formulae to sum or difference or product of three or more terms.

2.14 Explain the concept of the inverse of a trigonometric function by selecting an oppropriate domain and range.

2.15 Define inverses of six trigonometric functions along with their domains and ranges.

2.16 Derive relations between inverse trigonometric functions so that given $A = \sin^{-1}x$, express angle A in terms of other inverse trigonometric functions with examples.

2.17 State various properties of inverse trigonometric functions and identities like $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$ etc.

2.18 Apply formulae like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$, *where* $x \geq 0, y \geq 0, xy < 1$ etc., to solve Simple problems.

2.19 Explain what is meant by solutions of trigonometric equations and find the general solutions of sin x=k, cos x =k and tan x=k with appropriate examples.
2.20 Solve models of the type a $\sin^2$ x + b sin x +c=0, a cos x + b sin x=c etc., and problems using simple transformations.
2.21 State sine rule, cosine rule, tangent rule and projection rule.
2.22 Explain the formulae for sin A/2, cos A/2, tan A/2 and cot A/2 in terms of semi-perimeter s and sides a,b,c and solve problems.
2.23 List various formulae for the area of a triangle.
2.24 Solve problems using the above formulae.
2.25 Define Sinh x, cosh x and tanh x and list the hyperbolic identities.
2.26 Represent inverse hyperbolic functions in terms of logarithms.
2.27 Define complex number, its modulus , conjugate and list their properties.
2.28 Define the operations on complex numbers with examples.
2.29 Define amplitude of a complex number.
2.30 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form with examples.
2.31 Write DeMoivre's theorem (without proof) and illustrate with simple examples.

UNIT - III

Coordinate Geometry

C.O. 3 Find the equations and properties of straight lines, circles and conic sections in coordinate system.

L.O. 3.1 Write the different forms of a straight line – general form, point-slope form, slope-intercept form, two-point form, intercept form and normal form or perpendicular form.
3.2 Solve simple problems on the above forms.
3.3 Find distance of a point from a line, acute angle between two lines, intersection of two non parallel lines and distance between two parallel lines.
3.4 Define locus of a point and define a circle.
3.5 Write the general equation of a circle and find the centre and radius.
3.6 Find the equation of a circle given (i) centre and radius, (ii) two ends of a diameter (iii) Centre and a point on the circumference (iv) three non collinear points.
3.7. Define a conic section.
3.8 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.
3.9 Find the equation of a conic when focus, directrix and eccentricity are given.
3.10 Describe the properties of Parabola, Ellipse and Hyperbola in standard forms whose axes are along co-ordinate axes and solve simple examples on above.

C.O.4 Evaluate the limits and derivatives of various functions.

L.O. 4.1 Explain the concept of limit and meaning of $\lim_{x\to a} f(x)=l$ and state the properties of limits.
4.2 Evaluate the limits of the type $\lim_{x\to l} \frac{f(x)}{g(x)}$ and $\lim_{x\to\infty} \frac{f(x)}{g(x)}$

4.3 Mention the Standard limits $\lim_{x\to a}\frac{x^n-a^n}{x-a}$, $\lim_{x\to 0}\frac{\sin x}{x}$, $\lim_{x\to 0}\frac{\tan x}{x}$, $\lim_{x\to 0}\frac{a^x-1}{x}$, $\lim_{x\to 0}\frac{e^x-1}{x}$, $\lim_{x\to 0}(1+x)^{\frac{1}{x}}$, $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$ (without proof) and solve the problems using these standard limits.

4.4 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

4.5 State the concept of derivative of a function y = f(x) – definition, first principle as $\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

4.6 State the significance of derivative in scientific and engineering applications.

4.7 Find the derivatives of elementary functions like x^n , a^x, e^x, log x, sin x, cos x, tanx, Secx, Cosecx and Cot x using the first principles.

4.8 Find the derivatives of simple functions from the first principle .

4.9 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.

4.10 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples.

4.11 Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.

4.12 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.

4.13 Find the derivatives of hyperbolic functions.

4.14 Explain the procedures for finding the derivatives of implicit function with examples.

4.15 Explain the need of taking logarithms for differentiating some functions with examples like $[f(x)]^{g(x)}$.

4.16 Explain the concept of finding the higher order derivatives of second and third order with examples.

4.17 Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple examples.

4.18 Explain the definition of Homogenous function of degree n.

4.19 Explain Euler's theorem for homogeneous functions with applications to simple problems.

C.O. 5 Evaluate solutions for engineering problems using differentiation.

L.O. 5.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve y=f(x) at any point on the curve.

5.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve y=f(x) at any point on it.

5.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve y=f(x) .

5.4 Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

5.5 Explain the derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples.

5.6 Define the concept of increasing and decreasing functions.

5.7 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

5.8 Explain the procedure to find the extreme values (maxima or minima) of a function of single variable- simple problems yielding maxima and minima.

5.9 Solve problems on maxima and minima in applications like finding areas, volumes etc.

5.10 Apply the concept of derivatives to find the errors and approximations in simple problems.

CO/PO – Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	2				3	2	3
CO2	3	3	3	2				3	3	1
CO3	3	2	2	1				3	2	2
CO4	3	3	2	2				3	2	1
CO5	3	3	3	3				3	3	3
Avg	3	2.6	2.5	2				3	2.4	2

3 = Strongly mapped (High), **2 =**moderately mapped (Medium), **1 =**slightly mapped (Low)

Note:

PO5: Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

PO7: Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

PSO1: An ability to understand the concepts of basic mathematical concepts and to apply them in various areas like computer programming, civil constructions, fluid dynamics, electrical and electronic systems and all concerned engineering disciplines.

PSO2: An ability to solve the Engineering problems using latest software tool, along with analytical skills to arrive at faster and appropriate solutions.

PSO3: Wisdom of social and environmental awareness along with ethical responsibility to have a successful career as an engineer and to sustain passion and zeal for real world technological applications.

PO- CO – Mapping strength

PO no	Mapped with CO no	CO periods addressing PO in column I		Level (1,2 or 3)	Remarks
		No	%		
1	CO1, CO2, CO3,CO4,CO5	150	100%	3	>40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5% to 25% Level 1 Low addressed <5% Not addressed
2	CO1, CO2, CO3,CO4,CO5	138	92%	3	
3	CO1, CO2, CO3,CO4,CO5	133	88.6%	3	
4	CO1, CO2, CO3,CO4,CO5	120	80%	3	
PSO 1	CO1, CO2, CO3,CO4,CO5	150	100%	3	
PSO 2	CO1, CO2, CO3,CO4,CO5	135	90%	3	
PSO 3	CO1, CO2, CO3,CO4,CO5	125	83.3%	3	

COMMON TO ALL BRANCHES

COURSE CONTENT

Unit-I

Algebra

1. Relations and Functions:

Define Set, Ordered pairs, Cartesian product, Relations, functions, domain & range of functions. Describe types of functions (in-to, many-to-one, one-one, onto and bijective) and inverse functions – examples.

2. Partial Fractions:

Define rational, proper and improper fractions of polynomials. Resolve rational fractionsin to their partial fractions covering the types mentioned below.

$$i)\quad \frac{f(x)}{(ax+b)(cx+d)} \qquad ii)\quad \frac{f(x)}{(ax+b)^2(cx+d)}$$

$$iii)\quad \frac{f(x)}{(x^2+a^2)(bx+c)} \qquad iv)\quad \frac{f(x)}{(x^2+a^2)(x^2+b^2)}$$

3. Matrices:

Definition of a matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non-singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 3 variables-Solutions by Cramers's rule and Matrix inversion method-examples.

Unit-II

Trigonometry

4. Trigonometric ratios:
Definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.

5. Compound angles:
Formulas of sin(A±B), cos(A±B), tan(A±B),cot(A±B),and related identities with problems.

6. Multiple and sub multiple angles:
Formulae for trigonometric ratios of multiple angles 2A, 3A and sub multipleangles A/2 with problems.

7. Transformations of products into sums or differences and vice versa simple problems

8. Inverse trigonometric functions:
Definition, domains and ranges-basic properties- problems.

9. Trigonometric equations:
Concept of a solution, principal value and general solution of trigonometric equations: sinx =k , cosx= k, tanx =k, where k is a constant. Solutions of simple quadratic equations, equations involving usage of transformations- problems.

10. Properties of triangles:
Relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle- problems.

11. Hyperbolic functions:
Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.

12. Complex Numbers:
Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitue (polar) form , Exponential form (Euler form) of a complex number- Problems. DeMoivre's theorem.

UNIT-III
Coordinate geometry

13. Straight lines:various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
14. Circle: locus of a point, Circle, definition-Circle equation given (i) centre and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points - general equation of a circle – finding centre, radius.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. properties of parabola, ellipse and hyperbola in standard forms.

UNIT-IV
Differential Calculus:

16. **Concept of Limit-**Definition- Properties of Limits and Standard Limits -Simple Problems- Continuity of a function at a point- Simple Examples only.

17. **Concept of derivative-**Definition (first principle)- different notations-derivatives ofelementary functions- problems. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Chain rule, derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic,implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives -examples – functions of several variables - partial differentiation, Euler's theorem- simple problems.

UNIT-V

Applications of Derivatives:

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, sub tangent and subnormal to the curve at any point - problems.

19. Physical applications of the derivative – velocity, acceleration, derivative as a rate measure – Problems.

20. Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.

21. Using the concept of derivative of a function of single variable, find the absolute error, relative and percentage errors and approximate values due to errors in measuring.

Textbook:

Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. Shanti Narayan, A Textbook of matrices, S.Chand&Co.
2. Robert E. Moyer & Frank Ayers Jr., Schaum's Outline of Trigonometry, 4th Edition, Schaum's Series
3. M.Vygodsky, Mathematical Handbook, Mir Publishers, Moscow.
4. Frank Ayers & Elliott Mendelson, Schaum's Outline of Calculus, Schaum's Series

S. No	Chapter/ Unit title	No of Periods		Weightage Allotted	Marks wise distribution of weightage				Question wise distribution of weightage				COs mapped
	Unit - I : Algebra	**Theory**	**Practice**		**R**	**U**	**Ap**	**An**	**R**	**U**	**Ap**	**An**	
1	Relations and Functions	4	2	3	0	3	0	0	0	1	0	0	**CO1**
2	Partial Fractions	3	2	3	0	3	0	0	0	1	0	0	**CO1**
3	Matrices and Determinants	10	10	11	3	0	8	0	1	0	1	0	**CO1**
	Unit - II : Trigonometry												
4	Trigonometric Ratios	1	1	0	0	0	0	0	0	0	0	0	**CO2**
5	Compound Angles	3	2	3	3	0	0	0	1	0	0	0	**CO2**
6	Multiple and Submultiple angles	4	4	3	0	3	0	0	0	1	0	0	**CO2**
7	Transformations	3	3	8	0	8	0	0	0	1	0	0	**CO2**
8	Inverse Trigonometric Functions	3	2										
9	Trigonometric Equations	3	2	8	0	0	8	0	0	0	1	0	**CO2**
10	Properties of triangles	3	2										
11	Hyperbolic Functions	1	1	0	0	0	0	0	0	0	0	0	**CO2**
12	Complex Numbers	4	2	3	3	0	0	0	1	0	0	0	**CO2**
	Unit III : Co-ordinate Geometry												
13	Straight Lines	4	2	3	3	0	0	0	1	0	0	0	**CO3**
14	Circle	3	2	8	0	8	0	0	0	1	0	0	**CO3**
15	Conic Sections	8	4										
	Unit – IV : Differential Calculus												
16	Limits and Continuity	4	2	3	0	3	0	0	0	1	0	0	**CO4**
17	Differentiation	17	10	14	3	11	0	0	1	2	0	0	**CO4**
	Unit - V : Applications of Differentiation												

18	Geometrical Applications	3	2	10	0	0	0	10	0	0	0	1	**CO5**
19	Physical Applications	2	2										
20	Maxima and Minima	3	4										
21	Errors and Approximations	2	1										
Total		**89**	**61**	**80**	**15**	**39**	**16**	**10**	**5**	**8**	**2**	**1**	

R: Remembering Type : 15 Marks
U: understanding Type : 39 Marks
Ap: Application Type : 16 Marks
An: Analysing Type : 10 Marks

Engineering Mathematics – I
Unit Test Syllabus

Unit Test	Syllabus
Unit Test-I	From L.O. 1.1 to L.O. 2.11
Unit Test-II	From L.O. 2.12 to L.O. 3.10
Unit Test-III	From L.O.4.1 to L.O. 5.10

State Board of Technical Education and Training, A. P

First Year

Subject name: Engineering Mathematics-I

Sub Code: CHPP-102

Time : 90 minutes **Max.Marks:40**

Part-A **16Marks**

Instructions: **(1) Answer all questions.**

(2) First question carries four marks and the remaining questions carry three marks each.

1. Answer the following.

   a. If $f(x)=x^2$ and domain $=\{-1,0,1\}$, then find range. **(CO1)**

   b. If $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$, then find 3A. **(CO1)**

   c. Write the value of $Sin120^0$ **(CO2)**

   d. Write the formula for $\tan 2A$ in terms of $\tan A$ **(CO2)**

2. If $f:R\to R$ is defined by $f(x)=3x-5$, then prove that $f(x)$ is onto. **(CO1)**

3. If $A=\begin{bmatrix}1 & 3\\ 4 & -9\end{bmatrix}$, $B=\begin{bmatrix}2 & 4\\ -3 & 1\end{bmatrix}$ then find $2A+3B$ **(CO1)**

4. Prove that $Sin^2 45^0 - Sin^2 15^0 = \frac{\sqrt{3}}{4}$ **(CO2)**

5. Prove that $\frac{\sin 2A}{1-\cos 2A}=\cot A$ **(CO2)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**

(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Resolve $\frac{2x}{(x-1)(x-3)}$ into partial fractions. **(CO1)**

   or

   B) Resolve $\frac{x+4}{x^2-3x+2}$ into partial fractions. **(CO1)**

7. A) Using Cramer's rule to solve $x-y+z=2, 2x+3y-4z=-4, 3x+y+z=8$ **(CO1)**

or

B) Prove that $\begin{vmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{vmatrix} = (a-b)(b-c)(c-a)$ **(CO1)**

8. A) Find the adjoint of Matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 5 \\ 2 & 7 & -4 \end{bmatrix}$ **(CO1)**

or

B) If $A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 7 & 9 \\ -2 & 1 & 3 \end{bmatrix}$; $B = \begin{bmatrix} 3 & 1 & -5 \\ 2 & 1 & 4 \\ 0 & 3 & 1 \end{bmatrix}$, find AB and BA and verify if $AB = BA$.

(CO1)

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State Board of Technical Education and Training, A. P

First Year

Subject name: Engineering Mathematics-I

Sub Code: CHPP- 102

Time : 90 minutes **Max.Marks:40**

Part-A **16Marks**

Instructions: **(1) Answer all questions.**
(2) First question carries four marks and the remaining questions carry three marks each

1. Answer the following.

   a. $\sin C+\sin D=2\cos\left(\frac{C+D}{2}\right)\sin\left(\frac{C-D}{2}\right)$: State TRUE/FALSE **(CO2)**

   b. If $z=2+3i$, then find $|z|$ **(CO2)**

   c. $\sinh x=\frac{e^{x}-e^{-x}}{2}$: State TRUE/FALSE **(CO2)**

   d. Write the eccentricity of rectangular hyperbola. **(CO3)**

2. Express $(3-4i)(7+2i)$ in terms of $a+ib$ **(CO2)**

3. Find the perpendicular distance from $(1,1)$ to the line $2x+3y-1=0$ **(CO3)**

4. Find the angle between lines $2x-y+3=0$ and $x+y-2=0$ **(CO3)**

5. Find the centre and radius of the circle $x^2+y^2-2x+4y-4=0$ **(CO3)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Prove that $\frac{\sin 2\theta+\sin 4\theta+\sin 6\theta}{\cos 2\theta+\cos 4\theta+\cos 6\theta}=\tan 4\theta$. **(CO2)**

   or

   B) Prove that $\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{8}=\frac{\pi}{4}$ **(CO2)**

7. A) Solve $2\sin^2\theta-\sin\theta-1=0$ **(CO2)**

   or

   B) In any ΔABC, If $\angle B=60^0$ then $\frac{c}{a+b}+\frac{a}{b+c}=1$ **(CO2)**

8. A) Find the equation of circle with $(2,3)$ and $(6,9)$ as the end points of diameter andalso find centre and radius of circle. **(CO3)**

or

B) Find the equation of ellipse whose focus is $(1,-1)$, directrix is $x-y+3=0$ and eccentricity is1/2. **(CO3)**

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State Board of Technical Education and Training, A. P

First Year

Subject name: Engineering Mathematics-I

Sub Code: CHPP-102

Time : 90 minutes **Max.Marks:40**

Part-A **16Marks**

Instructions: **(1) Answer all questions.**
(2) First question carries four marks and the remaining questions carry three marks each

1. Answer the following.

   a. Find $\lim_{x\to 1}\frac{x^2+1}{x+5}$

   (CO4)

   b. $\lim_{\theta\to 0}\frac{\sin 2\theta}{\theta}=2$: State TRUE/FALSE **(CO4)**

   c. $\frac{d}{dx}\left(3\tan^{-1}x\right)=?$ **(CO4)**

   d. Formula for percentage error in x is _____ **(CO5)**

2. Evaluate $\lim_{x\to 2}\frac{x^5-32}{x^2-4}$ **(CO4)**
3. Find the derivative of $3\tan x-4\log x+7^x$ w.r.t. x **(CO4)**
4. Differentiate $x^2\sin x$ w.r.t. x **(CO4)**
5. Find the derivative of $\frac{2x+3}{3x+4}$ **(CO4)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Find the derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w.r.t. $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$. **(CO4)**

   or

   B) Find $\frac{dy}{dx}$ if $y=x^{\cos x}$ **(CO4)**

7. A) Verify Euler's theorem when $u(x,y)=\dfrac{x^4+y^4}{x-y}$ **(CO4)**

or

B) Find the equation of tangent and normal to the curve $3y=x^2-6x+17$ at $(4,3)$ **(CO5)**

8. A) Circular patch of oil spreads on water and the area is growing at the rate of $8\,sqcm/\min$. How fast is the radius increasing when radius is $5cm$. **(CO5)**

or

B) Find the maxima and minima values of $f(x)=x^3-6x^2+9x+15.$ **(CO5)**

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END-EXAM MODEL PAPERS

STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS-ICHPP- 102

TIME : 3 HOURS **MODEL PAPER- I** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. If $A=\left\{0,\frac{\pi}{6},\frac{\pi}{4},\frac{\pi}{3},\frac{\pi}{2}\right\}$ and $f:A\to B$ is a function such that $f(x)=\cos x$, then find the range of f. **CO1**

2. Resolve the function $\frac{x}{(x-1)(x-2)}$ into partial fractions. **CO1**

3. If $\mathrm{A}=\begin{bmatrix}3 & 9 & 0\\ 1 & 8 & -2\end{bmatrix}$ and $\mathrm{B}=\begin{bmatrix}4 & 0 & 2\\ 7 & 1 & 4\end{bmatrix}$, find $\mathrm{A}+\mathrm{B}$ and $\mathrm{A}-\mathrm{B}$. **CO1**

4. Show that $\frac{\cos 16^0+\sin 16^0}{\cos 16^0-\sin 16^0}=\tan 61^0.$ **CO2**

5. Prove that $\frac{\sin 2\theta}{1-\cos 2\theta}=\cot\theta.$ **CO2**

6. Find the modulus of the complex number $\left(\frac{1-i}{2+i}\right)$. **CO2**

7. Find the distance between parallel lines $x+2y+3=0$ and $x+2y+8=0.$ **CO3**

8. Find $\lim_{x\to 0}\frac{\sin 77x}{\sin 11x}.$ **CO4**

9. Differentiate $3\tan x-4\log x-7x^2$ w.r.t. x. **CO4**

10. If $x=at^2, y=2at$, then find $\frac{dy}{dx}$. **CO4**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11 A) Find the inverse of the matrix $\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$. **CO1**

Or

B) Solve the system of equations $x+y+z=6, x-y+z=2$ and $2x-y+3z=9$ by Cramer's rule. **CO1**

12 A) If $\cos x+\cos y=\frac{3}{5}$ and $\cos x-\cos y=\frac{2}{7}$, then show that **CO2**

$21\tan\left(\frac{x-y}{2}\right)+10\cot\left(\frac{x+y}{2}\right)=0.$

Or

B) If $\tan^{-1}x+\tan^{-1}y+\tan^{-1}z=\pi$ then show that $x+y+z=xyz.$ **CO2**

13 A) Solve $\sqrt{3}\cos\theta-\sin\theta=1.$ **CO2**

Or

B) In any $\Delta ABC,$ Show that $\cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}=\frac{s^2}{\Delta}.$ **CO2**

14 A) Find the equation of the circle with $(4,2)$ and $(1,5)$ as the two ends of its diameter and also find its centre and radius. **CO3**

Or

B) Find the centre, vertices, equation of axes, lengths of axes, eccentricity, foci, equations of directrices and length of latus rectum of the ellipse $4x^2+16y^2=1.$ **CO3**

15 A) Find the derivative of $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ w.r.t. $\tan^{-1}\left(\frac{2x}{1-x^2}\right)$ **CO4**

Or

B) If $u=\tan^{-1}\left(\frac{x^3-y^3}{x+y}\right),$ then prove that $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}=\sin 2u.$ **CO4**

PART-C

Answer the following question. Question carries TEN marks. **1x10=10M**

16. The sum of two numbers is 24. Find them so that the sum of their squares is minimum.**CO5**

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STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS-I CHPP- 102

TIME : 3 HOURS **MODEL PAPER- II** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. If $f:R\to R$ is a bijective function such that $f(x)=ax+b$, then find $f^{-1}(x)$. **CO1**
2. Resolve the function $\frac{1}{(x+1)(x-2)}$ into partial fractions. **CO1**
3. If $A=\begin{bmatrix} 0 & -1 & 3 \\ 1 & 0 & 7 \\ -3 & x & 0 \end{bmatrix}$ is a skew-symmetric matrix, find the value of x. **CO1**
4. Find the value of $\sin^2 82\frac{1}{2}^0-\sin^2 22\frac{1}{2}^0$. **CO2**
5. Prove that $\frac{\cos 3A}{2\cos 2A-1}=\cos A$. **CO2**
6. Find the conjugate of the complex number $(3-2i).(4+7i)$ **CO2**
7. Find the equation of the line passing through the points $(1,2)$ and $(3,-4)$. **CO3**
8. Find $\lim_{x\to 2}\frac{x^5-32}{x-2}$. **CO4**
9. Differentiate $\sqrt{x}-\sec x+\log x$ w.r.t. x. **CO4**
10. If $u(x,y)=x^3-3axy+y^3$, then find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$. **CO4**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11 A) Show that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}=(a-b)(b-c)(c-a)$. **CO1**

Or

B) Solve the system of equations $x+2y+3z=6, 3x-2y+4z=5$ and $x-y-z=-1$ using matrix inversion method. **CO1**

12 A) Prove that $\frac{\sin 2\theta+\sin 4\theta+\sin 6\theta}{\cos 2\theta+\cos 4\theta+\cos 6\theta}=\tan 4\theta$. **CO2**

Or

B) Prove that $\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{7}+\tan^{-1}\frac{1}{8}=\frac{\pi}{4}$. **CO2**

13 A) Solve $2\cos^2\theta - 3\cos\theta + 1 = 0.$ **CO2**

Or

B) In any $\Delta ABC,$ Show that $\sum a^3 \cos(B-C) = 3abc.$ **CO2**

14 A) Find the equation of the circle passing through the points $(0,0),(6,0)$ and $(0,8).$ **CO3**

Or

B) Find the equation of the rectangular hyperbola whose focus is $(1,2)$ and directrix is $3x+4y-5=0.$ **CO3**

15 A) If $\sin y = x\sin(a+y),$ then prove that $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}.$ **CO4**

Or

B) If $y = \tan^{-1} x,$ then prove that $(1+x^2)y_2 + 2xy_1 = 0.$ **CO4**

PART-C

Answer the following question. Question carries TEN marks. **1x10=10M**

16 Show that the semi-vertical angle of the cone of maximum volume and of given slant height is $\tan^{-1}\sqrt{2}.$ **CO4**

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Course code	Course Title	No. of Periods per week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-103	Engineering Physics	4	120	20	80

S. No	Unit Title/Chapter	No of Periods	COs Mapped
1	Units and Dimensions	08	CO1
2	Elements of Vectors	12	CO1
3	Dynamics	12	CO2
4	Friction	10	CO2
5	Work, Power and Energy	12	CO3
6	Simple harmonic motion	12	CO3
7	Heat and Thermodynamics	12	CO4
8	Sound	10	CO4
9	Properties of matter	10	CO5
10	Electricity and Magnetism	12	CO5
11	Modern physics	10	CO5
Total		**120**	

Course Title: Engineering Physics	
Course Objectives	1. To familiarize with the concepts of Physics involved in the process of various Engineering, Industrial and Daily life Applications. 2. To understand and apply the basic principles of physics in the field of engineering and technology to familiarize certain natural phenomenon occurring in the day to day life 3. To reinforce theoretical concepts by conducting relevant experiments/exercises

Course Outcomes	CO1	Explain S.I units and dimensions of different physical quantities, basic operations among vector quantities.
	CO2	Explain the motion of objects moving in one dimension and two dimensions, the causes of motion and hindrance to the motion of the objects especially with respect to friction.
	CO3	Explain the mechanical energy of bodies like PE, KE and conservation law of energy, the properties of simple harmonic motion.
	CO4	Explain gas laws, ideal gas equation, Isothermal and adiabatic processes, Specific heats, to study the laws of thermodynamics. Causes, consequences and methods to minimise noise pollution, explain beats, Doppler effect, Reverberation, echoes.
	CO5	Explain certain properties of solids, liquids like elastic properties, viscosity and surface tension. Explain Ohm's law, to study Kirchoff's laws, to study the principle of Wheatstone's bridge and its application to meter bridge. To study the magnetic force and understand magnetic field. To compute magnetic field strength on axial and equatorial lines of a bar magnet. To familiarise with modern topics like photoelectric effect, optical fibres, superconductivity and nanotechnology.

COS, POS, PSOS MAPPING

- POs mapping strength (as per given table)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3					1		1	1	1
CO2	3		2					1	1	
CO3	3		2					1		
CO4	3	2			2				2	2
CO5	3			2			2	1	1	

3 = strongly mapped 2= moderately mapped 1= slightly mapped

Note:The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:
i) Seminars ii) Tutorials iii) Guest lectures iv) Assignments v) Quiz competitions vi) Industrial visits vii) Tech Fest viii) Mini project ix) Group discussion x) Virtual classes xi) Library visit for e-books

Learning Outcomes

1.0 Concept of Units and dimensions

1.1 Explaintheconcept of Units, Physical quantity, Fundamental physical quantities and Derived physical quantities
1.2 Define unit, fundamental units and derived units, State SI units with symbols
1.3 State Multiples and submultiples in SI system, State Rules of writing S.I. units, State advantages of SI units
1.4 Define Dimensions, Write Dimensional formulae of physical quantities
1.5 List dimensional constants and dimensionless quantities
1.6 State the principle of homogeneity of dimensions
1.7 State the applications and limitations of dimensional analysis
1.8 Errors in measurement, Absolute error, relative error, percentage error, significant figures
1.9 Solve problems

2.0 Concept of Elements of Vectors

2.1 Explain the concept of scalars, Vectors and give examples
2.2 Represent vectors graphically, Classify the Vectors, Resolve the vectors
2.3 Determine the resultant of a vector by component method, represent a vector in Space using unit vectors (i, j, k)
2.4 State and explain triangle law, parallelogram law, and polygon law of addition of Vectors
2.5 Define Dot product of two vectors with examples (Work done, Power), mention the Properties of dot product
2.6 Define cross product of two vectors with examples (Torque, Linear velocity) Mention the properties of Cross product.
2.7 Solve the related numerical problems

3.0 Concept of Dynamics

3.1 Write the equations of motion in a straight line. Explain the acceleration due to Gravity.
3.2 Explain vertical motion of a body and derive expressions for a) Maximum Height, b) Time of ascent, c) time of descent, and d) time of flight

3.3 Derive height of a tower when a body projected vertically upwards from the top of a tower.
3.4 Explain projectile motion with examples
3.5 Explain horizontal projection and derive an expression for the path of a projectile in horizontal projection
3.6 Explain oblique projection and derive an expression for it. Derive formulae for
a) Maximum Height b) time of ascent c) time of descent and d) time of flight
e) Horizontal Range, f) Maximum range
3.7 Define force, momentum, angular displacement, angular velocity, angular acceleration, angular momentum, moment of inertia, torque
3.8 Solve the related numerical problems

4.0 Concept of Friction

4.1 Define friction and classify the types of friction.
4.2 Explain the concept of normal reaction.
4.3 State the laws of friction.
4.4 Define coefficients of friction, Angle of friction and angle of repose.
4.5 Derive expressions for acceleration of a body on a rough inclined plane. (Upwards and downwards)
4.6 List the advantages and disadvantages of friction.
4.7 Mention the methods of minimizing friction.
4.8 Explain why it is easy to pull a lawn roller than to push it.
4.9 Solve the related numerical problems.

5.0 Concepts of Work, Power, and Energy

5.1 Definethe terms Work, Power and Energy. State SI units and dimensionalFormulae.
5.2 Define potential energy and give examples, derive an expression for potential energy.
5.3 Define Kinetic energy and give examples, derive an expression for kinetic energy.
5.4 State and derive Work-Energy theorem.
5.5 Derive the relation between Kinetic energy and momentum.
5.6 State the law of conservation of energy and verify it in the case of a freelyfallingbody.
5.7 Solve the related numerical problems.

6.0 Concepts of Simple harmonic motion

6.1 Define Simple harmonic motion, Give examples, state the conditions.
6.2 Explanation of uniform circular motion of a particle is a combination of two perpendicular S.H.M.s.
6.3 Derive expressions for displacement, velocity, acceleration, Frequency, Time period of a particle executing SHM.
6.4 Define phase of SHM.
6.5 Define Ideal simple pendulum and derive expression for time period of simple pendulum.
6.6 State the laws of motion of simple pendulum.
6.7 Solve the related numerical problems.

7.0 Concept of heat and thermodynamics

7.1 Explain the concept of expansion of gases
7.2 State and explain Boyle's and Charles laws.
7.3 Define absolute zero temperature, absolute scale of temperature
7.4 Define ideal gas and distinguish from real gas

7.5 Derive Ideal gas equation. Define specific gas constant and universal gas constant, write S.I unit and dimensional formula. Calculate the value of R.
7.6 Explain why universal gas constant is same for all gases
7.7 State and explain isothermal process and adiabatic process
7.8 State first and second laws of thermodynamics and state applications
7.9 Define specific heats and molar specific heats of a gas, Derive C_P-C_V =R
7.10 Solve the relevant numerical problems

8.0 Concept of Sound

8.1 Concept of the sound, Wave motion. (longitudinal and transverse wave)
8.2 Distinguish between musical sound and noise.
8.3 Explain noise pollution and state SI unit for intensity level of sound.
8.4 Explain causes, effects and methods of minimizing of noise pollution.
8.5 Explain the phenomenon of beats state the applications.
8.6 Define Doppler effect, list the applications.
8.7 Define reverberation and reverberation timeand write Sabine's formula.
8.8 Define and explain echoes state its applications.
8.9 State conditions of good auditorium.
8.10 Solve the related numerical problems.

9.0 Concepts of properties of matter

9.1 Explain the terms elasticity, stress, strain and types of stress and strain.
9.2 State and explain Hooke's law.
9.3 Definitions of Modulus of elasticity, Young's modulus(Y), Bulk modulus (K), Rigidity modulus (n),Poisson's ratio (σ),
9.4 Define surface tension and give examples.
9.5 Explain Surface tension with reference to molecular theory.
9.6 Define angle of contact and capillarity and write formula for Surface Tension.
9.7 Explain the concept of viscosity, give examples, write Newton's formula.
9.8 Define co-efficient of viscosity and write its units and dimensional formula and State Poiseulle's equation for Co-efficient of viscosity.
9.9 Explain the effect of temperature on viscosity of liquids and gases.
9.10 Solve the related numerical problems.

10. Concepts of Electricity and Magnetism

10.1 Explain Ohm's law in electricity and write the formula.
10.2 Define specific resistance, conductance and state their units.
10.3 Explain Kichoff's laws.
10.4 Describe Wheatstone's bridge with legible sketch.
10.5 Describe Meter Bridge for the determination of resistivity with a circuit diagram.
10.6 Explain the concept of magnetism. State the Coulomb's inverse square law of Magnetism.
10.7 Define magnetic field and magnetic lines of force and write the properties of magnetic lines of force.
10.8 Derive an expression for the moment of couple on a bar magnet placed in a uniform magnetic field.
10.9 Derive equations for Magnetic induction field strength at a point on the axial lineand on the equatorial line of a bar magnet.
10.10 Solvethe related numerical problems

11.0 Concepts of modern physics

11.1 State and explain Photo-electric effect and Write Einstein's photo electricEquation.
11.2 State laws of photo electric effect.
11.3 Explain the Working of photo electric cell, write its applications.
11.4 Recapitulation of refraction of light and its laws, critical angle, total InternalReflection.
11.5 Explain the principle and working of Optical fiber, mention different types of Optical fiber, state the applications.
11.6 Define super conductor and super conductivity and mention examples.
11.7 State the properties of super conducting materials and list the applications.
11.8 Nanotechnology definition, nano materials, applications.

COURSECONTENT

1. Units and Dimensions:

Introduction, Physical quantity, Fundamental and Derived quantities, Fundamental and Derived units, SI units, Multiples and Sub multiples, Rules for writing S.I. units, Advantages of SI units. Dimensions and Dimensional formulae, Dimensional constants and Dimensionless quantities, Principle of homogeneity, Advantages and limitations of dimensional analysis, Errors in measurement, Absolute error, relative error, percentage error, significant figures, Problems.

2. Elements of Vectors:

Scalars and Vectors, Types of vectors (Proper Vector, Null Vector, Unit Vector, Equal, Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors, Representation of vectors, Resolution of vectors, Parallelogram, Triangle and Polygon laws of vectors, Subtraction of vectors, Dot and Cross products of vectors-Problems.

3. Dynamics

Introduction-Concept of acceleration due to gravity-Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections-Expressions for maximum height, time of flight, range-Define force, momentum, angular displacement, angular velocity, angular acceleration, angular momentum, moment of inertia, torque–problems.

4. Friction:

Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose-Angle of friction- rough inclined plane- Advantages and disadvantages of friction-Methods of reducing friction–Problems.

5. Work, Power and Energy:

Work, Power and Energy- Definitions and explanation- potential energy- kinetic energy-Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Law of Conservation of energy- Problems.

6. Simple Harmonic Motion:

Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Laws of simple pendulum-seconds pendulum-Problems.

7. Heat and Thermodynamics:

Expansion of Gases, Boyle's law, absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between gas constant(r) and universal gas constant(R),Isothermal and adiabatic processes, Laws of thermodynamics, Specific heats - molar specific heats of a gas -Different modes of transmission of heat ,laws of thermal conductivity, Coefficient of thermal conductivity-Problems.

8. Sound:

Sound- Nature of sound- Types of wave motion -musical sound and noise- Noise pollution – Causes &effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo-Reverberation-Reverberation time-Sabine 's formula-Conditions of good auditorium-Problems.

9. Properties of matter

Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law-Definitions of Modulus of elasticity, Young's modulus(Y), Bulk modulus(K), Rigidity modulus (n),Poisson's ratio (σ), relation between Y, K, n and σ(equations only no derivation)

Definition of surface tension-Explanation of Surface tension with reference to molecular theory - Definition of angle of contact -Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseuille's equation for Co-efficient of viscosity- The related numerical problems.

10. Electricity & Magnetism:

Ohm's law and explanation, Specific resistance, Kirchoff'slaws, Wheatstone's bridge, Meter bridge, Coulomb's inverse square law, magnetic field, magnetic lines of force, magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial line–problems.

11. Modern Physics;

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect-photoelectric cell–Applications of photo electric effect- Total internal reflection- fiber optics--principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- superconductivity–applications-Nanotechnology definition, nano materials, applications

REFERENCEBOOKS

1. Telugu Academy (English version)	Intermediate physics Volume-I & 2
2.Dr. S. L. Guptha and Sanjeev Guptha	Unified physics Volume 1,2,3 and 4
3. Resnick& Holiday	Text book of physics Volume I
4. Dhanpath Roy	Text book of applied physics
5. D.A Hill	Fiber optics
6. XI & XII Standard	NCERT Text Books

➢ **Model Blue Print with Weightage for Blooms category and questions for chapter and Cos mapped**

S. No	Unit Title/Chapter	No of Periods	Weightage of marks	Marks wise distribution of Weightage				Question wise distribution of Weightage				Mapped with CO
				R	U	Ap	An	R	U	Ap	An	
1	Units and Dimensions	08	03	3	0	0	0	1	0	0	0	CO1
2	Elements of Vectors	12	11	3	8	0	0	1	1	0	0	CO1
3	Dynamics	12	11	3	8	0	0	1	1	0	*	CO2
4	Friction	10	11	3	0	8	0	1	0	1	0	CO2
5	Work, Power and Energy	12	11	3	8	0	0	1	1	0	0	CO3
6	Simple harmonic motion	12	11	3	8	0	0	1	1	0	*	CO3
7	Heat and Thermodynamics	12	11	0	8	3	0	0	1	1	*	CO4
8	Sound	10	11	0	8	3	0	0	1	1	0	CO4
9	Properties of matter	10	08	0	8	0	0	0	1	0	0	CO5
10	Electricity and Magnetism	12	14	6	0	8	0	2	0	1	0	CO5
11	Modern physics	10	08	0	8	0	0	0	1	0	0	CO5
Total		**120**	**110**	**24**	**64**	**22**	**0**	**8**	**8**	**4**	***10**	

***One question of HOTs for 10 marks from any of the unit title 3 or 6 or 7**

➢ **Table specifying the scope of syllabus to be covered for Unit Tests**

Unit Test	Learning outcomes to be covered
Unit Test – 1	From 1.1 to 4.9
Unit Test – 2	From 5.1 to 7.10
Unit Test – 3	From 8.1 to 11.8

- **Model question paper for Unit Tests I,II,III with COs mapped**

UNIT TEST –I

Model Question Paper (C-20)

ENGINEERING PHYSICS (CHPP-103)

TIME: 90 minutes **Total Marks: 40**

PART-A **16 Marks**

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and others carry 3 marks each.
(3) Answers for the Question numbers 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.

1. i) The dimensional formula of force is _____ **(CO1)**

   ii) Which of the following is a scalar [ ] **(CO1)**

   a) force b) work c) displacement d) velocity

   iii) we can add a scalar to a vector (Yes / No) **(CO1)**

   iv) Friction is a self-adjusting force. [True / False] **(CO2)**

2. Define dot product. Give one example. **(CO1)**
3. A force of 150 N acts on a particle at an angle of 30° to the horizontal. Find the horizontal and vertical components of force. **(CO1)**
4. Define projectile. Give two examples. **(CO2)**
5. It is easier to pull a lawn roller than to push it. Explain **(CO2)**

PART—B **3x8=24**

Instructions: (1) Answer all questions. Each question carries 8marks.
(2) Answer should be comprehensive and the criteria for evaluation is content but not the length of the answer.

6) (A) Derive an expression for magnitude and direction of resultant of two Vectors using parallelogram law of vectors **(CO1)**

OR

(B) Write any four properties of dot product and any four properties of Cross product **(CO1)**

7) (A) Show that path of a projectile is a parabola in case of oblique Projection. **(CO2)**

OR

(B) Derive the expression for range and time of flight of a projectile **(CO2)**

8) (A) State and explain polygon law of vector addition with a neat diagram **(CO1)**

OR

(B) Derive the equation for acceleration of a body on a rough inclined plane **(CO2)**

***

UNIT TEST –II

Model Question Paper (C-20)

ENGINEERING PHYSICS (CHPP–103)

TIME: 90 minutes **Total Marks: 40**

PART –A **16 Marks**

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and others carry 3 marks each.
(3) Answers for the Question numbers 2 to 5 should be brief and Straight to the point and shall not exceed five simple sentences.

1) i) The value of 100^0 C is equal to _____ in Kelvin scale of temperature **(CO4)**

ii) Write the S.I unit of power **(CO3)**

iii) A simple pendulum be used in artificial satellite (Yes / No) **(CO3)**

iv) Specific heat of a gas is constant for all gases in nature [True / False] **(CO4)**

2. Derive the relation between momentum and kinetic energy **(CO3)**

3. A girl is swinging by sitting in a swing, how the frequency changes if she stands in the swing. **(CO3)**

4. Write the physical significance of universal gas constant. **(CO4)**

5. A body is projected in to the air in the vertically upward direction, find the height at which its potential and kinetic energies are equal. **(CO3)**

PART—B **3x8=24 Marks**

Instructions: (1) Answer all questions. Each question carries 8marks.
(2) Answer should be comprehensive and the criteria for evaluation is content but not the length of the answer.

6) (A) State the law of conservation of energy and verify it in case of a freely falling body. **(CO3)**

(OR)

(B) State and prove work energy theorem. **(CO3)**

7) (A) Define ideal simple pendulum and derive the equation for time period of a simple pendulum **(CO3)**

(OR)

(B) State the conditions for S.H.M, derive the equation for velocity for a Particle in S.H.M. **(CO3)**

8) (A) Define ideal gas, show that for an ideal gas the difference in specific heats is equal to universal gas constant **(CO4)**

(OR)

(B) State gas laws and derive the ideal gas equation **(CO4)**

***

UNIT TEST –III

Model Question Paper (C-20)

ENGINEERING PHYSICS (CHPP–103)

TIME: 90 minutes **Total Marks: 40**

PART –A **16 Marks**

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and others carry 3 marks each.
(3) Answers for the Question numbers 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.

1) i) Photo electric cell converts light energy in to _____ energy **(CO5)**

ii) What is elastic limit ? **(CO5)**

iii) SI unit of Specific resistance is ---------- **(CO5)**

iv) Inside a bar magnet magnetic line of force will travel from North pole to South pole [True / False] **(CO5)**

2. Distinguish between Musical sound and Noise **(CO4)**

3. What is the effect of temperature on Viscosity of liquids and gases **(CO5)**

4. The values of resistances P, Q, R are 50 Ω, 10Ω, 15 Ω respectively in the balanced condition of Wheatstone bridge, find the unknownresistance **(CO5)**

5. What is nanotechnology and write any two uses. **(CO5)**

PART—B **3x8=24 Marks**

Instructions: (1) Answer all questions. Each question carries 8marks.
(2) Answer should be comprehensive and the criteria for evaluation is content but not the length of the answer.

6) (A) Explain Surface Tension based on the molecular theory **(CO5)**

(OR)

(B)Define Reverberation and Reverberation Time. Derive Sabine formula for reverberation time. **(CO4)**

7) (A) Derive the balancing condition of Wheatstone bridge with neat circuit Diagram. **(CO5)**

(OR)

(B) Derive an expression for the magnetic induction field strength at a point on the equatorial line of a bar magnet. **(CO5)**

8) (A) Describe an experiment to determine the specific resistance of a wire using meter bridge. **(CO5)**

(OR)

(B) Explain the principle and working of an optical fiber. **(CO5)**

***

BOARD DIPLOMA EXAMINATION, (C–20)
FIRST YEAR EXAMINATION
CHPP–103, ENGINEERING PHYSICS

Time : 3 hours] **[Total Marks : 80M**

PART—A **3×10=30**

Instructions: (1) Answer all questions.
(2) Each question carries three marks.
(3) Answers should be brief and straight to the point and shall not exceed five simple Sentences.

1. Write the dimensional formula of the following physical quantities **(CO1)**
   (a) Velocity (b) Force (c) Angular momentum
2. Write any three properties of scalar product. **(CO1)**
3. Define projectile. Give two examples. **(CO2)**
4. It is easier to pull a lawn roller than to push it. Explain. **(CO2)**
5. Define potential energy and kinetic energy. **(CO3)**
6. For a body in simple harmonic motion velocity at mean position is 4m/s, if the time period is 3.14 s, find its amplitude. **(CO3)**
7. State first and second laws of thermodynamics. **(CO4)**
8. Write any three conditions of good auditorium **(CO4)**
9. Define ohmic and non-ohmic conductors. **(CO5)**
10. State Coulomb's inverse square law of magnetism. **(CO5)**

PART—B **8 ×5= 40**

Instructions: (1) Each question carries eight marks.
(2) Answers should be comprehensive and the criterion for valuation is the content But not the length of the answer.

11. A) Derive an expression for magnitude and direction of the resultant of two vectors using Parallelogram law of vectors. **(CO1)**
    (OR)
    B) Show that path of a projectile is parabola in case of oblique projection and derive expression for maximum height. **(CO2)**

12. A) Derive expression for acceleration of a body sliding downwards on a rough inclined plane**.** **(CO2)**
    (OR)
    B) Verify the law of conservation of energy in case of a freely falling body**.** **(CO3)**
13. A) Derive an expression for velocity and acceleration of a particle performing simple harmonic Motion. **(CO3)**
    (OR)
    B) Define ideal gas and derive ideal gas equation**.** **(CO4)**

14. A) Two tuning forks A and B produce 4 beats per second. On loading B with wax 6 beats are produced. If the quantity of wax is reduced the number of beats drops to 4. If the frequency of A is 326 Hz, find the frequency of B**.** **(CO4)**

(OR)

B) Explain surface tension based on molecular theory. Write three examples of surface tension. **(CO5)**

15. A) Derive an expression for balancing condition of Wheat stone's bridge with a neat circuit diagram. **(CO5)**

(OR)

B) Explain principle and working of optical fibers. Write any three applications . **(CO5)**

PART C **1 x 10 = 10**

16) Derive relationship between molar specific heat of a gas at constant pressure C_p and molar specific heat of a gas at constant volume C_v and hence show that C_p is greater than C_v.**(CO4)**

***

Course code	Course Title	No. of Periods per week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-104	Engineering Chemistry and Environmental Studies	4	120	20	80

S.No	Unit Title/Chapter	No of Periods	COs Mapped
1	Fundamentals of Chemistry	18	CO1
2	Solutions	10	CO1
3	Acids and bases	10	CO1
4	Principles of Metallurgy	8	CO1
5	Electrochemistry	16	CO2
6	Corrosion	8	CO2
7	Water Treatment	10	CO3
8	Polymers	12	CO4
9	Fuels	6	CO4
10	Chemistry in daily life	6	CO4
11	Environmental Studies	16	CO5
	Total	**120**	

- **Course Objectives**

Course Title: Engineering Chemistry & Environmental Studies	
Course Objectives	1. To familiarize with the concepts of chemistry involved in the process of various Engineering Industrial Applications. 2. To know the various natural and man-made environmental issues and concerns with an interdisciplinary approach that include physical, chemical, biological and socio cultural aspects of environment. 3. To reinforce theoretical concepts by conducting relevant experiments/exercises

- **Course outcomes**

Course Outcomes	CO1	Explain Bohr`s atomic model, chemical bonding, mole concept, acids and bases, P^H metallurgical process and alloys
	CO2	Explain electrolysis, Galvanic cell, emf and corrosion
	CO3	Explain the chemistry involved in the treatment of water by advanced method
	CO4	Synthesise of Plastics, rubber and applications of fuel chemical compounds used in our daily life.
	CO5	Explain the causes, effects and control methods of air and water pollution and measures to protect the environment

Course code CHPP-104	**Engg. Chemistry and Environmental studies No of Cos;5**			**No Of periods 120**
	Mapped with CO No	**CO periods addressing PO in Col 1 NO**	**%**	**1,2,3**	**remarks**
PO1	CO1,CO2,CO3, CO4,CO5				>40% level 3 (highly addressed) 25% to 40% level2(moderately addressed 5% to 25% level1 (Low addressed < 5%(not addressed)
PO2	CO1,CO2				
PO3	CO2,CO3				
PO4	CO1				
PO5	CO4,CO5				
PO6					
PO7					

- COs-POs mapping strength (as per given table)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	1		1				1	1	
CO2	3	1	2					1	1	
CO3	3		2							
CO4	3				1		2			
CO5	3				3			1		

3 = strongly mapped
2= moderately mapped
1= slightly mapped

Note: The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

i) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitions vi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

➢ **Model Blue Print with Weightage for Blooms category and questions for each chapter and COs mapped**

S.No	Unit Title/Chapter	No of Periods	Weightage of marks	Marks wise distribution of Weightage				Question wise distribution of Weightage				Mapped with CO
				R	U	Ap	An	R	U	Ap	An	
1	Fundamentals of Chemistry	18	19	8	8	3		1	1	1		CO1
2	Solutions	10	11	0	0	8	3			1	1	CO1
3	Acids and bases	10	11	0	8	0	3		1		1	CO1
4	Principles of Metallurgy	8	8	8	0	0		1				CO1
5	Electrochemistry	16	11	8	3	0		1	1		*	CO2
6	Corrosion	8	8	0	8	0			1			CO2
7	Water Treatment	10	11	8	3	0		1	1			CO3
8	Polymers	12	11	3	8	0		1	1		*	CO4
9	Fuels	6	3	3	0	0		1				CO4
10	Chemistry in daily life	6	3	0	0	3				1		CO4
11	Environmental Studies	16	14	3	11	0		1	2			CO5
Total		**120**	**110**	**12**	**6**	**6**	**6**	**20**	**35**	**5**	***10**	

***One question of HOTs for 10 marks from any of the unit title 5 or 8**

Upon completion of the course the student shall be able to learn out

ENGINEERINGCHEMISTRY AND ENVIRONMENTAL STUDIES

1.0 Atomic structure

1.1 Explain the charge, mass of fundamental particles of an atom (electron, proton and neutron) and the concept of atomic number and mass number.

1.2 State the Postulates of Bohr's atomic theory and its limitations.

1.3 Explain the significance of four Quantum numbers.

1.4 Explain 1. Aufbau principle, 2 Pauli's exclusion principle 3 Hund's rule.

1.5 Define Orbital of an atom and draw the shapes of s, p and d- Orbitals.

1.6 Write the electronic configuration of elements up to atomic number 30

1.7 Explain the significance of chemical bonding

1.8 Explain the Postulates of Electronic theory of valency

1.9 Define and explain Ionic and Covalent bonds with examples of NaCl , MgO, $*H_2$,$*O_2$ and $*N_2$. (* Lewis dot method)

1.10 List out the Properties of Ionic compounds and covalent compounds and distinguish between their properties.

1.11 Structures of ionic solids-define a) Unit cell b) co-ordination number and the structures of NaCl and CsCl unit cells.

2.0 Solutions

2.1 Define the terms 1.Solution, 2.Solute and 3.Solvent

2.2 Classify solutions based on physical state and solubility

2.3 Define mole and problems on mole concept.

2.4 Define the terms 1. Atomic weight, 2.Molecular weight and 3. Equivalent weight and calculate Molecular weight and Equivalent weight of the given acids.(HCl,H_2SO_4,H_3PO_4)Bases ($NaOH$, $Ca(OH)_2$, $Al(OH)_3$) and Salts ($NaCl$, Na_2CO_3, $CaCO_3$)

2.5 Define molarity and normality and numerical problems on molarity and normality
a) Calculate the Molarity or Normality if weight of solute and volume of solution are given
b) Calculate the weight of solute if Molarity or normality with volume of solution are given
c) Problems on dilution to convert high concentrated solutions to low concentrated Solutions

3.0 Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases and give the limitations of Arrhenius theory of Acids and Bases.

3.2 Explain Bronsted–Lowry theory of acids and bases and give the limitations of Bronsted–Lowry theory of acids and bases.

3.3 Explain Lewis theory of acids and bases and give the limitations of Lewis theory of acids and bases.

3.4 Explain the Ionic product of water

3.5 Define pH and explain P^H scale and solve the Numerical problems on pH(Strong Acids and Bases)

3.6 Define and explain buffer solution and give the examples of buffer solutions.

3.7 State the application of buffer solutions

4.0 Principles of Metallurgy

4.1 List out the Characteristics of Metals and non-metals

4.2 Distinguish between Metals and Non-metals

4.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4.Flux5.Slag

4.4 Describe the methods of concentration of Ore; 1.Handpicking, 2.Levigation and 3. Froth Floatation

4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.

4.6 Explain the purification of Copper by Electrolytic Refining

4.7 Define an Alloy and Write the composition and uses of the following alloys. 1. Brass 2. Germen silver 3. Nichrome.

5.0 Electrochemistry

5.1 Define the terms1. Conductor 2. Semiconductor 3.Insulator, 4.Electrolyte5.Non–electrolyte. Give two examples each.

5.2 Distinguish between metallic conduction and Electrolytic conduction

5.3 Explain electrolysis by taking example fused NaCl

5.4 Explain Faraday's laws of electrolysis

5.5 Define 1.Chemical equivalent (E) 2.Electrochemicalequivalent (e) and their relation.

5.6 Solve the Numerical problems on Faraday's laws of electrolysis and applications of electrolysis (Electro plating)

5.7 Define Galvanic cell and explain the construction and working of Galvanic cell.

5.8 Distinguish between electrolytic cell and galvanic cell

5.9 Explain the electrode potentials and standard electrode potentials
5.10 Explain the electrochemical series and its significance
5.11 Explain the emf of a cell and solve the numerical problems on emf of the cell based on standard electrode potentials.

6.0 Corrosion

6.1 Define the term corrosion.
6.2 state the Factors influencing the rate of corrosion
6.3 Describe the formation of a) composition cell b) stress cell c)concentration cell during corrosion.
6.4 Define rusting of iron and explain the mechanism of rusting of iron.
6.5 Explain the methods of prevention of corrosion
a)Protective coatings (anodic and cathodic coatings)
b) cathodicprotection (Sacrificial anode process and Impressed–voltage process)

7. 0 Water Treatment

7.1 Define soft water and hard water with respect to soap action.
7.2 Define and classify the hardness of water.
7.3 List out the salts that causing hardness of water (with Formulae)
7.4 State the disadvantages of using hard water in industries.
7.5 Define Degree of hardness and units of hardness (mg/L) or(ppm).
7.6 Explain the methods of softening of hard water: a) Ion-exchange process, b)Permutit process or zeolite process
7.7 State the essential qualities of drinking water.
7.8 Chemistry involved in treatment of water (Coagulation, Chlorination, defluorination)
7.9 Explain Osmosis and Reverse Osmosis with examples.
7.10 State the applications of Reverse Osmosis.

8.0 Polymers

8.1 Explain the concept of polymerisation
8.2 Describe the methods of polymerization a)addition polymerization of ethylene
b)condensation polymerization of Bakelite(Only flow chart)
8.3 Define thermoplastics and thermosetting plastics with examples.
8.4 Distinguish between thermo plastics and thermosetting plastics
8.5 List the Characteristics of plastics and state the disadvantages of using plastics.
8.6 State the advantages of plastics over traditional materials.
8.7 Explain the methods of preparation and uses of the following plastics:
1. PVC, 2.Teflon, 3. Polystyrene 4. Nylon 6,6
8.8 Explain processing of Natural rubber and write the structural formula of Natural rubber.
8.9 List the Characteristics of raw rubber
8.10 Define and explain Vulcanization and List out the Characteristics of Vulcanized rubber.
8.11 Define the term Elastomer and describe the preparation and uses of the following synthetic rubbers a) Buna-s and b)Neoprene rubber.

9.0 Fuels

9.1 Define the term fuel
9.2 Classify the fuels based on physical state and based on occurrence.
9.3 List the characteristics of good fuel.
9.4 State the composition and uses of gaseous fuels.
a)water gas b) producer gas, c) natural gas, d) Coal gas, e)Biogas.

10.0 Chemistry in daily life

10.1 Give the basic chemical composition, applications, health aspects and pollution impacts of
a) soaps, and detergents b) vinegar c) Insect repellents d) activated charcoal e) Soft drinks

11.0 ENVIRONMENTALSTUDIES

11.1 Define the term environment and explain the scope and importance of environmental studies

11.2 Define the segments of environment 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere,

11.3 Define the following terms 1)Pollutant, 2).Pollution, 3).Contaminant, 4)receptor, 5)sink, 6) particulates, 7)dissolved oxygen (DO), 8)Threshold limit value (TLV), 9).BOD,10).COD 11) eco system12) Producers13) Consumers 14) Decomposers with examples

11.4 State the renewable and non renewable energy sources with examples.

11.5 Explain biodiversity and threats to biodiversity

11.6 Define air pollution and classify the air pollutants-based on origin and physical state of matter.

11.7 Explain the causes, effects of air pollution on human beings, plants and animals and control methods of air pollution.

11.8 State the uses of forest resources.

11.9 Explain causes and effects of deforestation

11.10 Explain the causes and effects of the following
1) Greenhouse effect, 2) Ozone layer depletion and 3) Acid rain

11.11 Define Water pollution, explain the causes, effects and control methods of Water pollution.

COURSE CONTENT

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

1. Fundamentals of Chemistry

Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers –Aufbau principle - Hund's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples–Properties of Ionic and Covalent compounds- structures of ionic crystals (NaCl and CsCl).

2. Solutions

Introduction of concentration methods – mole concept, molarity and normality – Numerical problems on mole, molarity and normality.

3. Acids and Bases

Introduction – Theories of acids and bases and limitations – Arrhenius theory- Bronsted – Lowry theory – Lewis acid base theory – Ionic product of water- pH related numerical problems–Buffer solutions, action of buffer and its applications.

4. Principles of Metallurgy

Characteristics of Metals and non-metals –Distinguish between Metals and Non-metals, Define the terms i) Metallurgy ii) ore iii) Gangue iv) flux v) Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Methods of Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of brass, German silver and nichrome.

5. Electrochemistry

Conductors, semiconductors, insulators, electrolytes and non-electrolytes – electrolysis – Faraday's laws of electrolysis-application of electrolysis(electroplating) -numerical problems on Faraday's laws – Galvanic cell – standard electrode potential – electrochemical series–emf and numerical problems on emf of a cell .

6. Corrosion

Introduction - factors influencing corrosion - composition, stress and concentration cells– rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection methods.

7. Water technology

Introduction–soft and hard water–causes of hardness–types of hardness –disadvantages of hard water – degree of hardness (ppm and mg/lit) – softening methods – permutit process – ion exchange process– qualities of drinking water –Chemistry involved in treatment of water (Coagulation, Chlorination, defluorination) - Osmosis, Reverse Osmosis –Applications of Reverse osmosis.

8. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials- Disadvantages of using plastics – Preparation and uses of the following plastics i).PVC ii) Teflon iii) Polystyrene iv) .Nylon 6,6 –Processing of natural rubber - Vulcanization – Elastomers- Preparation and applications of Buna-s, Neoprene rubbers.

9. Fuels

Definition and classification of fuels–characteristics of good fuel-composition and uses of gaseous fuels.

10. Chemistry in daily life

Basic composition, applications, health aspects and pollution impacts of soaps and detergents, vinegar, insect repellents, soft drinks, activated charcoal.

11. **ENVIRONMENTALSTUDIES**

Introduction– environment –scope and importance of environmental studies – important terms related to environment– renewable and non-renewable energy sources–Concept of ecosystem – Biotic components –Forest resources – Deforestation -Biodiversity and its threats-Air pollution – causes-effects–Global environmental issues – control measures – Water pollution – causes – effects – control measures.

REFERENCEBOOKS

1. Telugu Academy — Intermediate chemistry Vol 1&2
2. Jain & Jain — Engineering Chemistry
3. O.P. Agarwal, — Hi- Tech. Engineering Chemistry
4. Sharma — Engineering Chemistry
5. A.K. De — Engineering Chemistry

Table specifying the scope of syllabus to be covered for unit test 1, unit test 2 and unit test 3

Unit Test	Learning outcomes to be covered
Unit Test - 1	From 1.1 to 3.7
Unit Test - 2	From 4.1 to 7.10
Unit Test - 3	From 8.1 to 11.11

Model question paper for Unit Test with Cos mapped

UNIT TEST –I

Model Question Paper (C-20)

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (CHPP-104)

TIME: 90 minutes **Total Marks: 40**

PART-A **16 Marks**

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and each of rest carries 3 marks.
(3) Answers for Q.No. 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.

1. a. Number of neutrons in $_{11}Na^{23}$ is ---------- **(CO1)**

   b. The molarity and normality of HCl is the same (True or False) **(CO1)**

   c. What is the p^H range of base? **(CO1)**

   d. Graphite is a good conductor of electricity (Yes or No) **(CO1)**

2. Distinguish between orbit and orbital. **(CO1)**

3. Define Covalent bond. Explain the formation of covalent bond in Oxygen and Nitrogen molecules. **(CO1)**

4. Define mole. Calculate the number of moles present in 50 gm of $CaCO_3$ and 9.8 gm of H_2SO_4. **(CO1)**

5. Define P^H. Calculate the P^H of 0.001M HCl and 0.01M NaOH solution. **(CO1)**

PART – B **3x8M = 24M**

Answer either (A) or (B) from each questions from Part-B. Each question carries 8 marks.

6. A) Explain Postulations of Bhor's atomic theory. Give its limitations. **(CO1)**

   (OR)

   B) Explain the significance of Quantum numbers. **(CO1)**

7. A) Express molarity normality with mathematical equation. Calculate the molarity and normality of 10gm of NaOH present in 500 ml solution. **(CO1)**

   (OR)

   B) Classify solutions based the physical state of solute and solvent and give an example each. **(CO1)**

8. A) What is buffer solution? Classify with examples and give it`s applications. **(CO1)**

   (OR)

   B) Explain Bronsted-Lowry theory of acids and bases. Give its limitations. **(CO1)**

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UNIT TEST –II

Model Question Paper (C-20)

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (CHPP-104)

TIME: 90 minutes **Total Marks:40Marks**

PART-A

16 Marks

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and each of rest carries 3 marks.
(3) Answers for Q.No. 2 to 5 should be brief and straight to the point and shall not exceed five simple sentences.

1. a) Bauxite is the ore of ..... metal **(CO2)**
   b) What is the unit of electrochemical equivalent? **(CO2)**
   c) $CaSO_4$ is the permanent hardness causing salt. (True or False) **(CO3)**
   d) Write the Chemical formula of rust. **(CO2)**
2. Write any three differences between metallic conduction and electrolytic conduction**.(CO2)**
3. Write the composition and applications of German silver and Nichrome. **(CO1)**
4. Mention any three disadvantages of using hard water in industries. **(CO3)**
5. Define electro chemical equivalent and chemical equivalent. Give the relation between them. **(CO2)**

PART – B **3x8M = 24M**

Answer either (A) or (B) from each questions from Part-B. Each question carries 8 marks.

6. A) What is galvanic cell? Explain construction and working of galvanic cell with neat diagram **(CO2)**
   (OR)
   B) State and explain Faraday`s laws of electrolysis. **(CO2)**
7. A) Explain different types of galvanic cells formed during the corrosion of metals. **(CO2)**
   (OR)
   B) What is hard water? Explain zeolite process of softening of hard water. **(CO3)**
8. A) Explain Froth floatation process. **(CO1)**
   (OR)
   B) Explain Electrolytic refining processing of copper. **(CO1)**

***

UNIT TEST –III

Model Question Paper (C-20)

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (CHPP-104)

TIME: 90 minutes **Total Marks:40**

PART-A **16 Marks**

Instructions: (1) Answer all questions.

(2) First question carries 4 marks and each of rest carries 3 marks.

(3) Answers for Q. No. 2 to 5 should be brief and straight to the point and shallnot exceed five simple sentences.

1. a) The monomer of PVC..... **(CO4)**

   b) Sulphur is the vulcanising agent. (True/False) **(CO4)**

   c) Give an example for secondary pollutant. **(CO5)**

   d) Presence of ozone in stratosphere is a pollutant.(Yes/No) **(CO5)**

2. List any three characteristic properties of vulcanised rubber. **(CO4)**
3. Define primary fuel and secondary fuels give an example each. **(CO4)**
4. Mention the basic chemical composition and applications of vinegar. **(CO4)**
5. Write any three threats to the biodiversity. **(CO5)**

PART – B **3x8M = 24M**

Answer either (A) or (B) from each questions from Part-B. Each question carries 8 marks.

6. A) Explain addition and condensation polymerisation with an example each. **(CO4)**

   (OR)

   B) Give a method of preparation and applications of the following

   i) Buna-Sii) Neoprene **(CO4)**

7. A) What is air pollution? Explain any three causes of air pollution. **(CO5)**

   (OR)

   B) Briefly explain ozone layer depletion and green house effect. **(CO5)**

8. A) What is water pollution? Explain any three controlling methods of water pollution.**(CO5)**

   (OR)

   B) What are thermoplastics and thermo setting plastic? Write any four differences between these two plastics. **(CO4)**

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Model Question Paper (C-20)

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES (CHPP-104)

TIME: 3hrs **Total Marks:80**

PART-A

Instructions: Answer all questions. Each question carries three marks. **3x10=30M**

1. Draw the shapes of s and p orbitals. **(CO1)**
2. Define mole. Find the mole number of 10 g of $CaCO_3$ **(CO1)**
3. Define Buffer solution. Give any two examples. **(CO1)**
4. Define chemical equivalent and electrochemical equivalent. Give their relation. **(CO2)**
5. State name of the salts and their formulae that cause hardness. **(CO3)**
6. Write any three disadvantages of using plastics. **(CO4)**
7. Classify the fuels based on their occurrence. **(CO4)**
8. Mention the basic chemical composition and applications of vinegar. **(CO4)**
9. List out any three threats to biodiversity. **(CO5)**
10. Define pollutant and contaminant. Give an example each. **(CO5)**

PART – B

Each question carries eight marks. **8x5=40M**

11. A) Explain Bhor's atomic theory and give its limitations. **(CO1)**

(OR)

B) Explain ionic bond formation and covalent bond formation with one example each.**(CO1)**

12. A) Calculate the molarity and normality of 250 ml of sodium carbonate solution that contains 10.6 gm of sodium carbonate. **(CO1)**

(OR)

B) Explain Bronsted and Lowry theory of acids and bases. Give its limitations. **(CO1)**

13. A) Explain froth floatation and electrolytic refining of copper with neat diagrams.**(CO1)**

(OR)

B) Explain the construction and working of galvanic cell. **(CO2)**

14. A) Explain Cathode protection methods. **(CO2)**

(OR)

B) Explain ion-exchange of softening of hard water with a neat diagram. **(CO3)**

15. A) Explain addition and condensation polymerisation with an example each. **(CO4)**

(OR)

B) Explain the causes and effects of air pollution. **(CO5)**

PART –C

Question carries ten marks **10x1 =10M**

16. Analyse the products formed at cathode and anode with electrode reactions during the Electrolysis of aqueous NaCl in compare with fused NaCl. **(CO2)**

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Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHPP-105	BASICS OF CHEMICAL AND POLYMER ENGINEERING	5	150	20	80

S.No.	Chapter/unit title	No of Periods	CO's mapped
1.	Fluid Mechanics	20	CO1, CO2, CO3, CO4, CO5
2.	Heat transfer	20	CO1, CO2, CO3, CO4, CO5
3.	Chemical process calculations	20	CO1, CO2, CO3, CO4, CO5
4.	Mass transfer	30	CO1, CO2, CO3, CO4, CO5
5.	Energy technology and industrial safety	30	CO1, CO2, CO3, CO4, CO5
6.	Polymerization engineering and technology	30	CO1, CO3, CO4, CO5
Total		**150**	

Course objectives:

1. To familiarize with basic chemical engineering concepts, laws and equipments in fluid mechanics, heat transfer, mass transfer and process calculations.
2. To know the applications of conventional and non conventional energies. And to know the safety aspects in chemical industries.
3. To understand the advantages and disadvantages of polymer products.

Course outcomes	CHPP-105.1	**CO1**	Define important concepts in chemical and polymer engineering.
	CHPP-105.2	**CO2**	Explain the laws involved in fluid mechanics, heat transfer, mass transfer operations.
	CHPP-105.3	**CO3**	Differentiate between different operations in chemical engineering with examples.
	CHPP-105.4	**CO4**	Classify fluids, pumps, mass transfer operations, forms of energies, heat exchangers and refractories.
	CHPP-105.5	**CO5**	Applications of polymers, advanced polymers.
	CHPP-105.6	**CO6**	Rein forcement of plastics

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-105.1	3	2	1		1	1		3		1
CHPP-105.2	2	1	2	3	2		1	2	3	1
CHPP-105.3	3	2	1	2	1		1	3	2	
CHPP-105.4	2	3	2	2	2	1		3	2	1
CHPP-105.5	3	2	1	2	1		1	1		3

CHPP-105.6	2	1	2	1	3	1		1		3
Average	**2.5**	**1.8**	**1.5**	**1.7**	**1.7**	**0.5**	**0.5**	**2.2**	**1.2**	**1.5**

Course code CHPP-105	**Course Title: Basics of Chemical and Polymer engineering No of Course outcomes :05**				**No of periods: 150**
POs	**Mapped with CO No**	**CO periods addressing PO in Column 1**		**Level (1, 2, 3)**	**Remarks**
		NO	**%**		
PO1	CO1, CO2, CO3, CO4, CO5	150	57	3	>40%- level 3 25%-40% level 2 5-25% : level 1 <5%: not addressed
PO2	CO1, CO2, CO3,	90	35	2	
PO3	CO5	20	8	1	

1.0 Fluid mechanics

1.1 Explain the importance of Chemical Engineering
1.2 Explain Know Types of Unit Operations
1.3 Explain the importance of flow of fluids
1.4 Define fluid and types of fluids
1.5 Explain the important physical properties of fluid and give their units.
1.6 List out different types of fluids based on physical properties
1.7 Explain fluid statics and static pressure
1.8 State Newton‘s law of viscosity
1.9 Distinguish Laminar and turbulent flow
1.10 Explain the importance of Reynold‘s number
1.11 Derive continuity equation
1.12 Explain momentum balance
1.13 List different types of valves
1.14 Classify pumps
1.15 Distinguish among Fan, Blower and compressor

2.0 Heat Transfer

2.1 Explain the nature of heat flow.
2.2 Explain various mechanisms of heat flow such as conduction, convection and Radiation.
2.3 Define conduction, convection and Radiation.
2.4 Define steady state and unsteady state heat flow
2.5 Explain the Fourier‘s law of heat flow by conduction
2.6 Define Natural convection and forced convection
2.7 Explain emission of Radiation and emissive power.
2.8 explain about black body
2.9 State the Classification of heat exchangers**.**
2.10 Define the term evaporation
2.11 Explain different types of evaporators

3.0 CHEMICAL PROCESS CALCULATIONS

3.1 Define Fundamental and Derived quantities
3.2 Comprehend Units and Dimensions.
3.3 Define Atom, Molecule, Mole, Gram–atom, Gram–molecule, Gram molar volume, equivalent mass.
3.4 Define density and Specific gravity and also explain the Variation of density and specific gravity with temperature.
3.5 Explain The Concept Of Hydrostatic Head.
3.6 Explain KineticTheory Of Gases.
3.7 Explain GasLaws AndIdeal Gas Equation.
3.8 Explain About Ideal Gas Constant
3.9 Explain About Unit Operation And Unit Process.
3.10 Explain About Degrees Of Freedom.
3.11 Explain about steady state and un-steady state mass balance.
3.12 Explain about Stoichiometry, applications of stoichiometry, stoichiometric equations, stoichiometric coefficients, and stoichiometric proportions. Give suitable examples.
3.13 Explain the terms internal energy and enthalpy.
3.14 Explain the terms sensible heat and latent heat.
3.15 Define Heat capacity and Specific heat.
3.16 Explain Partial and Complete Combustion.
3.17 Define Calorific value.

4.0 Mass Transfer

4.1 Define the mass transfer operation.
4.2 Explain the process of diffusion
4.3 Explain about the process of molecular diffusion with example
4.4 Explain Eddy diffusion.
4.5 Explain the batch, continuous contact operations.
4.6 Explain the co-current, counter- current contact and cross current operations.
4.7 Define distillation.
4.8 Explain absorption with examples.
4.9 Explain about stripping operation with examples
4.10 Explain about extraction and leaching operations
4.11 List different examples of extraction and leaching
4.12 Define adsorption with examples
4.13 Explain about types of adsorption
4.14 Explain about drying operation with examples.
4.15 Define various terms involved in humidification &dehumidification operations
4.16 Determine the humidity of a gas system
4.17 Define crystallization
4.18 Explain the principles of crystallization

5.0 Energy Technology

5.1 Explain the energy demand of industry and domestic.
5.2 List out different forms of energies.
5.3 Classify the different forms of energies
5.4 explain the different sources of energies

5.5 List out different types of primary fuels a)Solid b) liquid c) gaseous
5.6 List out different types of secondary fuels

5.7 Define a) Gross calorific value b) Net calorific value c) octane number d) cetane number e)diesel index f) flash point g) fire point of flues
5.8 Know the following different types of non-conventional energies, their sources and Their applications a) Solar b) Hydraulic c) Wind d) Tidal e) Bio –gas
5.9 Explain the importance of various furnaces in chemical industries
5.10 Classify furnaces
5.11 Explain the importance of refractories in furnaces
5.12 Classify refractories

6.0 Polymerization Engineering & Technology

6.1 Explain the terms of monomer, polymer, micro and macro molecules, give examples to all
- a) monomer
- b) polymer
- c) micro molecule
- d) macro molecule
- e) homomer
- f) co-polymer
- g) plastic
- h) rubber
- i) elastomer

6.2 Explain classification of polymers depending on –
- a) The origin (natural, Semisynthetic, synthetic etc.)
- b) The structure (linear, branched, network, hyperbranched, dendrimer.)
- c) The type of atom in the main chain (homochain, heterochain).
- d) The formation (condensation, addition)
- e) Homopolymers, copolymers.
- f) The behaviour on application of heat and pressure (thermoplastic and Thermosetting).
- g) The form and application (plastics, fiber. elastomers and resin).

6.3 Define Polymerization and degree of polymerization
6.4 List different polymerization processes.
6.5 Define and explain addition polymerization.
6.6 Define and explain condensation polymerization
6.7 Explain the ionic polymerization process.
6.8 Explain the free radical polymerization process.
6.9 Give examples to Domestic polymer products.
6.10 Explain different fields of applications for polymer products.
6.11 Explain the following properties of polymer products
- a) General properties
- b) Physical properties
- c) Mechanical properties
- d) Chemical properties

6.12 explain the advantages and disadvantages of polymer products in different fields.
6.13 list the advanced polymer products.
6.14 list applications of advanced polymer products.
6.15 Understand the future scope of polymerization Engineering & Technology
6.16 Define reinforcement
6.17 Explain the concept of fibre rein forced plastic (F.R.P.)
6.18 Give examples of F.R.P'S.

6.19 List specific properties & applications of F.R.P.

COs -Pos mapping strength

Course code CHPP-105	**Course Title: Basics of Chemical and Polymer engineering No of Course outcomes :05**				**No of periods: 150**
POs	**Mapped with CO No**	**CO periods addressing PO in Column 1**		**Level (1, 2, 3)**	**Remarks**
		NO	**%**		
PO1	CO1, CO2, CO3, CO4, CO5	150	57	3	>40%- level 3 25%-40% level 2 5-25% : level 1 <5%: not addressed
PO2	CO1, CO2, CO3,	90	35	2	
PO3	CO5	20	8	1	

Hyponated course contents:

1. Fluid mechanics

Unit operations-Types of Unit Operations-importance of flow of fluids-types of fluids-physical properties of fluid-types of fluids based on physical properties-fluid statics and static pressure-Newton‘s law of viscosity-Distinguish Laminar and turbulent flow- importance of Reynold‘s number-continuity equation-momentum balance-types of valves-pumps-Fan, Blower and compressor

2. Heat Transfer

Nature of heat flow-mechanisms of heat flow-conduction, convection and Radiation-steady state and unsteady state heat flow-Fourier‘s law of conduction-Natural convection and forced convection-emission of Radiation and emissive power-black body- heat exchangers-evaporation-types of evaporators

3. CHEMICAL PROCESS CALCULATIONS

Fundamental and Derived quantities-Units and Dimensions-Atom, Molecule, Mole, Gram atom, Gram molecule, Gram molar volume, equivalent mass.-density and Specific gravity-Variation of density and specific gravity with temperature-Hydrostatic head-Kinetic theory of gases-Gas laws and Ideal gas equation-Ideal gas constant-Unit operation and Unit Process-Degrees of Freedom-steady state and un-steady state mass balance-Stoichiometry-internal energy and enthalpy-sensible heat and latent heat-Heat capacity and Specific heat-Partial and Complete Combustion-calorific value.

4. Mass Transfer

Mass transfer operation-diffusion-molecular diffusion-eddy diffusion-batch, continuous contact operations-co-current, counter- current contact and cross current operations-distillation-absorption with examples- stripping with examples-extraction and leaching - examples of extraction and leaching-adsorption-types of adsorption-drying -terms involved in humidification

&dehumidification operations- humidity of a gas system-crystallization-principles of crystallization

5. Energy Technology

Energy demand of industry and domestic-forms of energies-sources of energies-primary fuels, Solid liquid , gaseous-secondary fuels-calorific value- Gross calorific value -Net calorific value - octane number - cetane number-diesel index -flash point -fire point-non conventional energies-Solar, Hydraulic, Wind, Tidal Bio gas-furnaces -classify furnaces-importance of refractories in furnaces-classify refractories

6. Polymerization Engineering & Technology

Monomer, polymer, micro and macro molecules, homomer, co-polymer, plastic, rubber, elastomer-classification of polymers-polymerization-degree of polymerization-polymerization processes-addition polymerization-condensation polymerization-ionic polymerization process-free radical polymerization process- examples to Domestic polymer products-fields of applications for polymer products-properties of polymer products-advantages and disadvantages of polymer products-advanced polymer products-applications of advanced polymer products-scope of polymerization Engineering & Technology-reinforcement -fibre reinforced plastic (F.R.P.)-examples of F.R.P'S- properties & applications of F.R.P.

REFERENCE BOOKS :

1. Physical Chemistry by Bahl and Tuli.
2. Organic Chemistry by Ball and Ball.
3. Introduction toChemical Engineering by Ghosal Sanyal Datta..
4. Unit Operations ofChemical Engineering by McCabe & Smith, Harriot.
5. Polymer Science by Gowarikar.
6. Polymer Scince by Billmeyar.
7. Polymer Science by R.D.Sharma.

S.No.	Major Topics	*No of Periods*	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				Cos mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Fluid Mechanics	20	14	3	11			1	2			CO1, CO2, CO3, CO4
2.	Heat transfer	20	11	8	3			1	1			CO1, CO2, CO3, CO4
3.	Chemical process calculations	20	11		3	8			1	1		CO1, CO2, CO3, CO4
4.	Mass transfer	30	14	3	8	3		1	1	1		CO1, CO2, CO5, CO6
5.	Energy technology and industrial safety	30	14	8	3	3		1	1	1		CO1, CO2
6.	Polymerization engineering and technology	30	16	3	3	10		1	1	1		CO1

Total	**150**	**80**									

C-20, CHPP-105

Subject Name: BASICS OF CHEMICAL AND POLYMER ENGINEERING

Syllabus split up for Unit Test

Unit test No.	Learning out comes to be covered
Unit test-I	Objective from 1.1 to 2.11
Unit test-II	Objective from 3.1 to 4.18
Unit test-III	Objective from 5.1 to 6.19

	S.No.	Chapter/unit title
Unit test-I	1.	Fluid Mechanics
	2.	Heat transfer
Unit test-II	3.	Chemical process calculations
	4.	Mass transfer
Unit test-II	5.	Energy technology and industrial safety
	6.	Polymerization engineering and technology

Model paper 1

State Board of Technical Education and Training, A.P

Diploma in Chemical Engineering (PP)

Subject Name: BASICS OF CHEMICAL AND POLYMER ENGINEERING

SUBJECT CODE: CHPP-105

Unit Test-1

Time : 90minutes **Max Marks: 40**

PART-A **16** Marks

Instructions*:* (1)Answer all questions **2X3=6 Marks**

(2) First question carries 4marks and rest of the questions carries 3marks

1)

a) Evaporation is a _____ **CO1**

a. Reynolds number range for laminar flow_____ **CO1**

b. Units for viscosity_____ **CO1**

c. Units for heat transfer constant K_____ **CO1**

2) Define Natural convection and forced convection **CO1**

3) Define steady state and unsteady state heat flow **CO1**

4) Explain fluid statics and static pressure **CO2**

5) Define fluid and types of fluids **CO1**

PART-B **8X3=24 Marks**

Instructions*:* (1) Answer all questions, (2) each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6) Explain Newton's law of viscosity **CO2**

(or)

7) Explain various mechanisms of heat flow such as conduction, convection and Radiation. **CO2**

8) Explain different types of evaporators **CO2**

(or)

9) Explain the Fourier's law of heat flow by conduction **CO2**

10) Distinguish among Fan, Blower and compressor **CO2**

(or)

11) Derive continuity equation **CO2**

***

Model paper 1

State Board of Technical Education and Training, A.P

Diploma in Chemical Engineering (PP)

Subject Name: BASICS OF CHEMICAL AND POLYMER ENGINEERING

SUBJECT CODE: CHPP-105

Unit Test-II

Time : 90minutes **Max Marks: 40**

PART-A **16** Marks

Instructions: (1)Answer all questions **2X3=6 Marks**

(2) First question carries 4marks and rest of the questions carries 3marks

1)

a) Gas Constant R=_____ **CO1**

b) Write the formula for enthalpy____ **CO1**

c) Example for adsorption_____ **CO1**

d) Bound moisture is_____ **CO1**

2) Define Heat capacity and Specific heat **CO1**
3) Explain the terms internal energy and enthalpy. **CO2**
4) Explain the process of diffusion **CO2**
5) Define distillation. **CO1**

PART-B **8X3=24 Marks**

Instructions: (1) Answer all questions, (2) each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6) Explain Gas Laws And Ideal Gas Equation. **CO2**

(or)

7) Explain About Unit Operation And Unit Process. **CO2**

8) Explain Kinetic Theory Of Gases. **CO2**

(or)

9) Explain About Unit Operation And Unit Process. **CO2**

10) Explain absorption with examples. **CO2**

(or)

11) Explain the principles of crystallization **CO2**

***

Model paper 1
State Board of Technical Education and Training, A.P
Diploma in Chemical Engineering (PP)
Subject Name: BASICS OF CHEMICAL AND POLYMER ENGINEERING
SUBJECT CODE: CHPP-105
Unit Test-III

Time : 90minutes **Max Marks: 40**

PART-A **16** Marks

Instructions: (1)Answer all questions **2X3=6 Marks**
(2) First question carries 4marks and rest of the questions carries 3marks

1)

a) solar energy is a_____ **CO1**
b) Coal energy is a_____ **CO1**

c) Write one example for natural polymer_____ **CO1**

d) SBR is a homopolymer (Yes/No) **CO1**

2) List out different forms of energies. **CO2**

3) Classify the furnaces **CO2**

4) Define Polymerization and degree of polymerization **CO2**

5) Define reinforcement **CO2**

PART-B **8X3=24 Marks**

Instructions: (1) Answer all questions (2) each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6) Explain the concept of fibre rein forced plastic **CO2**

(or)

7) List specific properties & applications of F.R.P. **CO2**

8) Explain the ionic polymerization process. **CO2**

(or)

9) Explain the free radical polymerization process. **CO2**

10) Explain the importance of various furnaces in chemical industries **CO2**

(or)

11) Explain about different types of non conventional energies, their sources and their applications **CO2**

***

End Exam Model question paper with COs mapped :

C-20-CHPP-105
BOARD DIPLOMA EXAMINATION
DCHE (P&P) – I YEAR
BASICS OF CHEMICAL AND POLYMER ENGINEERING
SUBJECT CODE: CHPP-105

Time : 3 hours **Total Marks: 80**

PART-A **10X3=30**

Instructions :1. Answer all questions. Each question carries three marks
2. Answers should be brief and straight to the point and shall not exceed five simple sentences

1. Give the differences between unit operation and unit process **(CO2)**
2. Define (a) Recycle (b) Bypass **(CO2)**
3. Give Haigen-Poiseuille equation **(CO2)**
4. Define conduction and give Fourier's law of heat conduction **(CO1)**

5. List the various mass transfer operations **(CO5)**
6. Define P^H and mention its significance **(CO1)**
7. Define specific gravity and list the various specific gravity scales **(CO2)**
8. Mention the various Non- Renewable energy sources **(CO1)**
9. Explain about addition polymerization **(CO7)**
10. Define degree of polymerization **(CO1)**

PART-B

Instruction : 8 marks for each question from Q.No 11 to 15 5x8 = 40 Marks

11. (a) Define solution and list the various concentration methods of solutions **(CO1)**

(OR)

(b) Explain the hardness of water **(CO1)**

12. (a) Mention the significance of (a) Equation of continuity (b) Bernoulli's Equation **(CO2)**

(OR)

(b) Explain the classification of pumps **(CO2)**

13. (a) Define black body and give the laws of black body radiation **(CO1)**

(OR)

(b) List the various types of heat exchangers **(CO5)**

14 . (a) Draw a neat sketch of continuous distillation column and label the parts **(CO3)**

(OR)

(b) Explain about drying and list the various drying equipment **(CO1)**

15. (a) Explain the free radical polymerization process **(CO2)**

(OR)

(b) List specific properties & applications of F.R.P. **(CO1)**

PART-C

QNO 16 is compulsory 1x10 = 10 Marks

16. Mention the significance of establishing chemical industries in small scale, medium scale and large scale **(CO7)**

***

C20_Materials Technology_CHPP 106

Course code	Course title	No. of periods/week	Total no of periods	Marks of FA	Marks for SA
CHPP - 106	Materials Technology	03	90	20	80

S.No	Chapter / unit title	No. of periods	CO's Mapped
1.	Introduction	03	CO1
2.	Mechanical Properties of metals and testing of materials	12	CO1,CO3
3.	Structure of metals and alloys	08	CO1
4.	Thermal equilibrium diagram	10	CO2
5.	Production of Iron and Steel	13	CO1, CO3, CO4, CO5

6.	Plain Carbon and Alloy Steels	06	CO1, CO4,CO5
7.	Non ferrous metals and alloys	09	CO1,CO4
8.	Miscellaneous materials	15	CO1,CO4, CO5
9.	Corrosion	14	CO1,CO3
	TOTAL	**90**	

COURSE OBJECTIVES

COURSE OBJECTIVES	i. Definition and classification of engineering materials and their applications, mechanical properties and testing of materials, structure of metals and alloys. ii. Thermal equilibrium diagram, cooling and allotropic forms of pure iron, manufacturing methods of iron and steel, classification composition of properties of and applications of plain carbon and alloys steel. iii. Composition properties, and applications of non-ferrous and metals and alloys applications and miscellaneous materials, types of corrosion , prevention methods of corrosion

Course outcomes:

CO NO		**Course Outcomes**
CO1	CHPP-106.1	Describe the basics, definitions, structure, phenomenon of various concepts related to Engineering materials.
CO2	CHPP -106.2	Illustrate the concepts related to Thermal Equilibrium diagrams.
CO3	CHPP -106.3	Explain about the construction and working of various testing machines to test the properties, Corrosion prevention methods, manufacturing methods of various Engineering materials with the aid of block diagrams, flow diagrams and neat sketches.
CO4	CHPP -106.4	Analyse the properties of various Engineering materials.
CO5	CHPP -106.5	Appraise the applications of various Engineering materials.

CO-PO/PSO MATRIX

CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CHPP -106.1	3							1	3	1
CHPP -106.2		2							3	
CHPP -106.3			3						3	1
CHPP -106.4				2					3	
CHPP -106.5			2							1
AVERAGE	**3**	**2**	**3**	**2**				**1**	**3**	**1**

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Learning outcome
CHAPTER – 1

a. Definition of Engineering Material.
b. Classification of Engineering Materials
c. Need of Engineering Materials and their applications.

CHAPTER – 2

2.1 Define the following properties
   a. Strength of a material
   b. Ultimate Strength
   c. Stress
   d. Strain
   e. Elasticity
   f. Tensile and compressive strength
   g. Ductility
   h. Hardness
   i. Toughness
   j. Brittleness
   k. Impact strength
   l. Fatigue and creep strength.

2.2 Distinguish between destructive and non-destructive methods of testing to identify various defects of materials and their applications..

2.3 Explain tensile strength and Compressive strength‘s by universal testing machine

2.4 Describe the hardness by Brinell hardness testing and Rockwell hardness testing machines.

2.5 Illustrate the determination of impact strength by Izod and Charpy‘s testing machines.

2.6 Summarize the procedures to detect the internal defects of a metal by radiography and ultrasonic tests.

CHAPTER -3

3.1 Quote Unit cell and space lattice.

3.2 Describe the arrangements of atoms in FCC (Face Centered Cubic), BCC (Body Centered Cubic) and HCP (Hexagonally close packed) systems and give examples.

3.3 State the effect of grain size on mechanical properties.

3.4 Identify the factors promoting grain size.

3.5 Explain the phenomenon of crystallization.

CHAPTER – 4

4.1 Explain Cooling curve and Allotropic forms of pure iron.

4.2 Draw Iron – Carbon thermal equilibrium diagram.

4.3 Locate the peritectic, eutectic, eutectoid points from the iron – carbon diagram.

CHAPTER – 5

5.1 List the various raw materials required for the production of iron.

5.2 Describe the block diagram of various manufacture methods of steel and iron.

5.3 Explain the production of Pig iron by Blast Furnace.

5.4 Explain the production of Cast iron by Cupola Furnace.

5.5 Explain the manufacturing methods of steel.

5.6 List different types of cast iron.

5.7 Mention the properties of cast Iron

5.8 Mention applications of cast-iron.

CHAPTER – 6

6.1 List the classification of plain carbon steels.

6.2 Describe the need for alloying the steel with other elements.

6.3 List the composition of alloy steels.
6.4 Mention the properties of alloy steels.
6.5 Mention the industrial applications of alloy steels.
6.6 Select the proper alloy steel for the given engineering application.

CHAPTER - 7

7.1 Explain the importance of various non – ferrous metals and alloys – aluminium,copper, Nickel, lead, Tin, Zinc, titanium, Zirconium.
7.2 List the properties of aluminium, copper, zinc, tin, lead, and their applications.
7.3 Explain the effects of the alloying elements (a) Copper (b) Silica (c) Magnesium (d) Manganese with aluminium.
7.4 List the types of copper alloys (Brasses & Bronzes).
7.5 Mention the properties of copper alloys (Brasses & Bronzes).
7.6 Mention the applications of copper alloys (Brasses & Bronzes).
7.7 List the types of Nickel alloys (Monel, Hastalloy).
7.8 Mention the properties of Nickel alloys (Monel, Hastalloy).
7.9 Mention the applications of Nickel alloys (Monel, Hastalloy).

CHAPTER – 8

8.1 Explain the Importance and types of Glass.
8.2 Mention the applications of Glass.
8.3 Describe the importance of glass and its lining as materials of construction for the process equipment.
8.4 List the properties of carbon and graphite.
8.5 List the applications of carbon and graphite.
8.6 Explain the composition of stoneware.
8.7 Mention the properties of stoneware.
8.8 Mention the applications of stoneware.
8.9 List the application of asbestos, Rubber, Elastomers.
8.10 List the application of polymers.
8.11 Define refractories.
8.12 State the applications of refractories.
8.13 List the applications of Glass ceramics, Ceramites and Glass wool.

CHAPTER – 9

9.1 Define corrosion and explain the causes of corrosion.
9.2 Explain electro chemical theory of corrosion.
9.3 Describe (a) electrode potential (b) passivity (c) electro chemical series (d)polarization.
9.4 Explain briefly about (a) uniform corrosion (b) stress corrosion (c) pitting (d) hydrogen attack(e) Bimetallic corrosion (f) grain boundary corrosion (g) Fatigue corrosion
9.5 Explain briefly about the methods of prevention corrosion by a) proper selection of materials (b) organic coatings (c) inorganic coatings (d) Anodic and cathodic protection (e) Anodic and cathodic inhibitors.

REFERENCE BOOKS:

1. Engineering Chemistry by Jain & Jain, Dhanapat Rai Publications, New Delhi.
2. Engineering Metallurgy by D. Swarup
3. Engineering Metallurgy by Higgins.
4. Corrosion Engineering by Fontane McGraw Hill.
5. Engineering Metallurgy by S.P.Naik.

6. Engineering Metallurgy by D. Swarup.
7. Material Science by HazraChowdhery.
8. An introduction to Science of corrosion and inhibition by S.N.Benerjee.
9. Elements of Fuels, furnaces and refractories by O.P.Gupta
10. Engineering Materials by Pakirappa.
11. Materials Science and EngineeringbyRaghavan V
12. Engineering Materials by R K Rajput

COURSE CODE : CHPP-106	**CourseTitle : Materials Technology Number of course Outcomes: 06**				**No of periods 90**
POs	**Pos Mapped with CO No.**	**CO periods addressing PO in column 1**		**Level (1,2,3)**	**REMARKS**
		NO	**%**		
PO1	CO1	40	44	3	>40% level3 Highly addressed 25% level2 Moderately addressed 5 to 25% level1 Low addressed <5% not addressed
PO2	CO2	5	6	1	
PO3	CO3,CO5	33	36	2	
PO4	CO4	12	14	1	
PO5					
PO6					
PO7					

Blue Print:

S.NO	**Chapter/ unit title**	**No. of periods**	**Weight age Allocated**	**Marks Wise Distribution of Weight age**				**Question Wise Distribution of Weight age**				**Cos Mapped**
				R	**U**	**AP**	**An**	**R**	**U**	**AP**	**An**	
1	Introduction	03	03	3	-	-	-	1	-	-	-	CO1
2	Mechanical properties of metals and testing of materials	12	21	3	-	8	10	1	-	1	1	CO1,CO3
3	Structure of metals and alloys	08	03	3	-	-	-	1	-	-	-	CO1

4	Thermal equilibrium diagram	10	08	-	-	8	-	-	-	1	-	CO2
5	Production of iron and steel	13	11	3	-	8	-	1	-	1	-	CO1, CO3, CO4, CO5
6	Plan carbon and alloy steels	06	06	3	3	-	-	1	1	-	-	CO1, CO4,CO5
7	Non - ferrous metals and alloys	09	11	3	-	8	-	1	-	1	-	CO1,CO4
8	Miscellaneous materials	15	06	3	3	-	-	1	1	-	-	CO1,CO4, CO5
9	Corrosion	14	11	3	-	8	-	1	-	1	-	CO1,CO3
	TOTAL	**90**	**80**									

C-20, CHPP-106
Subject Name: Materials Technology
I Year
Syllabus split up for Unit Test

Unit test No.	Learning out comes to be covered
Unit test-I	Objectives from 1.1 to 4.4
Unit test-II	Objective from 5.1 to 7.5
Unit test-III	Objective from 8.1 to 9.5

C-20, CHPP-106

Model Paper-1)
State Board of technical Education and Training, A.P
Diploma in Chemical Engineering (PP/PC/OT)
I YEAR
Subject Name: MATERIALS TECHNOLOGY
Subject Code: CHPP/CHPC/CHOT - 106

Time: 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

Instructions: (1) Answer all questions.
(2) First question carries four marks; each question of remaining carries three marks

1. Define the following properties.
   a) Iron is more elastic than rubber(true/false) ` **(CO1)**
   b) Abbreviation of UTM is ---------- **(CO1)**

c) Which of the following is more brittle? a)iron , b) rubber , c) stone ware……. **(CO1)**

d) Name of the test used to determine the Impact strength is ---------- **(CO3)**

2. Define engineering materials and classify them. **(CO1)**
3. Distinguish between destructive and non-destructive tests. **(CO3)**
4. State the effect of grain size on mechanical properties. **(CO1)**
5. Write the peritectic and eutectic reaction. **(CO2)**

Part-B **3X8=24**

Instructions: (1) Answer all questions.

(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6 a) Explain the hardness of a material by Brinell hardness testing machine with a neat sketch. **(CO3)**

(or)

b) Write the principle and explain the radiography test with a neat diagram **(CO3)**

7 a) Write about charpy impact and Izod impact testing with the help of diagrams **(CO3)**

(or)

b) Explain ultrasonic test with a neat sketch **CO3)**

8 a) Define unit cell and space lattice draw the structure of BCC and FCC and explain **(CO2)**

(or)

b) With a neat sketch explain the iron carbon equilibrium diagrams and identify the various phases in it. **(CO2)**

MODEL QUESTION PAPER WITH COs MAPPED

PART A: 30 marks 10 questions, 3 marks each NO CHOICE

-60 minutes (6 minutes each)

PART B: 40 marks, 5 questions, 8 marks each, EITHER OR TYPE

-90 minutes (18minutes for each question)

PART C: 10 marks, 1question, 10marks

-30 minutes (higher order question)

Q.no	Questions	Bloom's category	Marks allocated	CO addressed
PART – A (30 marks)				
1.	Define engineering materials	R	3	CO1
2.	Distinguish between destructive non-destructive tests	R	3	CO1
3.	State the effect of grain size on mechanical properties.	R	3	CO1
4.	Write the properties and applications different types of cast iron.	R	3	CO4,CO5
5.	Explain the need for alloying the steel with other elements .	R	3	CO1
6.	List the applications of alloy	U	3	CO5

	steels			
7.	Write the properties of zinc and tin.	R	3	CO4
8.	Write the applications of asbestos.	R	3	CO5
9.	Define refractories and write the applications.	U	3	CO1, CO5
10.	Explain passivity.	R	3	CO1
PART –B (40 marks)				
11.	Explain the Brinell hardness test with a neat sketch (or) Explain the Rockwell hardness testing machines with a neat sketch.	AP	8	CO3
12.	Explain iron carbon equilibrium diagram (or) Explain cooling curves and allotropic forms of pure iron.	AP	8	CO2
13.	Explain the manufacturing method of pig iron by blast furnace (or) Explain the manufacturing method of cast iron by cupola furnace.	AP	8	CO3
14.	Explain the composition properties and applications of brass(or) Explain the composition properties and applications of nickel alloys.	AP	8	CO1, CO4, CO5
15.	Explain electro chemical theory of corrosion (or) Explain preventive methods of corrosion.	AP	8	CO3
PART – C (10 marks)				
16.	Analyse the procedure to detect internal defects of a metal by radiography test	AN	10	CO3

Course code	**Course title**	**No.Of Periods / week**	**Total number of periods**	**Marks for FA**	**Marks for SA**
CHPP–107	Engineering Drawing	6	180	40	60

TIME SCHEDULE

S.No	**Major Topics**	**No. of Drawing plates**	**No. Of Periods**	***Marks to be awarded***	***Short* Answer Questions**	***Essay type* Questions**
1	Importance of	--	01	-	-	-

	Engineering Drawing					
2	Engineering Drawing Instruments	01	05	-	-	-
3	Free hand lettering & Numbering	01	06	05	1	-
4	Dimensioning Practice	01	09	05	1	-
5	Geometrical constructions	03	24	15	1	1
6	Projections of Points, Lines, Planes & Auxiliary Planes	03	21	05	1	
7	Projections of Solids	01	12	10		1
8	Sections of Solids	01	21	10	-	1
9	Orthographic Projections	01	30	10	-	1
10	Isometric Views	01	30	10	-	1
11	Development of surfaces	01	21	10	-	1
Total		**14**	**180**	**80**	**04**	**06**

Course Objectives and Course Outcomes

Course Objectives		Upon completion of the course the student shall able to understand the basic graphic skills and use them in preparation of engineering drawings, their reading and interpretation	
Course Outcomes	**CO1**	CHPP-107.1	Practice the use of engineering drawing instruments
	CO2	CHPP-107.2	Familiarise with the conventions to be followed in engineering drawing as per BIS
	CO3	CHPP-107.3	Construct the i) basic geometrical constructions ii) engineering curves
	CO4	CHPP-107.4	Visualise and draw the orthographic projections of i) Points ii) Lines iii) Regular Planes iv) Regular Solids V) Sections of Regular Solids

	CO5	CHPP-107.5	Visualise and draw the isometric views of machine components
	CO6	CHPP-107.6	Draw the developments of surfaces of regular solids and use them to make the components used in daily life

PO-CO Mapping

Course Code : CHPP-107	**Course Title: ENGINEERING DRAWING** **Number of Course Outcomes: 06**				**No. of Periods: 180**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		
PO1	CO2, CO3, CO4, CO5, CO6	50	42	3	**>40% Level 3 Highly addressed** **25% to 40% Level 2 Moderately Addressed** **5 to 25% Level 1 Low addressed** **<5% Not addressed**
PO2	CO1, CO2, CO3, CO4, CO5, CO6	30	25	2	
PO3	CO1, CO2, CO3, CO4, CO5, CO6	30	25	2	
PO4					
PO5					
PO6					
PO7	CO1, CO2, CO3, CO4, CO5, CO6	10	08	1	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	2				1	2	3	1
CO2	3	2	2				1	2	3	1
CO3	3	2	2				1	2	3	1
CO4	3	2	2				1	2	3	1
CO5	3	2	2				1	2	3	1
CO6	3	2	2				1	2	3	1

3: High, 2: Moderate,1: Low

LEARNING OUTCOMES
Upon completion of the course the student shall able to

1.0 Understand the basic concepts of Engineering Drawing

1.1 State the importance of drawing as an engineering communication medium

1.2 State the necessity of B.I.S. Code of practice for Engineering Drawing.

1.3 Explain the linkages between Engineering drawing and other subjects of Mechanical Engineering

2.0 Use of Engineering Drawing Instruments

2.1 Select the correct instruments to draw the different lines / curves

2.2 Use correct grade of pencil to draw different types of lines and for different purposes

2.3 Select and use appropriate scales for a given application.

2.4 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.

2.5 Prepare Title block as per B.I.S. Specifications.

2.6 Identify the steps to be taken to keep the drawing clean and tidy.

Drawing Plate 1: (Having two exercises)

3.0 Write Free Hand Lettering and Numbers

3.1 Write titles using vertical lettering and numerals of 7mm, 10mm and 14mm height

3.2 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height

3.3 Select suitable sizes of lettering for different layouts and applications

Drawing plate 2: (Having 5 to 6 exercises)

4.0 Understand Dimensioning Practice

4.2 Acquaint with the conventions, notations, rules and methods of dimensioning in engineering drawing as per the B.I.S.

4.5 Dimension a given drawing using standard notations and desired system of dimensioning.

Drawing Plate 3: (Having 08 to10 exercises)

5.0 Apply Principles of Geometric Constructions

5.1 Practice the basic geometric constructions like i) dividing a line into equal parts ii) exterior and interior tangents to the given two circles iii) tangent arcs to two given lines and arcs

5.2 Draw any regular polygon using general method when i) side length is given ii) inscribing circle radius is given iii) describing circle radius is given

5.2 Draw the conics using general and special methods,

5.3 Draw the engineering curves like i) involute ii) cycloid iii) helix

5.4 Identify the applications of the above constructions in engineering practice.

Drawing Plate -4: Having problems up to construction of polygon

Drawing Plate -5: Having problems of construction of conics

Drawing Plate -6: Having problems of construction of involute, cycloid and helix

6.0 Projections of points, lines, planes & auxiliary planes

6.1 Explain the basic principles of the orthographic projections

6.2 Visualise and draw the projection of a point with respect to reference planes (HP&VP)

6.3 Visualise and draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to other plane)

6.4 Visualise and draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)

6.5 Identify the need of Auxiliary views for a given engineering drawing.

6.5 Draw the auxiliary views of a given engineering component

Drawing Plate -7: Having problems up to projection of points and Lines (15 exercises)

Drawing Plate -8: Having problems of projection of planes (6 exercises)

Drawing Plate -9: Having problems on auxiliary planes (Having 4 exercises)

7.0 Draw the Projections of Solids

7.1 Visualise and draw the projections of regular solids like Prisms, Pyramids, Cylinder, Cone...(up to axis of solids parallel to one plane and inclined to other plane)

Drawing plate No.10: Having problems of projection of solids (10 exercises)

8.0 Appreciate the need of Sectional Views

8.1 Identify the need to draw sectional views.

8.4 Differentiate between true shape and apparent shape of section

8.5 Draw sectional views and true sections of regular solids by applying the principles of hatching.

Drawing Plate–11: Having problems of section of solids (6 exercises)

9.0 Apply principles of orthographic projection

9.1 Draw the orthographic views of an object from its pictorial drawing.

9.2 Draw the minimum number of views needed to represent a given object fully.

Drawing Plate 12 : (Having 10 to 12 exercises)

10.0 Prepare pictorial drawings

10.1 identify the need of pictorial drawings.

10.2 Differentiate between isometric scale and true scale.

10.3 Prepare Isometric views from the given orthographic drawings.

Drawing plate 13: (Having 10 to 12 exercises)

11.0 Interpret Development of surfaces of different solids

11.1 State the need for preparing development drawing.

11.2 Draw the development of simple engineering objects and their truncations (cubes, prisms, cylinders, cones, pyramid)

11.3 Prepare development of surface of engineering components like i) funnel ii) 90^0 elbow iii) Tray

Drawing plate No. 14: (Having 05 exercises)

Competencies and Key competencies to be achieved by the student

S.No	Major topic	Key Competency
1.	Importance of Engineering Drawing	• Explain the linkages between Engineering drawing and other subjects of study in Diploma course.
2.	Engineering Drawing Instruments	• Select the correct instruments to draw various entities in different orientation
3.	Free hand lettering & Numbering	• Write titles using sloping and vertical lettering and numerals as per B.I.S (Bureau of Indian standards)
4.	Dimensioning Practice	• Dimension a given drawing using standard notations and desired system of dimensioning

5.	Geometrical construction	• Construct ellipse, parabola, rectangular hyperbola, involute, cycloid and helix from the given data.
6.	Projection of points, Lines, Planes & Solids	• Draw the projections of points, straight lines, planes & solids with respect to reference planes (HP& VP)
7.	Auxiliary views	• Draw the auxiliary views of a given Engineering component • Differentiate between Auxiliary view and apparent view
8.	Sections of Solids	• Differentiate between true shape and apparent shape of section • Apply principles of hatching. • Draw simple sections of regular solids
9.	Orthographic Projection	• Draw the minimum number of views needed to represent a given object fully.
10.	Isometric Views	• Differentiate between isometric scale and true scale. • Draw the isometric views of given objects,.
11.	Development of surfaces	• Prepare development of Surface of regular solids and other components like i) funnel ii) 90^0 elbow iii) Tray

COURSE CONTENTS:

NOTES:

1.B.I.S Specification should invariably be followed in all the topics.

2. A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.

1.0 The importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

2.0 Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils - Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet,

3.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering
Practicing of letters & numbers of given sizes (7mm, 10mm and 14mm)
Advantages of single stroke or simple style of lettering - Use of lettering stencils

4.0 Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description -Location of features, surface finish, fully dimensioned Drawing -Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features “Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

5.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts

Construction of tangent lines: to draw interior and exterior tangents to two circles of given radii and centre distance

Construction of tangent arcs:

i) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).
ii) Tangent arc of given radius touching a circle or an arc and a given line.
iii) Tangent arcs of radius R, touching two given circles internally and externally.

Construction of polygon: construction of any regular polygon by general method for given side length, inscribing circle radius and describing/superscribing circle radius

Conics: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. Applications viz., Projectiles, reflectors, Cooling Towers, P-V Diagram of a Hyperbolic process - Construction of any conic section of given eccentricity by general method - Construction of ellipse by concentric circles

method, Oblong Method and Arcs of circles method - Construction of parabola by rectangle method and Tangent method - Construction of rectangular hyperbola

General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering application, viz., Gear tooth profile, screw threads, springs etc. – their construction

6.0 Projection of points, lines and planes & auxiliary views

Classification of projections, Observer, Object, Projectors, Projection, Reference Planes, Reference Line, Various angles of projections –Differences between first angle and third angle projections

Projections of points in different quadrants

Projections of straight line -

(a) Parallel to both the planes.
(b) Perpendicular to one of the planes.
(c) Inclined to one plane and parallel to other planes

Projections of regular planes

(a) Plane parallel to one of the reference planes
(b) Plane perpendicular to HP and inclined to VP and vice versa.

Auxiliary views

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane - Partial auxiliary view.

7.0 Projections of regular solids

(a) Axis perpendicular to one of the planes
(b) Axis parallel to VP and inclined to HP and vice versa.

8.0 Sections of Solids

Need for drawing sectional views – what is a sectional view - Hatching – Section of regular solids inclined to one plane and parallel to other plane

9.0 Orthographic Projections

Meaning of orthographic projection - Using a viewing box and a model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object - Concept of front view, top view, and side view sketching these views for a number of engg objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe an object fully.

10.0 Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Isometric axes, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and true scale - difference between Isometric view and Isometric projection - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, circular - shapes, non-isometric lines – Drawing the isometric views for the given orthographic projections -Use of box / offset method

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal work-Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other - Development of simple solids like cubes, prisms, cylinders, cones, pyramid and truncation of these solids-Types of development: Parallel line and radial line development -Procedure of drawing development of funnels, 90^0 elbow pipes, Tray.

REFERENCE BOOKS

Engineering Graphics by P I Varghese – (McGraw-hill)

Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)

Engineering Drawing by N.D.Bhatt.

T.S.M. & S.S.M on " Technical Drawing" prepared by T.T.T.I., Madras.

SP-46-1998 – Bureau of Indian Standards.

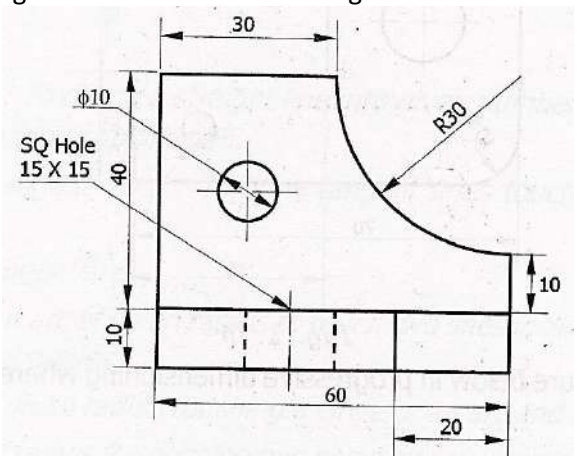
C-20- CHPP-107
BOARD DIPLOMA EXAMINATIONS
MODEL QUESTION PAPER
DCHE(PP) – I-YEAR
ENGINEERING DRAWING

Instructions: **01.** **All the dimensions are in mm**
02. **Use first angle projections only**
03. **Due weightage will be given for the dimensioning and neatness**

PART – A **05 x 04=20**

01. **Answer all the questions**
02. **Each question carries FIVE marks**

01. Write the following in single stroke capital vertical lettering of size 10mm
ORTHOGRAPHIC PROJECTIONS
02. Redraw the given fig. and dimension it according to SP-46:1988.Assume suitable scale



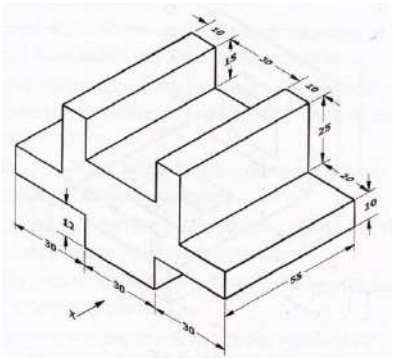
03. Draw internal common tangents to two unequal circles of radii 26mm and 20mm.The distance between the circles is 75mm.
04. Draw the projections of a regular pentagon of side length 40 mm inclined to the H.P. by 30^0 and perpendicular to V.P. using auxiliary plane method

PART – B **10 X 04 = 40**

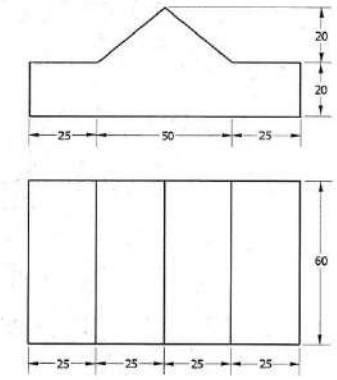
01. **Answer any FOUR of the following questions**
02. **Each question carries TEN marks**

05. Draw the involute of a circle of diameter 30 mm and also draw a tangent to the curve at a distance of 60 mm from the centre of the circle.
06. A right circular cone of height 80 mm and base radius 60 mm is resting in the H.P. on one of its generators and its axis is parallel to V.P. Draw the projections of the solid.
07. A regular hexagonal prism of height 80 mm and base side 40 mm is resting in the H.P. on its base. It is cut by an auxiliary inclined plane of 60^0 inclination passing through the axis at a distance of 30 mm from the top base. Draw the sectional views of the solid and the true section.
08. A pentagonal pyramid of height 80 mm and base side 40 mm is resting in the H.P. on its base such that one of the sides of the base is perpendicular to the V.P. It is cut by a section plane perpendicular to the V.P. and inclined to the H.P. by 60^0 and passing through the axis at a distance of 25 mm from the base. Draw the development of the lateral surface of the truncated pyramid.

09. Draw the front view, top view and left side view of the object shown in the fig.



10. Draw the isometric view of the component whose orthographic projections are given below



Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CH-PP-108	Workshop practice	6	180	40	60

S.No.	Major Topics	No. of periods
1.	Carpentry	24
2.	Fitting and welding	36
3.	Basic machine operations	22
4.	Plumbing	08
TOTAL		**90**

Course title : Workshop Practice		
Course Objectives	(i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant experiments/exercises	
Course Outcomes	C01	Demonstrate the skill of planning and organizing experimental set up for a desired purpose
	C02	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems
	C03	Observe various parameters, their variations and graphically represent the same
	C04	Analyse the experimental results to draw inferences to make recommendations
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

Learning outcome

1.0 Use of different tools in Carpentry, Fitting, Welding and Turning section of workshop.

2.0 Prepare various carpentry joints, panel boards and cabinet boxes.

3.0 Hacksaw cutting, grinding, thread cutting for metal conduit; G.I. Pipes and roads etc, in fitting section.

4.0 Handle welding transformer and make lap and butt joints.

5.0 Exercise on lathe like simple turning, step turning, taper turning and knurling.

6.0 Exercise on thread cutting for pipes and rods on Lathes.

7.0 Hand drilling machines and grinding machine.

8.0 Know the basics of plumbing work and applications.

8.1 Know the types of pipe joints.
Understand the symbols.
Know the materials used pipes.
Assembling, threading, joining of pipes.

Able to understand cross, T, L joints etc.

COURSE CONTENT

Following list of experiments are to be made by every student in the workshop

1. CARPENTRY

1. Exercises on planning, sawing and chiselling
2. Prepare a half lap joint
3. Prepare a Dovetail joint.
4. Prepare a Mortise joint.
5. Prepare a 20 cm X 15 cm Teakwood switch board with hinges and bottom hook.
6. Fix the laminate sheet to the above box and cut suitable holes to mount tone flush type switch, socket.

2. FITTING AND WELDING

1. Exercises to cut a metal conduit, G.I. Pipe and solid rod using hack saw.
2. 3 & 4 Thread cutting of G.I.pipe, metal conduit and solid rod using Die set.

5. & 6. Internal thread cutting using Tap set and cleaning the threads using reamers and make a hexagonal nut from a round rod.

WELDING

1. Prepare a job and to make a lap joint and finish it using grinder.
2. Prepare a job and make a butt joint and finish it with grinder.
3. Prepare the job and make ***'T'*** joint.

3. MACHINE SHOP

Exercise on turning the given rod to get three different diameters using lathe.
Make a bolt and cut threads using lathe.
Cut the threads to G.I. Pipe using lathe.
Prepare a centre punch and knurl its head.
Make a square plate using power hack saw, remove sharp edges using grinder, make triangle and drill three holes of different diameters at the vertices.

4. PLUMBING

Plumbing work and applications

1. Types of pipe joints.
2. Symbols
3. Materials used for pipes
4. Assembling, Threading, Joining of pipes.
5. Different fittings such as cross, L, T etc.,

PHYSICS LAB PRACTICE

(C-20 CURRICULUM COMMON TO ALL BRANCHES)

Subject Code	Subject Title	Periods per week	Total periods per year
AA-109 A	Physics Laboratory	03	45

TIMESCHEDULE

S.No	Name of the Experiment	No.of
1.	Hands on practice on Vernier Callipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination) (**Single lens**	03
7.	Refractive index of solid using traveling microscope	03
8.	Boyle's law verification	03
9.	Meter bridge	03
10.	Mapping of magnet lines of force and locate null points	03
	DEMONSTRATION EXPERIMENTS	
11.	Surface tension of liquid using traveling microscope	03
12.	Coefficient of viscosity by capillary method	03
	Revision	06
	Test	03
	Total	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice with Vernier callipers to determine the volumes and areas of a cylinder and sphere and their comparison etc .

2.0 Practice with Screw gauge to determine thickness of a glass plate, cross sectional area of a wire and volumes of sphere and also their comparison etc

3.0 Verify the parallelogram law and Triangle law

4.0 Determine the value of acceleration due to gravity using Simple Pendulum

5.0 Determine the velocity of sound in air at room temperature and its value at zero degree centigrade.

6.0 Calculate the Focal length and focal power of convex lenses using distant object method , U-V method , U-V graph and 1 / U – 1 / V graph methods and their comparison.

7.0 Determine the refractive index of a solid using travelling microscope.

8.0 Verify the Boyle's law employing a Quill tube.

9.0 Determine the specific resistance of material of a wire using Meter Bridge.

10.0 Drawing magnetic lines of force under N-S and N-N methods and locate null points.

11.0 Determine the surface tension of a liquid using travelling Microscope (**Demo)**

12.0 Determine the viscosity of a liquid using capillary method (**Demo)**

Competencies and Key competencies to be achieved by the student

Name of the Experiment	Competencies	Key competencies
1. Hands on practice on Vernier Callipers(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate the physical quantities of given object	• Read the scales • Calculate the requisite physical quantities of given objects
2. Hands on practice on Screw gauge(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass place and cross section of wire and other quantities	• Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire and other quantities
3. Verification of Parallelogram law of forces and Triangle law of forces(03)	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum(03)	• Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and $l\text{-}T^2$ graph	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and $l\text{-}T^2$ graph

5. Velocity of sound in air –Resonance method (03)	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonating lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonating lengths • Calculate velocity of sound at room temperature • Calculate velocity of sound at 0^0 C
6. Focal length and Focal power of convex lens (Separate & Combination) (03)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses • Draw u-v and 1/u – 1/v graphs	• Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graphs
7. Refractive index of solid using traveling microscope(03)	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab
8. Boyle's law verification (03)	• Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value P x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l
9. Meter bridge(03)	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance

10. Mapping of magnet lines of force(03)	• Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines	• Draw magnetic lines of force • Locate the neutral points along equatorial and
11. Surface tension of liquid using traveling microscope(03)	• Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water	• Read the scale • Calculate height of liquid rise • Calculate the surface tension of water
12.. Coefficient of viscosity by capillary method(03)	• Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method	• Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water

Scheme of Valuation for end Lab Practical Examination :

A.	Writing Aim, Apparatus, Formula, Graph, Precautions carries	10 (Ten) Marks
B.	For Drawing the table, taking Readings, Calculation work, Drawing the graph, finding result carries	15 (Fifteen) Marks
C.	Viva Voice	05 (Five) Marks
	Total	**30 (Thirty) Marks**

- **Course outcomes**

Course Outcomes	CO1	Experiments with Vernier callipers, Screw gauge, Parallelogram law and Triangle law
	CO2	Experiments with Simple pendulum, Resonance apparatus (Velocity of sound in air)
	CO3	Experiments with Convex lens, Refractive index of solid by travelling microscope
	CO4	Experiments with quill tube (Boyles law verification), Meter bridge, Mapping of magnetic lines of force
	CO5	Experiments with Surface tension and Viscosity

- **COs-PO mapping strength (as per given table)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3			1	1	1	1
CO2	3	2	2		1		
CO3	3		2			1	2
CO4	3	2			2		
CO5	3		1	2		1	2

3 = strongly mapped 2= moderately mapped 1= slightly mapped

CHEMISTRY LABORATORY/CHPP-109B
(C-20 curriculum common to all Branches)

Subject Code	Subject Title	Periods per week	Total periods per year
CHPP-109B	Chemistry Laboratory	03	45

CO1	Operate and practice volumetric apparatus and preparation of standard solution
CO2	Evaluate and judge the neutralization point in acid base titration
CO3	Evaluate the end point of reduction and oxidation reaction
CO4	Judge the stable end point of complex formation, stable precipitation
CO5	Judge operate and demonstrate and perform precise operations with instrument for investigation of water pollution parameters

PO CO mapping

Course code CHPP-109B	**Chemistry Laboratory No of Cos;5**			**No Of periods 45**
	Mapped with CO No	**CO periods addressing PO in Col 1 NO %**	**1,2,3**	**remarks**
	CO1,CO2,CO3, CO4,CO5			>40% level 3 (highly addressed) 25% to 40% level2(moderately addressed 5% to 25% level1 (Low addressed < 5%(not addressed)
	CO1,CO2,CO3, CO4,CO5			
	CO1,CO2,CO3, CO4,CO5			
	CO2,CO3, CO4,CO5			

COs-POs mapping strength (as per given table)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	3		1				1		
CO2	2	3		2	2			1		
CO3	2	3		2	2			1		
CO4	2	3		2	2			1		
CO5	2	3		2	2			1		

3=strongly mapped

2= moderately mapped

1= slightly mapped

Note:

The gaps in CO and PO mapping will be achieved by one or more appropriate activities from the following:

i) Seminars ii) Tutorials iii) Guest Lectures iv) Assignments v) Quiz competitions vi) Industrial visit vii) Tech Fest viii) Mini project ix) Group discussions x) Virtual classes xi) Library visit for e-books

TIMESCHEDULE

S.No	Name of the Experiment	No.ofPeriods	Mapped with COs
1.	a) Recognition of chemical substances and solutions used in the laboratory by senses. b) Familiarization of methods for Volumetric analysis	03	CO1
2.	Preparation of Std Na_2CO_3 and making solutions of different	03	CO1
3.	Estimation of HCl solution using Std.Na_2CO_3 solution	03	CO2
4.	Estimation of NaOH using Std.HCl solution	03	CO2
5.	Estimation of H_2SO_4usingStd.NaOH solution	03	CO2
6.	Estimation of Mohr's Salt using Std.$KMnO_4$	03	CO3
7.	Determination of acidity of water sample	03	CO2
8.	Determination of alkalinity of water sample	03	CO2
9.	Determination of total hardness of water using Std. EDTA	03	CO4
10.	Estimation of Chlorides present in water sample	03	CO4
11.	Estimation of Dissolved Oxygen(D.O)in water sample	03	CO5
12.	Determination of pH using pH meter	03	CO5
13.	Determination of conductivity of water and adjusting ionic	03	CO5
14.	Determination of turbidity of water	03	CO5
15.	Estimation of total solids present in water sample	03	CO5
	Total:	**45**	

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc. To identify the chemical compounds and solutions by senses.

2.0 Practice making standard solutions with pre weighed salts and to make solutions of desired dilutions using appropriate techniques.

3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3solutionfor estimation of HCl

4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH

5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4

6.0 Conduct titrations adopting standard procedures and using Std.$KMnO_4$solution for estimation of Mohr's Salt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions
a) To determine conductivity
b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 To determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Familiarization of methods for Volumetric analysis. Recognition of chemical substances And solutions (03)	-	--
Preparation of Std Na_2CO_3 and making solutions of different dilution(03)	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions
Estimation of HCl solution using Std. Na_2CO_3solution (03)	▪ Cleaning the glassware and rinsing with appropriate solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants	▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point
Estimation of NaOH using Std.HCl solution (03)		
Estimation of H_2SO_4 using Std.NaOH solution (03)		

Estimation of Mohr's Salt using Std.$KMnO_4$ (03) Determination of acidity of water sample (03) Determination of alkalinity of water sample (03) Determination of total hardness of water using Std. EDTA solution (03) Estimation of Chlorides present in water sample (03) Estimation of Dissolved Oxygen(D.O) in water sample (By titration method) (03)	▪ Filling the burette with titrant ▪ Fixing the burette to the stand ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results	▪ Making accurate observations
Determination of pH using pH meter (03) Determination of conductivity of water and adjusting ionic strength to required level (03) Determination of turbidity of water (03)	▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions	▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Estimation of total solids present in water sample (03)	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

SCHEME OF VALUATION

A)	Writing Chemicals, apparatus ,principle and procedure	5M
B)	Demonstrated competencies Making standard solutions Measuring accurately the standard solutions and titrants Effectively controlling the flow of the titrant Identifying the end point Making accurate observations	20M
C)	Viva-voce	5M
	Total	**30M**

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA
CHPP-110	Computer Fundamentals Lab	3	90	40	60

Time schedule:

S.No.	Chapter/Unit Title	No. of sessions each of 3 periods duration	No.of Periods
1.	Computer hardware Basics	2	6
2.	Windows Operating System	2	6
3.	MS Word	8	24
4.	MS Excel	7	21
5.	MS PowerPoint	5	15
6.	Adobe Photoshop	6	18
	Total periods	**30**	**90**

S.No.	Chapter/Unit Title	No.of Periods	CO's Mapped
1.	Computer hardware Basics	6	CO1
2.	Windows Operating System	6	CO1
3.	MS Word	24	CO2
4.	MS Excel	21	CO3
5.	MS PowerPoint	15	CO4
6	Adobe Photoshop	18	CO5
	Total periods	**90**	

Course Objectives	i)To know Hardware Basics ii)To familiarize operating systems iii)To use MS Office effectively to enable to students use these skills in future courses iv) To use Adobe Photoshop in image editing.

Course Outcomes	At the end of the course students will be able to		
	CO1	CHPP-110.1	Identify hardware and software components
	CO2	CHPP-110.2	Prepare documents with given specifications using word processing software
	CO3	CHPP-110.3	Use Spread sheet software to make calculation and to draw various graphs / charts.
	CO4	CHPP-110.4	Use Power point software to develop effective presentation for a given theme or topic.
	CO5	CHPP-110.5	Edit digital or scanned images using Photoshop

CO-PO/PSO MATRIX

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-110.1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CHPP-110.2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CHPP-110.3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CHPP-110.4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CHPP-110.5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
Average	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**

3=Strongly mapped , 2=moderately mapped, 1=slightly mapped

Learning Outcomes:

I. Computer Hardware Basics

a).To Familiarize with Computer system and hardware connections

b).To Start and Shut down Computer correctly

c).To check the software details of the computer

2. To check the hardware present in your computer

II. Windows's operating system

3. To Explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
   Home – Insert- Page layout – References – Review- View.
7. To practice Word Processing Basics
8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV.Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To sort and filter data in table.
20. To present data using Excel Graphs and Charts.
21. To develop lab reports of respective discipline.
22. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

23. To familiarize with Ribbon layout features of PowerPoint 2007.
24. To create a simple PowerPoint Presentation
25. To set up a Master Slide in PowerPoint
26. To insert Text and Objects

27. To insert a Flow Charts
28. To insert a Table
29. To insert a Charts/Graphs
30. To insert video and audio
31. To practice Animating text and objects
32. To Review presentation

VI. Practice with Adobe Photoshop

33.To familiarize with standard toolbox
34. To edit a photograph.
35. To insert Borders around photograph.
36. To change Background of a Photograph.
37. To change colours of Photograph.
38. To prepare a cover page for the book in your subject area.
39. To adjust the brightness and contrast of the picture so that it gives an elegant look.
40. To type a word and apply the shadow emboss effects.

Key competencies:

Expt No	Name of Experiment	Competencies	Key competencies
1 (a).	To familiarize with Computer system and hardware connections	a. Identify the parts of a Computer system: i). CPU ii). Mother Board iii) Monitor iv) CD/DVD Drive v) Power Switch vi) Start Button vii) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Key Board	a. Login and logout as per the standard procedure b. Operate mouse &Key Board
1 (c).	To Explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager
2.	To check the software details of the computer	a. Find the details of Operating System being used b. Find the details of Service Pack installed	Access the properties of computer and find the details

3.	To check the hardware present in your computer	a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard drives and partitions e. Use the Taskbar	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required
4.	Working with Files and Folders	a. Create folders and organizing files in different folders b. Use copy / paste move commands to organize files and folders	a. Create files and folders Rename , arrange and search for the required folder/file
	Working with Files and Folders Continued....	c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut to files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin	b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint	a. Use windows accessories and select correct text editor based on the situation. b. Use MS pain to create /Edit pictures and save in the required format.
6.	To familiarize with Ribbon layout of MS word. – Home – Insert- page layout- References- Review-View	a. Create/Open a document b. Use Save and Save as features c. Work on two Word documents simultaneously d. Choose correct Paper size and Printing options	a. Create a Document and name appropriately and save b. Set paper size and print options

7.	To practice Word Processing Basics	a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar	a. Use key board and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers
9.	To insert a table of required number of rows and columns	a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order	a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	a. Create a 2-page document. &Insert hyperlinks and t Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table.	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts

11.	To Use Mail merge feature of MS Word	a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes.	Use Mail merge feature
12.	To use Equations and symbols features.	a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar-Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move Around a Worksheets-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit
15.	To edit spread sheet Copy, Cut, Paste, and selecting cells	a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width	Format the excel sheet
16.	To use built in functions and Formatting Data	a. Perform Mathematical Calculations verify -AutoSum b. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations

18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To sort and filter data in table	a. Sort data in multiple columns b. Sort data in a row c. Sort data using Custom order d. Filter data in work sheet	a. Refine the data in a worksheet and keep it organized b. Narrow a worksheet by selecting specific choice
20.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce c. Excel Column Chart	a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
21.	To develop lab reports of respective discipline	ate Lab reports using MS Word and Excel	a. Insert Practical subject name in Header and page numbers in Footer
22.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percentage symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	a. Format Excel sheet b. Insert headers &footers and print
23.	To familiarize with Ribbon layout &features of PowerPoint 2007.	Use various options in PowerPoint a. Home b. Insert c. Design d. Animation e. Slideshow f. View g. Review	Access required options in the tool bar

24.	To create a simple PowerPoint Presentation	a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide	a. Create simple PowerPoint presentation with photographs/Clip Art and text boxes b. Use bullets option
25.	To Set up a Master Slide in PowerPoint and add notes	a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint g. Add Notes to a PowerPoint Presentation	a. Setup Master slide and format b. Add notes
26.	To Insert Text and Objects	a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects	Insert Text and Objects Use 3d features
27.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
28.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
29.	To insert a Charts/Graphs	a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background	Create charts and Bar graphs, Pie Charts and format.

30.	To Insert audio & video, Hyperlinks in a slide Add narration to the slide	a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files
31.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like Entrance, Emphasis, Motion Paths &Exit	Add animation effects
32.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Hand-out	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show
33	To familiarize with standard toolbox	a. Open Adobe Photoshop b. Use various tools such as i. The Layer Tool ii. The Color& Swatches Tool iii. Custom Fonts & The Text Tool iv. Brush Tool v. The Select Tool vi. The Move Tool vii. The Zoom Tool viii. The Eraser ix. The Crop Tool x. The Fill Tool	Open a photograph and save it in Photoshop
34	To edit a photograph	a. Use the Crop tool b. Trim edges c. Change the shape and size of a photo d. Remove the part of photograph including graphics and text	a. Able to edit image by using corresponding tools.

35	To insert Borders around photograph	a. Start with a single background layer b. Bring the background forward c. Enlarge the canvas d. Create a border color e. Send the border color to the back f. Experiment with different colors	Able to create a border or frame around an image to add visual interest to a photo
36	To change Background of a Photograph	a. open the foreground and background image b. Use different selection tools to paint over the image c. Copy background image and paste it on the foreground. d. Resize and/or drag the background image to reposition. e. In the Layers panel, drag the background layer below the foreground image layer.	Able to swap background elements using the Select and Mask tool and layers.
37	To change colors of Photograph	a. Change colors using: i) Color Replacement tool ii) **Hue/Saturation adjustment layer tool**	Able to control color saturation
38	To prepare a cover page for the book in subject area	a. open a file with height 500 and width 400 for the cover page. b. apply two different colors to work area by dividing it into two parts using Rectangle tool. c. Copy any picture and place it on work area→ resize it using free transform tool. d. Type text and apply color and style e. Apply effects using blended options	Able to prepare cover page for the book
39	To adjust the brightness and contrast of picture to give an elegant look	a. open a file. b. Go to image→ adjustments→ Brightness/Contrast. c. adjust the brightness and contrast. d. Save the image.	Able to control brightness/contrast.

40	To type a word and apply the shadow emboss effects	a. open a file b. Select the text tool and type text. c. Select the typed text go to layer→ layer style→ blended option→ drop shadow, inner shadow, bevel and emboss→ contour→ satin→ gradient overlay d. Save the image.	Able to apply shadow emboss effects

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning outcomes to be covered
Unit test-1	From 1 to 8
Unit test-2	From 9 to 22
Unit test-3	From 23 to 40

I Year Internal Lab Examination

UNIT TEST - I

MODEL QUESTION PAPER

COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE: CHPP-110**

MAX MARKS:40 **Time:90Min**

1. Identify the internal hardware components of a PC and assemble them.
2. Identify the external components or peripherals of a PC and connect them.
3. Identify the components on motherboard.
4. Perform the process of placing processor on CPU slot.
5. Perform the process of removing and placing the RAM in the corresponding slot.
6. Identify the CMOS battery and test whether it is working it or not.
7. Find details of following:

   a) Operating System being used.

   b) Processor name

   c) RAM

   d) Hard disk
8. Create a folder by your name, search a file or folder and find its path.
9. Draw the National Flag using MS Paint.
10. Create a word document that contains TEN names of your classmates (boys-5 & girls-5) and perform the following tasks:

    a) Save the document to your desktop.

    b) Sort the names in each list alphabetically.

    c) Set line spacing to 1.15.

    d) Use bullet points for the names in both lists separately.

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I Year Internal Lab Examination

UNIT TEST - II

MODEL QUESTION PAPER

COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE:CHPP-110**

MAX MARKS:40 **Time:90Min**

1. Write individually addressed letters to your friends about the Republic Day celebration using Mail Merge.
2. Create a Word document about your college and insert page numbers in footer and College Name in header.
3. Create your class time table using Tables in MS Word.
4. Create a 2-page document about your College& insert hyperlinks for courses offered in the college and insert Bookmarks next to College Name.
5. Write individually addressed letters to your friends (at least 5 members) to intimate the External Examination time table using Mail Merge.
6. Write an equation $\frac{(x+y)^2}{(x-y)^2} = \frac{x^2+2xy+y^2}{x^2-2xy+y^2}$ in MS word.
7. Create the organizational structure of your college in MS Word.
8. Create a spreadsheet by totalling marks of 3 or more subjects, then calculate percentage and hence find grade based on boundary conditions of FIVE students: Grades O >= 90%, A >=80%, B >=70%, C >=60%, D >=50%, E >=40%, F <40%
9. Create a Excel spreadsheet for the following data, making sure that the cell marked with Category (A1) is pasted in cell A1 in the spreadsheet and perform the questions below.

Category (A1)	Product Name	Quantity	Inventory	Price per Unit	Total Price
Office Supplies	Binder	2	20	12.99	25.98
Office Supplies	Pencil	20	20	0.99	
Electronics	Samsung 4K Smart TV	1	5	399.00	
Electronics	Bluetooth Speakers	4	5	44.49	
Computers	Lenovo X230 12in Laptop	2	2	279.90	

a) Change the format of the “Total Price” column to “Currency” format.
b) Calculate Total Price by writing formula.
c) Turn on filtering for the table.
d) Sort the table by column “Category” from A to Z.

10. Create a spreadsheet to calculate Cumulative monthly attendance for a period of Three months.

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Year Internal Lab Examination

UNIT TEST - III

MODEL QUESTION PAPER

COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE: CHPP -110**

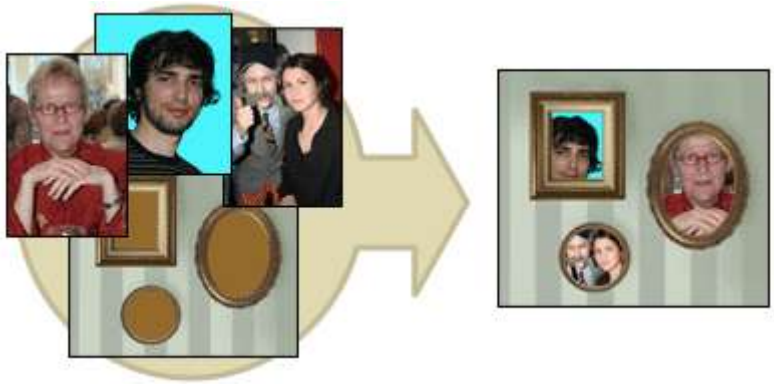
MAX MARKS:40 **Time:90Min**

1. Create a PowerPoint Presentation about your College in 5 slides only.
2. Create a PowerPoint Presentation on Computer Hardware in minimum 5 slides.
3. Create a PowerPoint Presentation on Computer Fundamentals with *Entrance, Emphasis* effects in minimum 5 slides.
4. Create a PowerPoint Presentation on any topic with special animation effects like *Entrance, Motion Paths &Exit.*
5. Resize the image using Photoshop.
6. Change the background of a Photograph.
7. Edit an image by using

   a) Crop tool.

   b) Resize the image

   c) Save the new image with new name keeping original image as it is.
8. A Picture of two parrots (parrots.jpg) is given to you. Make anyone of one of the parrots in Black & White.
9. Convert a color image to monochrome and improve quality of photograph.
10. Copy three pictures and fit into the empty frames.



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BOARD DIPLOMA EXAMINATIONS
DIPLOMA IN COMPUTER ENGINEERING
MODEL PRACTICAL QUESTION PAPER-YEAR END EXAM
COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE:CHPP-110**
MAX MARKS:60 **TIME: 3HOURS**

1. Identify the internal hardware components of a PC and assemble them.
2. Identify the external components or peripherals of a PC and connect them.
3. Write the procedure to create the files and folders
4. Write the procedure to access Calculator, Paint and Notepad application
5. Write the procedure to perform the following in MS Word
   (a) Change the Font Size
   (b) Change the Font Style
   (c) Change the Text Size
6. Write the procedure to perform the following in MS Word
   (a) Change the Font Color.
   (b) Use Various Text Alignment Options.
   (c) Format text in Bold, Italic and Underline.
7. Create the hierarchy of your family in MS Word.
8. Write the procedure to perform the following in MS Word:
   (a) Insert a Table
   (b) Add a Row
   (c) Add a column
   (d) Delete a Row
   (e) Delete a column
9. Write the procedure to use Equation $\frac{(x+y)^2}{(x-y)^2} = \frac{x^2+2xy+y^2}{x^2-2xy+y^2}$ and Symbols.
10. Write the procedure to perform the following in MS Excel
    (a) To Modify Column Width
    (b) To Modify Row Height
    (c) Format text in Bold, Italic, and Underline.
11. Write the procedure to create charts and Graphs in MS Excel.
12. Write the procedure to create simple Power Point Presentation on your college in Three slides.
13. Write the procedure to perform Animation on Text and Objects in your presentation.

14. Take a photographic image. Give a title for the image. Put the border. Write your names. Write the Name of Institution and Place.
15. Prepare a cover page for the book in your subject area. Plan your own design.
16. You are given a picture of a flower and associated background (Extract.jpg).Extract the Flower only from that and organize it on a background. Select your own background for organization.
17. You are given a picture (BrightnessContrast.jpg). Adjust the brightness and contrast of the picture so that it gives an elegant look.
18. You are given a picture (position.jpg). Position the picture preferably on a plain background of a color of your choice - Positioning include rotation and scaling.
19. Remove the arrows and text from the given photographic image(Filename: photo.jpg).
20. Type a word; apply the following effects. Shadow Emboss.

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III SEMESTER

DIPLOMA IN CHEMICAL ENGINEERING (PLASTICS AND POLYMERS)
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
C-20, III SEMESTER

Subject Code	Name of the Subject	Instruction period / week-Mod(non-mod)		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CHPP - 301	Engineering Mathematics - II	4	-	60	3	20	80	100
CHPP -302	Electrical Technology	4	-	60	3	20	80	100
CHPP -303	Organic and Physical Chemistry	5	-	75	3	20	80	100
CHPP -304	Unit Operations-I	6	-	90	3	20	80	100
CHPP -305	Mass and Energy Balance	5	-	75	3	20	80	100
PRACTICAL:								
CHPP -306	CAD Practice in Chemical Engineering	-	3	45	3	40	60	100
CHPP -307	Electrical Technology Lab	-	3	45	3	40	60	100
CHPP -308	Organic and Physical Chemistry Lab	-	6	90	3	40	60	100
CHPP -309	Unit Operations-I Lab	-	6	90	3	40	60	100
TOTAL		**24**	**18**	**630**		**260**	**640**	**900**

CHPP-301 Common to all branches.
CHPP-302, 303, 305, 306, 307, 308 Common to DCHE,DCHE(PC/OT)
CHPP-304, 309 Common to DCHE(PC/OT)

C-20

ENGINEERING MATHEMATICS-II

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
CHPP-301	Engineering Mathematics-II	4	60	20	80

S.No.	Unit Title	No. of periods	COs mapped
1	Indefinite Integration	22	CO1
2	Definite Integration and its applications	24	CO2
3	Differential Equations of first order	14	CO3
	Total Periods	**60**	

Course Objectives	(i) To understand the concepts of indefinite integrals and definite integrals with applications to engineering problems. (ii) To understand the formation of differential equations and learn various methods of solving them.

Course Outcomes	CO1	Integrate various functions using different methods.
	CO2	Evaluate definite integrals with applications.
	CO3	Obtain differential equations and solve differential equations of first order and first degree.

ENGINEERING MATHEMATICS – II

Learning Outcomes

Unit-I

C.O. 1 Integrate various functions using different methods.

L.O. 1.1. Explain the concept of Indefinite integral as an anti-derivative.

1.2. State the indefinite integral of standard functions and properties of Integrals $\int (u + v)\, dx$ and $\int ku\, dx$ where k is constant and u, v are functions of x.

1.3. Solve integration problems involving standard functions using the above rules.

1.4. Evaluate integrals involving simple functions of the following type by the method of substitution.

i) $\int f(ax + b)\, dx$ where $f(x)dx$ is in standard form.

ii) $\int [f(x)]^n f'(x)\, dx$

iii) $\int f'(x)/[f(x)]\, dx$

iv) $\int f\{g(x)\} g'(x)\, dx$

1.5. Find the integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$ using the above.

1.6. Evaluate the integrals of the form $\int \sin^m x \cos^n x\, dx$ where m and n are suitable positive integers.

1.7. Evaluate integrals of suitable powers of $\tan x$ and $\sec x$.

1.8. Evaluate the Standard integrals of the functions of the type

$$i)\frac{1}{a^2+x^2},\frac{1}{a^2-x^2},\frac{1}{x^2-a^2}$$

$$ii)\frac{1}{\sqrt{a^2+x^2}},\frac{1}{\sqrt{a^2-x^2}},\frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\sqrt{x^2-a^2},\sqrt{x^2+a^2},\sqrt{a^2-x^2}$$

1.9. Evaluate the integrals of the type

$$\int\frac{1}{a+bSin\theta}d\theta,\int\frac{1}{a+b\cos\theta}d\theta \text{ and } \int\frac{1}{a\cos\theta+b\sin\theta+c}d\theta\,.$$

1.10. Evaluate integrals using decomposition method.

1.11. Solve problems using integration by parts.

1.12 Use Bernoulli's rule for evaluating the integrals of the form $\int u.vdx$.

1.13. Evaluate the integrals of the form $\int e^x [f(x) + f'(x)]\, dx$.

Unit-II

C.O.2 Evaluate definite integrals with applications.

L.O. 2.1. State the fundamental theorem of integral calculus

2.2. Explain the concept of definite integral.

2.3. Solve problems on definite integrals over an interval using the above concept.

2.4. State various properties of definite integrals.

2.5. Evaluate simple problems on definite integrals using the above properties.

Syllabus for Unit test-I completed

2.6. Explain definite integral as a limit of sum by considering an area.

2.7. Find the areas under plane curves and area enclosed between two curves using integration.

2.8. Obtain the mean value and root mean square value of the functions in any given interval.

2.9. Obtain the volumes of solids of revolution.

2.10. Solve some problems using Trapezoidal rule, Simpson's 1/3 rule for approximation of integrals.

Unit -III

C.O. 3 Form differential equations and solve differential equations of first order and first degree.

L.O. 3.1 Define a Differential equation, its order and degree

3.2 Find order and degree of a given differential equation.

3.3 Form a differential equation by eliminating arbitrary constants.

3.4 Solve the first order and first degree differential equations by variables separable method.

3.5 Solve Homogeneous differential equation of first order and first degree.

3.6 Solve exact differential equation of first order and first degree.

3.7 Solve linear differential equation of the form dy/dx + Py = Q, where P and Q are functions of x or constants.

3.8 Solve Bernoulli's differential equation reducible to linear form.

3.9 Solve simple problems arising in engineering applications.

C-20

Engineering Mathematics – II

CO/PO – Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	2	2				3	1	2
CO2	3	3	3	3				3	3	3
CO3	3	3	3	3				3	3	3
Avg	**3**	**2.6**	**2.6**	**2.6**				**3**	**2.3**	**2.6**

3 = Strongly mapped (High), **2 =** Moderately mapped (Medium), **1 =** Slightly mapped (Low)

PO5: Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

PO7: Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

PSO1: An ability to understand the concepts of basic mathematical techniques and to apply them in various areas like computer programming, civil constructions, fluid dynamics, electrical and electronic systems and all concerned engineering disciplines.

PSO2: An ability to solve the Engineering problems using latest software tools, along with analytical skills to arrive at faster and appropriate solutions.

PSO3: Wisdom of social and environmental awareness along with ethical responsibility to have a successful career as an engineer and to sustain passion and zeal for real world technological applications.

Engineering Mathematics – II

PO- CO – Mapping strength

PO no	Mapped with CO no	CO periods addressing PO in column I		Level (1,2 or 3)	Remarks
		Number	%		
1	CO1, CO2, CO3	60	100%	3	>40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5% to 25% Level 1 Low addressed <5% Not addressed
2	CO1, CO2, CO3	60	100%	3	
3	CO1, CO2, CO3	60	100%	3	
4	CO2, CO3	38	63.3%	3	
5					
6					
7					
PSO 1	CO1, CO2, CO3	60	100%	3	
PSO 2	CO1, CO2, CO3	40	66.6%	3	
PSO 3	CO1, CO2, CO3	48	75%	3	

ENGINEERING MATHEMATICS – II

COURSE CONTENTS

Unit-I

Indefinite Integration.

1. Integration regarded as anti-derivative – Indefinite integrals of standard functions. Properties of indefinite integrals. Integration by substitution or change of variable. Integrals of tan x, cot x, sec x, cosec x. Integrals of the form $\int \sin^m x.\cos^n x\,dx$, where at least one of m and n is odd positive integers. Integrals of suitable powers of tanx. secx and cosecx.cotx by substitution. Evaluation of integrals which are reducible to the following forms:

$$i)\ \frac{1}{a^2+x^2}, \frac{1}{a^2-x^2}, \frac{1}{x^2-a^2}$$

$$ii)\ \frac{1}{\sqrt{a^2+x^2}}, \frac{1}{\sqrt{a^2-x^2}}, \frac{1}{\sqrt{x^2-a^2}}$$

$$iii)\ \sqrt{x^2-a^2}, \sqrt{x^2+a^2}, \sqrt{a^2-x^2}$$

Integration by decomposition of the integrand into simple rational, algebraic functions. Integration by parts, Bernoulli's rule and integrals of the form $\int e^x [f(x) + f'(x)]\,dx$.

Unit-II

Definite Integral and its applications:

2. Definite integral-fundamental theorem of integral calculus, properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Mean and RMS values of a function on a given interval Volumes of solids of revolution. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

Unit -III

Differential Equations:

3. Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solutions of differential equations of first order and first degree using methods, variables separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

Textbook:

Engineering Mathematics-II, a textbook for third semester diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Schaum's Outlines Differential Equations, Richard Bronson & Gabriel B. Costa
3. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

BLUE PRINT

S. No	Chapter/Unit title	No of Periods	Weightage allotted	Marks wise distribution of weightage				Question wise distribution of weightage				COs mapped
				R	U	Ap	An	R	U	Ap	An	
1	Unit – I: Indefinite Integration	22	28	11	11	06	0	2	2	2	0	CO1
2	Unit – II: Definite Integration and its applications	24	33	11	03	11	08	2	1	2	1	CO2
3	Unit – III: Differential Equations of first order	14	19	03	03	03	10	1	1	1	1	CO3
Total		**60**	**80**	**25**	**17**	**20**	**18**	**5**	**4**	**5**	**2**	

R: Remembering Type : 25 Marks
U: understanding Type : 17 Marks
Ap: Application Type : 20 Marks
An: Analysing Type : 18 Marks

Engineering Mathematics – II
Unit Test Syllabus

Unit Test	Syllabus
Unit Test-I	From L.O 1.1 to L.O 2.5
Unit Test-II	From L.O 2.6 to L.O 3.9

UNIT TEST MODEL PAPERS

Unit Test I **C –20, CHPP-301**

State Board of Technical Education and Training, A. P

First Year

Subject name: Engineering Mathematics-II

Sub Code: CHPP-301

Time : 90 minutes **Max.Marks:40**

Part-A **16Marks**

Instructions: **(1) Answer all questions.**
(2) First question carries four marks and the remaining questions carry three marks each.

1. Answer the following.

   Evaluate $\int x^8 dx$ **(CO1)**

   Evaluate $\int \frac{1}{\sqrt{4-x^2}} dx.$ (CO1)

   $\int e^x \left(f(x) + f'(x) \right) dx = e^x f(x) + c$ is true/false **(CO1)**

   a. Evaluate $\int_0^{\frac{\pi}{2}} \cos x dx$ **(CO2)**

2. Evaluate $\int \left(3\cos ec^2 x - 2\tan x \sec x + \frac{1}{x} \right) dx.$ **(CO1)**

3. Evaluate $\int \frac{\sin(\log x)}{x} dx.$ **(CO1)**

4. Evaluate $\int e^x \sin 2x dx.$ **(CO1)**

5. Evaluate $\int_0^{\frac{\pi}{2}} \sin^2 x dx$ **(CO2)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Evaluate $\int \frac{1}{5+4\cos x} dx.$ **(CO1)**

   or

   B) Evaluate $\int \sin^4 x \cos^3 x dx.$ **(CO1)**

7. A) Evaluate $\int \cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)dx.$ **(CO1)**

or

B) Evaluate $\int x^4 e^{2x} dx.$ **(CO1)**

8. A) Evaluate $\int_0^{\frac{\pi}{2}} \cos 4x \cos x dx$ **(CO2)**

or

B) Evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin^{10} x}{\sin^{10} x + \cos^{10} x} dx$ **(CO2)**

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Unit Test II

State Board of Technical Education and Training, A. P

First Year

Subject name: Engineering Mathematics-II

Sub Code: CHPP-301

Time : 90 minutes **Max.Marks:40**

Part-A **16Marks**

Instructions: **(1) Answer all questions.**
(2) First question carries four marks and the remaining questions carry three marks each.

1. Answer the following.

   a. Volume of the curve $y = f(x)$ over the interval $[a,b]$ when rotated about X-axis is _____ **(CO2)**

   b. Mean value of $f(x)$ over the interval $[a,b]$ is_____ **(CO2)**

   c. Order of differential equation $\frac{d^2y}{dx^2} + p^2y = 0$ is_____ **(CO3)**

   d. Integrating factor of $\frac{dy}{dx} + Py = Q$ is_____ **(CO3)**

2. Find the mean value of $x^2 + 2x + 1$ over the interval $[1,2]$ **(CO2)**
3. Find the area enclosed by curve $x^2 = 4y$ between the lines $x = 2$ and $x = 4$ **(CO2)**
4. Form the differential equation by eliminating the arbitrary constants from $y = A\cos 2x + B\sin 2x.$ **(CO3)**
5. Solve $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}.$ **(CO3)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Find the area bounded between the curve $y = x^2 - 5x$ and the line $y = 4 - 2x$ **(CO2)**

   Or

   B) Find the R.M.S value of $\sqrt{\log x}$ between the lines $x = e$ to $x = e^2$ **(CO2)**

7. A) Find the volume of the solid obtained by revolving the ellipse $\frac{x^2}{16}+\frac{y^2}{25}=1$ about x axis **(CO2)**

or

B) Calculate the approximate value of $\int_0^6 \frac{1}{1+x}dx$ by taking $n=6$ using Trapezoidal rule **(CO3)**

8. A) Solve $\left(y^2-2xy\right)dx+\left(2xy+x^2\right)dy=0.$ **(CO3)**

or

B) Solve $x\frac{dy}{dx}+\frac{y}{x}=x^3y^6.$ **(CO3)**

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END EXAM MODEL PAPERS

STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS-II CHPP-301

TIME : 3 HOURS **MODEL PAPER- I** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. Evaluate $\int\left(2\sin x-3e^{x}+\frac{4}{1+x^{2}}\right)dx.$ **CO1**
2. Evaluate $\int e^{x}\sin e^{x}dx.$ **CO1**
3. Evaluate $\int \sin 3x\cos 2xdx.$ **CO1**
4. Evaluate $\int xe^{x}dx.$ **CO1**
5. Evaluate $\int_{0}^{1}\frac{1}{1+x^{2}}dx.$ **CO2**
6. Find the mean value of $y=x^{2}$ from $x=0$ to $x=1$ **CO2**
7. Find the area of the region bounded by the curve $y=\sin x$ from $x=0$ to $x=\pi$ **CO2**
8. Find the order and degree of the differential equation $\left(\frac{d^{3}y}{dx^{3}}\right)^{2}-3\left(\frac{dy}{dx}\right)^{2}-x^{2}=1$ **CO3**
9. Solve $\frac{dy}{dx}=\frac{1+y^{2}}{1+x^{2}}$ **CO3**
10. Solve $\left(x^{2}+y\right)dx+\left(y^{2}+x\right)dy=0.$ **CO3**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11. A) Evaluate $\int\frac{3x+1}{(x-1)(x+3)}dx.$ **CO1**

    Or

    B) Evaluate $\int\frac{1}{5+4\cos x}dx.$ **CO1**

12. A) Evaluate $\int x\sin 3xcosxdx.$ **CO1**

    Or

    B) Evaluate $\int x^{3}\cos xdx.$ **CO1**

13. A) Evaluate $\int_{0}^{1}\frac{x^{3}}{1+x^{8}}dx.$ **CO2**

    Or

    B) Evaluate $\int_{0}^{\frac{\pi}{2}}\frac{1}{1+\tan^{3}x}dx.$ **CO2**

14. A) Find the area of the region bounded by the curves $y^2 = 4x$ **and** $x^2 = 4y$. **CO2**

Or

B) Find the R.M.S values of $\sqrt{27-4x^2}$ from $x = 0$ to $x = 3$ **CO2**

15. A) Find the volume of the solid generated by revolution of the ellipse $\frac{x^2}{16} + \frac{y^2}{25} = 1$ about X-axis **CO2**

Or

B) Calculate the approximate value of $\int_1^{11} x^3 dx$ by using Simpson's 1/3rd rule by dividing the range into 10 equal parts. **CO2**

PART-C

Answer the following question. Question carries TEN marks. **1x10=10M**

16. Solve $2\sin x \frac{dy}{dx} - y\cos x = xy^3 e^x$. **CO3**

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STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS-II CHPP- 301

TIME : 3 HOURS **MODEL PAPER-II** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. Evaluate $\int\left(3e^{x}-2\cos x+\frac{3}{x}\right)dx.$ **CO1**
2. Evaluate $\int\cos^{2}2xdx.$ **CO1**
3. Evaluate $\int\frac{\tan^{-1}x}{1+x^{2}}dx.$ **CO1**
4. Evaluate $\int x\cos xdx.$ **CO1**
5. Evaluate $\int_{0}^{2}\frac{1}{\sqrt{4-x^{2}}}dx.$ **CO2**
6. Find the mean value of $i=a\sin t$ over the complete wave. **CO2**
7. Find the volume generated by revolving the circle $x^{2}+y^{2}=9$ from $x=0$ to $x=2$ about x-axis. **CO2**
8. Obtain the differential equation by eliminating the arbitrary constants A and B from the curve $y=Ae^{x}+Be^{-x}$ **CO3**
9. Solve $\frac{dy}{dx}=e^{2x+y}$ **CO3**
10. Solve $\frac{dy}{dx}+\frac{y}{x}=x$ **CO3**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11. A) Evaluate $\int\frac{1}{2x^{2}+3x+5}dx.$ **CO1**

    Or

    B) Evaluate $\int\sin^{3}x\cos^{5}xdx.$ **CO1**

12. A) Evaluate $\int e^{x}\left(\frac{2+\sin 2x}{1+\cos 2x}\right)dx.$ **CO1**

    Or

    B) Evaluate $\int e^{2x}x^{4}dx.$ **CO1**

13. A) Evaluate $\int_{0}^{1}\frac{\sec^{2}x}{(1+\tan x)^{2}}dx.$ **CO2**

    Or

    B) Evaluate $\int_{0}^{\frac{\pi}{2}}\log(1+\tan\theta)d\theta.$ **CO2**

14. A) Find the area bounded between the curves $y=x^{2}$ and the line $y=3x+4$. **CO3**

    Or

    B) Find the R.M.S value of $\sqrt{\log x}$ between the lines $x=e$ to $x=e^{2}$ **CO2**

15. A) Find the volume of right circular cone using integration. **CO2**

Or

B) Find the approximate value of π from $\int_0^1 \frac{1}{1+x^2}dx$ using Trapezoidal rule by dividing $[0,1]$ into 5 equal sub-intervals. **CO2**

PART-C

Answer the following question. Question carries TEN marks. 1x10=10M

16. Solve $xy^2dy-\left(x^3+y^3\right)dx=0$ **CO3**

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Electrical Technology common with DCHE/DCHEPC/DCHEPP/DCHEOT/DPET

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CHPP-302	**Electrical Technology**	**4**	**60**	**20**	**80**

S.No.	Chapter/unit title	No. of periods	CO's Mapped
1.	D.C & A.C Circuits	15	**CO1**
2.	Electromagnetism and Electromagnetic Induction	10	**CO2**
3.	D.C & A.C Machines	20	**CO2**
4.	Electrical Measuring Instrument	05	**CO3**
5.	Understand the different equipments& safety procedures used in industry.	05	**CO4**
6.	Electronic Devices	05	**CO5**
Total periods		**60**	

Course objectives

Course objectives	(i) To know DC and AC circuits, electromagnetism and electromagnetic induction (ii) To understand classification, application, construction and working principles of AC and DC machines **(iii)** To understand different components, safety precautions in industries and working of electronic devices

Course Outcomes

Course Outcomes	**CO1**	Illustrate with example various terminology of electrical circuits and calculate different types of power quantities
	CO2	Analyse the principles of operations required for working of DC and AC machines
	CO3	Recognize different types of measuring instruments.
	CO4	Describe different methods and applications of heating, welding and safety procedures and devices.
	CO5	Explain about semiconductors and various semiconductor devices

Learning Outcome

Chapter-1

1.1 Understand the concepts of Current, Electric potential, potential difference, Resistance, Conductance, Specific resistance and conductivity.
1.2 Laws of resistance & Statement of Ohms Law.
1.3 Calculation of current, Voltage and Resistance in a given dc circuit.
1.4 Calculation of equivalent resistance in a – Series Circuit, parallel Circuit.
1.5 Simple problems on Series, Parallel Circuits.
1.6 State and explain Kirchhoff's of Laws.
1.7 Define the following terms related to alternating quantities.

i) Alternating quantity, ii) wave form iii) Cycle iv) Time period v) frequency vi) instantaneous value vii) RMS value viii) average value ix)form factor x) peak factor.

1.8 Express instantaneous value , RMS value and average value in terms of maximum value.

1.9 Explain phase and phase difference between two alternating quantities.

1.10 State leading and lagging vector quantities.

1.11 State phase relationships between voltage and current in (a) R (b) L (c) C (d) R – L – C in series.

1.12 Define Power factor .

1.13 State equation for i) Active power ii) reactive power iii) apparent power in single phase AC circuits.

1.14 Explain Star and Delta connections in 3 - Φ circuits.

1.15 State phase and line voltages and currents and their relationship in Star and Delta connections.

1.16 State expression for i) Active power ii) reactive power iii) apparent power in 3- phase AC circuits.

1.17 Simple problems on the above.

Chapter-2

2.1 Explain the terms – permeability, magnetic field strength, flux and Flux density – Relation between permeability, flux density and magnetic field strength.

2.2 Express the field strength due to i) straight current carrying conductor ii) on the axis of a solenoid.

2.3 State the following terms related to electromagnetic induction

i. Faraday's laws of electromagnetic induction
ii. Fleming's Left Hand Rule
iii. Statically Induced emf
iv. Dynamically Induced emf
v. Self inducedemf
vi. Mutually Induced emf
vii. Lenz's Law.

2.4 Give the expression for self inductance, Mutual Inductance and Coefficient of coupling. (No derivation).

2.5 Simple problems on above.

Chapter-3

3.1 List the parts and function of each part of the D.C. Machine.

3.2 Classify the D.C. Machines as D.C. Generators and D.C. Motors – State their working principle.

3.3 State generated emf equation. (No derivation).

3.4 State and explain Back emf. (No derivation).

3.5 State torque equation. (No derivation).

3.6 Solve simple problems on above.

3.7 Explain the necessity of starter and explain 3 point starter with neat diagram.

3.8 Explain speed control of D.C. Shunt motor by armature control and (b) Field control methods.

3.9 State the applications of D.C. Generators and D.C. Motors

3.10 Explain the principle of working of a transformer.

3.11 Classify the types of transformers basing on construction of the transformers. (Core type and shell type).

3.12 State emf equation of a transformer. Solve simple problems. (No derivation).

3.13 State step – up and step – down transformers.

3.14 Explain Auto transformers.

3.15 Classify the three phase induction motors and single phase Induction motors – state the application of each motor.
3.16 Explain the construction and working principles of 3 – phase Induction Motors
3.17 Explain the construction and working principles of 1 – phase Induction Motors
3.18 Explain the necessity of starter in 3-phase induction motor
3.19 Explain i) DOL starter ii) Star Delta Starter with neat diagrams.
3.20 State the applications of 1 phase and 3-phase induction motors.

Chapter-4

4.1 Explain the construction and working of moving iron and moving coil instruments.
4.2 State uses of (a) Megger (b) Multi meter and (c) Energy Meter in electrical circuits.
4.3 Explain Thermocouple instruments for measuring temperatures.

Chapter-5

5.1 Explain the basic principles of electric Heating.
5.2 State applications of electric Heating.
5.3 Explain the basic principles of electric welding.
5.4 Classify the methods of electric welding, state applications of each method.
5.5 Describe the working of DC welding generator with neat diagram.
5.6 Describe the working of welding transformer with neat diagram.
5.7 State the function of the following i) Switch ii) Fuse iii) Circuit breaker iv) Relay v) Capacitor banks.
5.8 State safety precautions to be adopted for prevention of electric shock to persons working on electric equipments or live wires.
5.9 State procedures for first aid to a person came into contact with live wires.

Chapter-6

6.1 Classify the materials like conductors, insulators and semi conductors based on i) Valence electrons ii) Conductivity iii) Energy band diagrams.
6.2 Explain the P- type semiconductor and N – type semiconductor.
6.3 Explain P – N Junction diode.
6.4 State the applications of a P – N Junction diode (as a rectifier).
6.5 Explain the P– N – P and N – P – N transistors and their applications.

Course code CHPP-302	**Course title : Electrical Technology Number of course outcomes:05**				**No. of periods: 60**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		**›40% Level 3 Highly addressed**
PO1	**CO1,CO3,CO6**	**45**	**75**	**3**	
PO2	**CO2,CO5**	**9**	**15**	**1**	
PO3	**CO4**	**6**	**10**	**1**	**25% to 40% Level 2 Moderately addressed**
PO4					
PO5					
PO6					**5 to 25% Level 1 Low addressed**
PO7					**‹5% Not addressed**

COURSE CONTENTS

1. Concepts of Current, Electric potential, potential difference, Resistance, Conductance, Specific resistance and conductivity.Ohm's Law – simple problems on D.C.circuits – Equivalent and resistance- Parallel circuits – Kirchoff's Laws – Problems- Single Phase circuits – Definitions related to alternative quantities - Phase and phase difference – leading and lagging quanties – Phase relationships between voltage and current in R, L, C, R-L in series , R-C in series and R-L-C in series – define power factor – Solve simple A.C.circuits – expression– active power and reactive power- apparent power in single phase circuits- star and delta connections in 3-phase circuits - expression– active power and reactive power- apparent power – simple problems on above.
2. Concepts of different terms related to Electromagnetism – electromagnetic induction – expressions for field strength due to straight current carrying conductor and on the axis of solenoid - Dynamically induced emf – statically induced emf – self and mutually induced emf – self inductance and mutual inductance – Simple Problems.
3. D.C & A.C. Machines – working – construction – types of D.C.generators – types of D.C motors – Generated emf – Back emf – torque – equations – 3 – point starter – speed control – Applications of D.C Generators D.C. Motors- Single – phase– Auto transformers – Construction and working principles of 3-phase and single phase induction motors –DOL starter and Star delta starter Applications - Single – phase and Three – Phase induction motors.
4. Electrical Measuring Instruments – Construction and working of moving iron and moving coil instruments – Megger, Multimeter – Single – Phase energy meter – Thermocouple Instruments.
5. Understand the different equipments& safety procedures used in industry basic principles of electric heating and welding methods – classification of methods of electric heating and welding with their applications- D.C.welding generator- welding transformer – functions of switch, fuse, circuit breaker, Relay , Capacitor banks and Motor control centres- safety precautions to prevent shock – safety procedures for first aid against electric shock.
6. Electronic Devices – Semiconductors – P type and N type semiconductor – P – N Junction diode – PNP transistor and NPN transistors with their applications.

REFERENCES BOOKS:

1. Electrical Technology – By B.L. Theraja (Vol – I and Vol – II)
2. Fundamentals of Electrical Engineering and Electronics – By B.L. Theraja.
3. The Art and Science of utilization of electrical energy - By H. Partab.
4. Electrical Technology – By Huges
5. Electrical Technology – By V.K. Mehta

Model Blue print with weightages for Blooms category and questions for each chapter and COs mapped

S.No	Chapter/unit title	No. of periods	Weightage allocated	Marks wise Distribution of weightage				Question wise Distribution of weightage				CO'sMapped
				R	U	Ap	An	R	U	Ap	An	
1	D.C & A.C Circuits	15	**17**	**3**	**6**	**8**	--	**1**	**2**	**1**	--	**CO1**
2	Electromagnetism and Electromagnetic Induction	10	**11**	--	**3**	**8**	--	--	**1**	**1**	--	**CO2**
3	D.C & A.C Machines	20	**24**	**3**	**3**	**8**	**10**	**1**	**1**	**1**	**1**	**CO2**
4	Electrical Measuring Instrument	05	**11**	**3**	--	**8**	--	**1**	--	**1**	--	**CO3**
5	Understand the different equipments& safety procedures used in industry.	05	**11**	**3**	--	**8**	--	**1**	--	**1**	--	**CO4**
6	Electronic Devices	05	**6**	**3**	**3**	--	--	**1**	**1**	--	--	**CO5**
Total		**60**	**80**	**15**	**15**	**40**	**10**	**5**	**5**	**5**	**1**	

Part-C question may be taken from CO2 only

C-20, CH/CHPC/CHPP/CHOT-302
Subject Name: Electrical Technology
III semester
Syllabus split up for Unit Test

nit test NO	Learning out comes to be covered
Unit test-I	Objectives from 1.1 to 3.5
Unit test-II	Objective from 3.6 to 6.5

(Model Paper 1) **C-20, CHPP-302**

State Board of Technical Education and Training,A.P

Diploma in Chemical Engineering (Plastics &Polymers),D.ChE(P&P),

Third Semester

Subject Name: ELECTRICAL TECHNOLOGY

Subject Code: CHPP-302

Time: 90 minutes **Unit Test I** **Max .Marks:40**

Part-A **16Marks**

Instructions: (1) Answer all questions.

(2) First question carries four marks,each question of remaining carries three marks.

1 (a)Define form factor. **CO1**

(b)Magnetic flux density.

(c)Applications of D.C generator.

(d) Back EMF of D.C motor.

2. What is dynamically induced EMF. **CO2**

3. State the laws of resistance. **CO2**

4. List the parts of D.C machine. **CO3**

5. State the methods of speed control of D.C shunt motor. **CO1**

Part-B **3X8=24Marks**

Instructions: (1) Answer all questions

(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. (a) i. State and explain Kirchhoff's laws **CO1**

ii. State the expressions for active power,reactive power and apparent power. **CO2**

(OR)

(b) Explain star and delta connection in 3- phase circuits. Write the phase and line voltages and currents and their relationship in star and delta connection **CO4**

7. (a) i. State the expression for field strength on the axis of a solenoid. **CO4**

ii. An air cored solenoid of length of 0.8mhas 800 turns and carries a current of 8A.Calculate field strength. **CO4**

(OR)

(b) Explain statically induced EMF and dynamically induced EMF. **CO3**

8. (a) Explain the working of a 3 point starter with diagram. **CO5**

(OR)

(b) Classify the D.C generators based on the field and armature winding connections. **CO5**

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C-20/CHPP-302

BOARD DIPLOMA EXAMINATION
D.CHE. –III SEM EXAMINATION
CHPP-302 ELECTRICAL TECHNOLOGY

TIME:3 HOURS **MAX MARKS:80**

Part - A **10 × 3 = 30M**

Instructions: (1) Answer all questions and each question carries 3 marks
(2) Answers should be brief and straight to the point and shall not exceed 5 simple sentences

1. State Ohm's law. CO1
2. What is the importance of back emf? CO2
3. State the uses of (i) Megger(ii)Multi meter (iii) Energy meter. CO3
4. List the applications of electrical heating. CO4
5. Define valence electrons. CO5
6. Calculate the equivalent resistance of two parallel resistors of each 6 ohms and 6 ohms when they are connected in series with 7 ohms resistances. CO1
7. Express the equations of Active Power,ReactivePower,Apparent Power CO1
8. State Faradayslaw's of electromagnetic induction. CO2
9. State the working principle of transformer. CO2
10. Differentiate P-type and N-type semi conductor. CO5

PART – B **5 × 8 = 40marks**

Instructions: (1) Answer any 5 questions and each question carries 8 marks
(2) The answers should be comprehensive and the criteria for valuation is the content but not the length of answer

11. (A) State phase and line voltages and currents and their relationships in star and delta connections. CO1

(or)

(B) Describe (i) Cycle (ii) time period (iii) Frequency CO1

12. (A) Explain Statically induced e.m,f and Dynamically induced e.m.f CO2

(or)

(B) Explain the speed control of DC. Shunt motor by armature control method. CO2

13. (A) Explain the construction and working of Moving Iron Instruments . CO3

(or)

(B) Explain the construction and working of Moving coil Instruments . CO3

14. (A) Classify the methods of electric welding and give one application of each . CO4

(or)

(B) Explain the first aid method of to rescue a person who came into contact with live wires. CO4

15. (A) Classify the materials as conductors, Insulators, and semi conductors based on energy bands CO5

(or)

(B) Draw the circuit symbols of PNP and NPN transistors, name the terminals and applications of transistors, CO5

PART –C

Instructions: Part C consists of 1 question which carries 10 marks.

16. Analyse the speed characteristics of armature control and field control methods of DC Shunt motor . CO2

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Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHPP-303	Organic and physical chemistry	5	75	20	80

S.No.	Major topics	No. of periods	*CO's mapped*
1.	Chemistry of Aliphatic compounds-I	12	CO1, CO2, CO3, CO4
2.	Chemistry of Aliphatic compounds-II	20	CO1, CO2, CO3, CO4
3.	Chemistry of Aromatic compounds	09	CO1, CO2, CO3, CO4
4.	Electro Chemistry	13	CO1, CO2, CO5
5.	Chemical Equilibrium	12	CO1, CO2
6.	Thermo Chemistry	09	CO1
Total		**75**	

Course objectives:

1. To familiarize with the knowledge of classification, nomenclature, isomerism, preparation and properties of organic compounds.
2. To familiarize with the knowledge of electrochemistry, chemical equilibrium and thermochemistry
3. To understand andreinforce theconcept in various chemical processes for better production results.

Course outcomes	**CO1**	CHPP-303.1	Appraise basic concepts of thermochemistry, Electrolysis, Physical and organic chemistry,
	CO2	CHPP-303.2	Find the applications of aliphatic and aromatic hydrocarbons, electrochemistry
	CO3	CHPP-303.3	Explain the Preparation methods of aliphatic and aromatic hydrocarbons
	CO4	CHPP-303.4	Find the Properties of aliphatic and aromatic hydrocarbons
	CO5	CHPP-303.5	Solve problems in electro chemistry, thermochemistry and equilibrium

CO-PO/PSO MATRIX

CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**	**PSO3**
CHPP-303.1		2						3		
CHPP-303.2	3								3	
CHPP-303.3		2							3	
CHPP-303.4		3								2
CHPP-303.5		2							3	
AVERAGE	**3**	**2**						**3**	**3**	**2**

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Learning outcomes

1. Chemistry of Aliphatic Compounds-I.

1.1 Give Introduction to organic chemistry.
1.2 Explain the unique characteristics of carbon.
1.3 Explain hybridization of carbon in organic compounds i.e,. sp^3, sp^2 and sp.
1.4 Give the classification of organic compounds.
1.5 Explain IUPAC nomenclature of organic compounds.
1.6 Explain homologous series and characteristics.
1.7 Explain isomerism: Structural isomerism and Stereo isomerism (Geometrical and optical) with examples.
1.8 Explain the preparation of Alkanes:
Preparation of Methane and Ethane by (i) De-carboxylation (ii) Wurtz reaction (Ethane only) (iii) by reduction of Alkyl Halides.
1.9 Properties of alkanes: (i) Halogenation (ii) Nitration (iii) Combustion of methane and ethane.
1.10. Explain the preparation of alkenes :
Preparation of Ethylene by: (i) Dehydration of ethyl alcohol (ii) Dehydrohalogenation of ethyl bromide (iii) Dehalogation of 1, 2 – dibromo ethane.
1.11 Explain the Properties of Ethylene: Reaction with (i) H_2, (ii) Br_2/CCl_4 (iii) Ozone (iv) Oxidation by $KMnO_4$.
1.12 Explain the preparation of alkynes:
Preparation of Acetylene from (i) Calcium carbide (ii) Dehydro halogenation of 1,2 di-bromo ethane (iii) Dehalogenation of 1, 1, 2, 2 – tetra bromo ethane.
1.13 Explain the Properties of Acetylene: Reaction with (i) H_2 / Ni (ii) Br_2 / CCl_4 (iii) H_2O in presence of 30% H_2SO_4 and 1% $HgSO_4$.
1.14 List the uses of ethane, methane, ethylene and acetylene.

2.Chemistry of Aliphatic Compounds-II.

2.1 Explain ethyl chloride preparation from
(i) Grove's process
(ii) PCl_3
(iii) Ethylene and
explain the properties of Ethyl Chloride - Reaction with
(i) KOH
(ii) KCN
(iii) AgCN
(iv) Wurtz Reaction

2.2 Explain Chloroform preparation from

(i) Ethyl alcohol
(ii) Methane
(iii) CCl_4 and

Properties of Chloroform

(i) Reimer-Tiemann reaction
(ii) Carbylamine or isocyanide test
(iii) Oxidation
(iv) HNO_3

2.3 Alcohols:

Describe classification into primary, secondary and tertiary alcohols.
Distinction of primary, secondary and tertiary alcohols using Lucas reagent.
Explain the Preparation of Ethyl alcohol from

i) Ester hydrolysis
ii) Grignard reagent
iii) Fermentation of molasses

Explain the Properties of Ethyl alcohol: Reaction with

i) Acetic acid
ii) Conc. H_2SO_4
iii) Bleaching powder
iv) PCl_3

2.4 Aldehydes:

Explain Preparation of acetaldehyde from

i) Oxidation of ethyl alcohol
ii) Distillation of calcium acetate and calcium formate.
iii) Acetylene.

Explain Properties of Acetaldehyde

i) Addition of Grignard reagent
ii) Reaction with hydrazine
iii) Aldol condensation
iv) Silver mirror test
iv) Fehling's test

Uses of acetaldehyde.

2.5 Ketones:

Explain the Preparation of acetone from

i) Oxidation of Isopropyl alcohol
ii) Distillation of calcium acetate
iii) Propyne.

Explain Properties of acetone

i) Addition of Grignard reagent
ii) Reaction with hydrazine
iii) Iodoform reaction

Uses of acetone

2.6 Carboxylic Acids:

Explain the Preparation of Acetic acid from

i) Ester hydrolysis
ii) Oxidation of ethyl alcohol
iii) Hydrolysis of methyl cyanide.

Explain the Properties of Acetic acid

i) Reaction with sodium
ii) Reaction with ethyl alcohol
iii) Reaction with Cl_2 / P (Hell – Volhard – Zelinsky reaction)
Uses of Acetic acid.

2.7 Ethers:

Explain the Preparation of diethyl ether
i) Williamson's synthesis
ii) Dehydrating of ethyl alcohol
Explain the Properties of ether
i) Halogenation
ii) Hydrolysis by dil. H_2SO_4
iii) Action HI.
Uses of ether.

2.8 Polymerization: a) Definition and types of polymerization
b) Additionpolymerizationex : Polyethene
c) Condensation polymerization ex : Bakelite.

2.9 List the uses of Ethyl chloride, Ethyl alcohol, acetaldehyde, acetone, acetic acid and ether

3. Chemistry of Aromatic compounds.

3.1 Explain aromaticity and Huckle's rule.
3.2 Explain the nomenclature of aromatic compounds.
3.3 Explain the preparation, properties and uses of benzene.
3.4 Explain the preparation, properties and uses of nitrobenzene
3.5 Explain the preparation, properties and uses of Aniline
3.6 Explain the preparation, properties and usesof Phenol

4. Electro Chemistry.

4.1 Give introduction to electrochemistry.
4.2 Explain about electrolytes and non-electrolytes with examples.
4.3 Define electrolytic conduction and metallic conduction
4.4 Differentiateelectrolytic conduction and metallic conduction
4.5 Explain about Strong electrolytes and weak electrolytes with examples.
4.6 Explain Faraday's laws of electrolysis.
4.7 Solve simple problems based on Faraday's laws.
4.8 List applications of electrolysis.

5. Chemical equilibrium

5.1 Define chemical Equilibrium:
Reversible and irreversible reactions – examples.Homogeneous and heterogeneous Equilibria – examples.
5.2 Explain chemical equilibrium and its characteristics.
5.3 Explain law of Mass Action
5.4 Apply law of mass action to a general reaction i.e. $mA + nB \leftrightarrow pC + qD$
5.4 Explain the effect of (i) concentration
(ii) Pressure
(iii) Temperature and
(iv) Catalyst on chemical equilibrium.
5.5 Explain Lechatelier's principle –
5.6 Apply Lechatlier's principle to (i) manufacture of NH_3 by Haber's process
(ii) Formation of SO_3 in contact process.

6. Thermo chemistry.

6.1 Give Introduction to thermochemistry.
6.2 Define 1^{st} law of thermo dynamics and know the equations for "E", "Q", "W" and "H".

6.3 Define Internal energy and Enthalpy.
6.4 Explain exothermic and Endothermic reactions with examples.
6.5 Types of heats of reactions.
i) Heat of formation
ii) Heat of combustion
iii) Heat of neutralization
iv) Heat of solution.

COURSE CONTENT:

1. Introduction – Classification and nomenclature of organic compounds – Isomerism – Preparation, properties and uses of Alkanes, Alkenes and Alkynes
2. Ethyl Chloride, Chloroform, Alcohols, Aldehydes, Ketones, Carboxylic acids, Ethers. Polymerization- Addition and Condensation polymerization
3. Preparation, properties and uses of – Benzene, Nitro benzene, Aniline.
4. Electrolytes, non-electrolytes, Arrhenius theory- Faraday's laws of electrolysis – Problems.
5. Chemical equilibrium – Law of mass action – Effect of concentration, pressure, temperature and catalyst on chemical equilibrium – Lechatelier's principle – Applications.
6. Internal energy and Enthalpy-First law of Thermodynamics– Exothermic and Endothermic reactions – Different heats of reactions.

REFERENCE BOOKS:

1. Intermediate Chemistry – Vol, 1 & 2 published by Telugu Academy (or) Vikram Series.
2. Text book of Applied Science – R.V. Subba Rao published by: Book Traders, Hyderabad.
3. Text Book of Organic Chemistry – Arun Bahl& B.S. Bahl, published by S. Chand & Co, New Delhi.
4. Essentials of Physical Chemistry – Bahl& Tuli, published by S. Chand & Co, New Delhi.

Course code CHPP-303	Course Title: ORGANIC AND PHYSICAL CHEMISTRY No of Course outcomes 06				No of periods: 75
POs	Mapped with CO No	CO periods addressing PO in Column 1		Level (1, 2, 3)	Remarks
		NO	%		
PO1	CO2	17	22	1	>40%- level 3 25%-40% level 2 5-25% : level 1 <5%: not addressed
PO2	CO1, CO3, CO4 and CO5	58	78	3	

S.No.	Major Topics	No of Periods	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				Cos mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Chemistry of Aliphatic compounds-I	12	14	11	3			2	1			CO1, CO2, CO3, CO4
2.	Chemistry of Aliphatic compounds-II	20	21	3	8		10	1	1		1	CO1, CO2, CO3, CO4
3.	Chemistry of Aromatic compounds	09	11	3	8			1	1			CO1, CO2, CO3, CO4
4.	Electro Chemistry	13	14	3	11			1	2			CO1, CO2, CO5
5.	Chemical Equilibrium	12	14	3	11			1	2			CO1, CO2
6.	Thermo Chemistry	09	6	3	3			1	1			CO1
Total		**75**	**80**	**26**	**44**		**10**	**7**	**8**		**1**	

C-20, CH/CHPC/CHPP/CHOT-303

Subject Name: Organic and Physical chemistry

III semester

Syllabus split up for Unit Test

Unit test No.	Learning out comes to be covered
Unit test-I	Objectives from 1.1 to 3.6
Unit test-II	Objective from 4.1 to 6.5

(Model Paper-1) **C-20,CHPP-303**

State Board of technical Education and Training ,A.P

Diploma in Chemical Engineering (PP)

III SEMESTER

Subject Name: Organic and Physical chemistry

Subject Code: CHPP-303

Time: 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

Instructions: (1) Answer all questions.

(2) First question carries four marks, each question of remaining carries three marks.

1. a)Write the chemical formulae of acetic acid ---------- **(CO1)**
   b) Bleaching powder is a perfume or disinfectant:---------- **(CO1)**
   c) Chemical formulae of sulfuric acid ---------- **(CO1)**
   d) Chemical formulae of laughing gas is ---------- **(CO1)**
2. List the uses of ethane, methane, ethylene and acetylene. **(CO2)**
3. List the uses of Ethyl chloride, Ethyl alcohol, acetaldehyde, acetone. **(CO2)**
4. What is aromaticity and Huckle's rule? **(CO1)**
5. Give the classification of organic compounds **(CO2)**

Part-B **3X8=24**

Instructions: (1) Answer all question (2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer .

6. (a) Explain the preparation of Methane and Ethane by (i) De-carboxylation
   (ii) Wurtz reaction (Ethane only)
   (iii) by reduction of Alkyl Halides. **(CO3)**

   OR

   (b) Explain the Preparation of Acetylene from (i) Calcium carbide
   (ii) Dehydro halogenation of 1,2di-bromo ethane
   (iii) Dehalogenation of 1, 1, 2, 2 –tetra bromo ethane **(CO3)**

7. (a) Explain the Preparation of acetone from **(CO3)**
   i) Oxidation of Isopropyl alcohol
   ii) Distillation of calcium acetate
   iii) Propyne.

   OR

   (b) Explain the Properties and uses of ether by **(CO4)**
   i) Halogenation
   ii) Hydrolysis by dil. H_2SO_4
   iii) Action HI.

8. (a) Explain the preparation, properties and uses of nitrobenzene. **(CO4)**

   OR

   (b) Explain the preparation, properties and uses of Phenol. **(CO4)**

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Model Question paper

Q.No	Question	Blooms category	Marks allocated	CO adressed
	Part-A(30 marks)			
1.	Explain the unique characteristics of carbon	remembering	3	CO1
2.	Explain the reaction of acetylene with H_2/Ni, andBr_2/CCl_4	understanding	3	CO4
3.	Give the classification of alcohols, give an example to each	understanding	3	CO1
4.	Explain about aromaticity of benzene	Remembering	3	CO1
5.	What current strength in ampere will be required to liberate 10 g of chlorine from sodium chloride solution in one hour?	Remembering	3	CO2
6.	Distinguish between strong electrolyte and weak electrolyte	understanding	3	CO1
7.	Explain law of mass action	understanding	3	CO1
8.	Explain reversible and irreversible reactions with examples	remembering	3	CO1
9.	Explain first law of thermodynamics	understanding	3	CO1
10.	Define (a)heat of formation (b) heat of combustion	Remembering	3	CO1
	Part-B(40 marks)			
1	Explain the preparation of ethane by Decarboxylation and Wurtz reaction. Explain reaction of ethylene with ozone and hydrogen (or) Explain two preparation methods and two properties of acetylene.	remembering	8	CO3/CO4
2	Explain two methods of preparation and two chemical properties of acetic acid (or) (a)Explain the preparation of acetaldehyde from ethyl alcohol and acetylene. (b) explain hydrolysis of ester and methyl cyanide	understanding	8	CO3/CO4
3	Explain two preparation methods and two chemical properties of benzene (or)	understanding	8	CO3/CO4

	Explain two preparation methods and two chemical properties of nitro benzene			
4	Explain faradays laws of electrolysis (or) (a)Differentiate between electrolyte and non-electrolyte (b) Define about electrolytic conduction and metallic conduction (c) Write the industrial applications of electrolysis	understanding	8	CO1
5	Explain lechatlier's principle for Haber's process (or) Explain the effect of temperature, pressure and concentration on equilibrium	understanding	8	CO1/CO2
Part-C(10 marks)				
6	(a)Explain silver mirror test and fehling's test (b)what happens when acetone reacts with grignard reagent and hydrazine give chemical reactions (c) write a short notes on aldol condensation	analyzing	10	CO4

Course code	Course title	No. of periods/week	Total no of periods	Marks of FA	Marks for SA
CHPP- 304	UNIT OPERATIONS-1	06	90	20	80

S.No	Chapter / unit title	No. of periods	CO's Mapped
1.	Introduction to fluid flow phenomena and basic equations of fluid flow	15	CO1, CO2
2.	Flow of incompressible fluids in pipes and flow past immersed bodies	15	CO1, CO2
3.	Know about flow measurement & transport of fluids	20	CO3
4.	Heat transfer by conduction	08	CO1, CO4, CO5
5.	Principles of heat flow in fluids	08	CO1, CO4, CO5
6.	Heat transfer to fluids with and without phase change	08	CO1, CO4, CO5
7.	Radiation heat transfer	04	CO1, CO4, CO5
8.	Heat exchange equipment and evaporation	12	CO3
	Total	**90**	

COURSE OBJECTIVES

COURSE OBJECTIVES	i. Introduction to fluid flow, and basic equations of fluid in pipes flow meters, problems based on above topics ii. Modes of heat transfer, heat transfer to fluids with at without phase change problems based on above topics. iii. Types of heat exchanges and evaporators, evaporator accessories, performance of an evaporation.

CO NO		COURSE OUTCOMES
CO1	**CHPP-304.1**	Compose the types of fluids, Definitions, Laws of heat transfer and mechanisms.
CO2	**CHPP-304.2**	Formulate the basic equations of mass and momentum, Laminar and turbulent flow, Friction factor in pipes.
CO3	**CHPP-304.3**	Describe the Working and constructions of Flow meters, pressure measuring devices, heat exchange equipment.
CO4	**CHPP-304.4**	Deduce the derivations of Bernoulli's equation, Hagen-Poiseuille's equation, Pressure drop equations, Composite wall, Cylindrical wall and LMTD.
CO5	**CHPP-304.5**	Solve Problems based on Bernoulli's equation, Hagen-Poiseuille's equation, Pressure drop equations, Composite wall, Cylindrical wall and LMTD.

Course outcomes :

CO-PO/PSO MATRIX:

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-304.1	3							3		
CHPP-304.2		2	2					2	2	
CHPP-304.3			2						2	
CHPP-304.4		2						2		2
CHPP-304.5		3	2						3	
AVERAGE	**3**	**3**	**2**					**3**	**2**	**2**

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Learning outcome

CHAPTER – 1 :

1.1 Definition of a fluid, types of fluid physical properties of fluid and their units, Newton's law of viscosity.

1.2 List the Fluid pressures, concept of pressure, measurement of pressure. Using Working and Manometers .

1.3 Describe Reynolds experiment, laminar and turbulent flow, boundary layers formation.

1.4 Explain the boundary layer separation, boundary layer effects on fluid flow. Mass balance and momentum balance equations.

1.5 Evaluate the equation of continuity derivation, Bernoulli's , modified Bernoulli's equations and problems based on their equations.

1.6 Problems based on Reynolds number, pressure drop.

CHAPTER – 2:

2.1 Describe the flow in incompressible fluids in pipes, shear stress distribution in pipe, equation and friction factor for laminar flow.

2.2 Define laminar flow in pipes, average velocity, Kinetic energy factor, explain the Hagen Poiseuille equation for pressure drop calculations.

2.3 Explain friction factor in turbulent flow, the roughness parameter, effect of roughness, and the friction factor contraction.

2.4 Illustrate the energy loss due to flow in pipe fittings sudden expansion and contraction,

2.5 solve simple problems on energy loses in fluid flow through pipes, friction factor in laminar and turbulent flow.

2.6 Predict the equivalent length, drag, drag coefficient and different types of drag.

2.7 Compare the relationship between drag coefficient and Reynolds number in laminar and turbulent flow.

2.8 Differentiate free settling and hindered settling, quote strokes law, solve problems on stokes law.

2.9 Summarize the packed bed and the equations of pressure drop in packed beds, the process of fluidization and application of fluidization.

CHAPTER – 3:

3.1 List the classification of flow meters, pumps, and various types of pipe fittings.

3.2 Explain the principle, construction and working of flow meters, reciprocating, centrifugal pump.

3.3 Summarize the classification and pipes and tubes, schedule number, gauge for pipes and tubes.

3.4 Describe the functions of pump in fluid handling, the principle, construction and working of reciprocating positive displacement pump
- i) Piston pump
- ii) Plunger pump
- iii) Diaphragm pump.

3.5 Explain the principle, construction and working of rotary positive displacement pumps.
- i) Gear pump
- ii) Screw pump

3.6 Inventory the terms related to a pump
- i) Suction head
- ii) Discharge head
- iii) Total head
- iv) NPSH
- v) Cavitation
- vi) Priming
- vii) Mechanical efficiency
- viii) Power required

3.7 Describe the working of i) fan ii) blower iii) vacuum pump at differentiate between the fan and a blower.

3.8 Solve the problems based on flow meters, and centrifugal pump.

CHAPTER – 4:

4.1 List the mechanism of heat flow.

4.2 Define the steady state and unsteady state heat flow and the fourier's law heat conduction.

4.3 Quote the thermal conducting of a substance of its units.

4.4 Evaluate the derivation of equation for heat conduction through a single plane walls a cylindrical wall and composite wall.

4.5 Differentiate the significance of lagging, economic lagging, thickness and insulating materials.

4.6 Explain the compound resistances in series and solve problems in case of heat conduction through a flat wall, cylindrical wall and composite wall.

CHAPTER – 5

5.1 Define modes of how transfer with examples.

5.2 Explain the working of typical heat exchange and the terms approach and range.

5.3 Differentiate the counter current and parallel current flows in an heat exchanger and locate the temperature variations a long the length of the heat exchanger curve in both cases.

5.4 Explain the enthalpy balances in heat exchangers and in Total condenses, the rate of heat transfer heat flux, average temperature of fluid stream and overall heat transfer coefficient.

5.5 Evaluate the logarithmic mean temperature difference, variable overall heat transfer coefficient.

5.6 Explain the film concept in heat transfer by convection and the film coefficient anology to thermal conductivity.

5.7 Evaluate the overall heat transfer coefficient from individual heat transfer coefficients.

5.8 Solve problems based on calculate of LMTD, and overall heat transfer coefficients.

CHAPTER – 6:

6.1 Explain the regimes of heat transfer in fluids, thermal boundary layer.

6.2 Explain the heat transfer by forced convection

6.3 Predict graetz and peclet numbers.

6.4 Practice the various empirical equations used to calculate 'h' such as i) Dittus – boelter equation ii) sieder – tate equation iii) Colburn equation.

6.5 Explain the mechanism of heat transfer from condensing vapours , boiling liquids, pool boiling nucleate boiling and film boiling.

6.6 Distinguish the drop wise and film type condensation.

6.7 Solve problem based on dimension less numbers and heat transfer coefficient using various empirical equations.

CHAPTER – 7 :

7.1 Define the terms related to radiation such as absorptivity, reflectivity and transitivity , emission power , black body emissivity, kirchoff's law.

7.2 Describe the Stefan Boltzmann law, planck's law and wiens displacement law.

7.3 Explain the process and radiation between surfaces.

7.4 Explain the angle of vision and view factor.

7.5 Solve the problem related to the laws of radiation.

7.6 Explain and evaluate the combined heat transfer by conduction , convection and radiation.

CHAPTER – 8:

8.1 List the classification and evaporators and heat exchangers.

8.2 Explain the principle, construction and working of a double pipe heat exchanger, shell and tube heat exchanger.

8.3 Explain the principle. Construction and working of multi pass heat exchanger and temperature patterns in multi pass exchanges with sketches.

8.4 List the external surface heat exchangers i) fin type ii) plate type with a neat diagram.

8.5 Explain the function of a condenser, kettle type boiler, calandrias with a neat sketch.

8.6 illustrate the term evaporation, the different liquid properties to be considered in evaporation.

8.7 List the evaporator accessories such as a) steam traps b) condensers c) entrainment separators d) barometric leg e) ejectors f) salt removal systems.

8.8 Explain the principle, constructions and working of standard vertical tube evaporates, falling film and climbing film evaporators and forced circulation evaporates, multiple effect evaporator system with a sketch.

8.9 Give the performance of an evaporator a) economy b) capacity of an evaporator, the boiling point elevation at the effect of hydrostatics head capacity and economy of a multiple effect evaporators.

8.10 Explain the enthalpy balance equations for the single effect evaporators enthalpy concentration diagram.

8.11 Solve the problems on calculation of the heat transfer area, steam requirement and economy in case of a signal effect evaporation.

8.12 Explain the various methods of feeding the multiple effect evaporator system with its advantages and disadvantages.

Course code CHPP-304	**Course Title: Unit operations -1 Number of course Outcomes: 08**				**No. of periods 90**
PO's	**Pos Mapped with CO No.**	**CO periods addressing PO in column 1**		**Level (1,2,3)**	**Remarks**
		No. of Periods	Percentage		
PO1	CO1	20	21	1	25% Level2 Moderately addressed
PO2	CO2, CO4, CO5	38	41	3	>40% Level3 Highly addressed
PO3	CO2, CO3, CO5.	32	37	2	5 to 25% level1 Low addressed
PO4					5 to 25% level1 Low addressed
PO5					
PO6					
PO7					

Hyponated Course contents:

1. **Introduction to fluid flow phenomena and basic equations of fluid flow:**
   Fluid: definition of fluid, ideal fluid, real fluid, compressible and incompressible fluids, newtonian and non-newtonian fluids; physical properties of fluids– density, viscosity, velocity head, pressure head, static head, pressure concept; manometers: U–tube manometer, inverted Utube manometer, inclined manometer– differential manometer – flow pattern in circular tubesimportant of Reynold‘s number, laminar flow, turbulent flow, Reynold‘s experiment - flow in boundary layer- solve problems on Reynolds number and pressure drop in manometers, boundary layer separation and its effects on flow. Mass balance, momentum balance, stream line and stream tube, continuity equation- average velocity, mass velocity, Bernoulli‘s equation, modified Bernoulli‘s equation for frictional flow, pump work, kinetic energy correction, solve problems on various heads using Bernoulli‘s equation and pump work in Bernoulli‘s equation.

2. **Flow of incompressible fluids in pipes and flow past immersed bodies:**
   Friction –skin friction, wall shear, equations for friction factor, relationship between skin frictionparameters, flow of incompressible fluids, shear stress distribution in pipes, equation for friction factor, laminar flow in pipes, average velocity, kinetic energy factor, momentum correction factor for laminar flow of Newtonian fluids, Hagen Poiseuille equation, average velocity, effect of Roughness, friction factor chart, energy loss for fluids during flow, expansion and contractionlosses in fitting, equivalent length, solve simple problems on friction factor in Laminar & turbulent flow and energy losses in fluid flow through pipes. Drag- Types of drag, drag coefficient, stokes law, drag coefficient Vs Reynolds number Curve, fanning friction factor, friction in flow through beds of solids, equivalent particle diameter, sphericity, packed bed, void fraction, pressure drop equations- flow of particles through fluids, free settling, hindered settling, equations for terminal velocities for different particles, Reynolds number ranges, fluidization, fluidization velocities and pressure drops, applications of fluidization,simple problems on Stoke‘s law.

3. **Know about flow measurement & transportation of fluids:**
   Flow meters- head meters, area meters, orifice meter, venturi meter, pitot tube , rotameter- turbine meter- schedule number, gauge for pipes, pipes and tubes, pipe fitting and joints; Valves – gate valve, globe valve, plug valve, check valve, diaphragm valve, butterfly valve, ball valve, safety valve or relief valve, Pumps-functions of a pump, classification of pumps, positive displacement pumps, Reciprocating pumps, piston pumps, plunger pumps, diaphragm pumps, rotary pumps, gear pump, screw pump;Centrifugal pumps – single and multistage centrifugal pumps, different types of casings, suction head, discharge head, total developed head, NPSH, priming, cavitation, characteristic curves, equipment for gas flow- fans, blowers, compressors; Vacuum producing equipment– ejectors– solve simple problems on calculation of velocities, volumetric flow rates using venturi and orifice meters, power required by a centrifugal pump.

4. Heat transfer by conduction:

Mechanisms of heat flow, Fourier's law of heat conduction, thermal conductivity, steady state and unsteady state conduction, derivation of equation for heat conduction through a single plane wall, a cylindrical wall and composite wall, compound resistances in series, significance of lagging, economic lagging thickness, heat insulating materials, solve simple problems on calculation of rate of heat flow, intermediate temperatures in case of heat conduction through a flat wall, cylindrical wall and composite walls.

5. Principles of heat flow in fluids:

Convection: convection, natural convection and forced convection, working of typical heat exchanger, approach and range, counter current and parallel current flows in an heat exchanger, temperature variations along the length of the heat exchanger in both cases, enthalpy balances in heat exchangers and in total condensers, rate of heat transfer, heat flux, average temperature of fluid stream and overall heat transfer coefficient, logarithmic mean temperature difference (LMTD), variable overall heat transfer coefficient and Solve simple problems on calculation of LMTD, film co-efficient (individual heat transfer coefficients), analogy between film co-efficient and thermal conductivity, Nusselt number, Prandtl number, fouling factors, Calculation of Overall heat transfer coefficients from individual coefficients, Classification of Individual heat transfer coefficients and its magnitude – solve simple problems on calculation of overall heat transfer coefficients

6. Heat transfer to Fluids without and with phase change:

Regimes of heat transfer in fluids, thermal boundary layer, heat transfer by forced convection in laminar flow and turbulent flow, Graetz and Peclet numbers, various empirical equations used to calculate 'h_i' such as 1.Dittus – boelter equation 2. Sieder – tate equation 3. Colburn equation, heat transfer from condensing vapors, drop wise and film wise condensation, heat transfer to boiling liquids-pool boiling, nucleate boiling and film boiling, Solve simple problems to calculate various dimensionless numbers and heat transfer coefficient using various empirical equations.

7. Radiation Heat transfer:

Fundamentals of radiation, absorptivity, reflectivity and transitivity, emission of radiation, wave length, emissive power, black body radiation , black body emissivity, emissivities of solids, laws of Black body radiation, stefanboltzmann law, planck's law and wiens displacement law, absorption of radiation by opaque solids, reflectivity, absorptivity, Kirchoff's law, radiation between surfaces, angle of vision, view factor, combined heat transfer by conduction, convection and radiation.

8. Heat exchange equipment and evaporation:

Classification of heat exchangers; principle, construction and working of a double pipe heat exchanger, shell and tube heat exchanger, floating head heat exchanger, multipass heat exchanger, temperature patterns in multipass exchangers, extended surface heat exchangers – Fin type and plate type heat exchangers, function of a condenser, a) Kettle type boilers b) Calandrias

Evaporation: Definition, different liquid properties to be considered in evaporation, Types of evaporators: Principle, construction and working of a) standard vertical tube

evaporator, b) falling film and climbing film evaporators, c) forced circulation evaporators, evaporator accessories such as a) Steam traps b) Condensers c) Entrainment separators d) Barometric leg e) Ejectors f) Salt removal systems, performance of an evaporator, economy and capacity of an evaporator, boiling point elevation, and the effect of hydrostatics head, Duhring's rule, enthalpy balance equation for the single effect evaporator, enthalpy balance equation for the single effect evaporator, enthalpy concentration diagram, solve simple problems on calculation of the heat transfer area, steam requirement and economy in case of a single effect evaporator, working principle of the multiple effect evaporator system, methods of feeding the multiple effect evaporator system with its advantages and disadvantages, capacity and economy of a multiple effect evaporators

REFERRENCE BOOKS

1. Unit operations of chemical Engg by WareenL.Mc Cabe, Julian C.Smith and Peter Harriott, Fifth edition, Mc Graw Hill Publication.
2. Introduction to Chemical Engg by Walter L.Badger& Julius T.Banchero. Mc GRAW HillPublication.
3. Process Heat Transfer by Donald Q. Kern, Mc GRAW Hill Publication.
4. Heat Transfer by D.P. Tiwari, Umesh publications, New Delhi

MODEL BLUE PRINT WITH WEIGHT AGES FOR BLOOMS CATEGORY AND QUESTIONS FOR EACH CHAPTER AND Cos MAPPED.

S.NO	Chapter/ unit title	No. of periods	Weight age Allocated	Marks Wise Distribution of Weight age				Question Wise Distribution of Weight age				Cos Mapped
				R	U	Ap	An	R	U	AP	An	
1	Introduction to fluid flow phenomena and basic equations of fluid flow.	15	14	3	3	8	-	1	1	1	-	CO1, CO2, CO5
2	Flow of incompressible fluids in pipe and flow past immersed bodies.	15	14	3	3	8	-	1	1	1	-	CO2, CO3, CO4
3	Know about flow measurement & transportation of fluids.	20	13	3	-	-	10	1	-	-	1	CO3, CO5
4	Heat transfer by conduction.	08	11	3	-	8	-	1	-	1	-	CO1, CO4, CO5
5	Principles of heat flow in fluids.	08	11	3	-	8	-	1	-	1	-	CO1, CO4, CO5
6	Heat transfer to fluids with and without phase change.	08	03	3	-	-	-	1	-	-	-	CO4, CO5
7	Radiation heat transfer.	04	03	3	-	-	-	1	-	-	-	CO1, CO3
8	Heat exchange equipment and Evaporation.	12	11	3	-	8	-	1	-	1	-	CO3
	Total	**90**	**80**	24	6	40	10	8	2	5	1	

C-20, CHPC/CHPP/CHOT-304

Subject Name: Unit Operations-I

Syllabus split up for Unit Test

Unit test NO	Learning out comes to be covered
Unit test-I	Objective from 1.1 to 3.8
Unit test-II	Objective from 4.1 to 8.12

(Model Paper-1) **C-20, CHPP-304**

State Board of technical Education and Training, A.P

Diploma in Chemical Engineering (PP)

III SEMESTER

Subject Name: UNIT OPERATIONS -I

Subject Code: CHPP-304

Time: 90 minutes **Unit Test I** **Max .Marks:40**

Part-A **16Marks**

Instructions: (1) Answer all questions.

(2) First question carries four marks; each question of remaining carries three marks

1. Write the following: **(CO1)**
   a)Write the formula for Newton's law of viscosity.
   b)Write the Hagen poise Ville equation.
   c)Which settling is a faster one: free settling or hindered settling.----------
   d)What do you mean by positive displacement of a pump?----------

2. Write the importance of Reynolds number. **(CO2)**

3. Write about the friction factor in turbulent. **(CO2)**

4. Write about the classification of pumps. **(CO3)**

5. Write about the types of pipe fittings. **(CO3)**

Part-B **3X8=24**

Instructions: (1) Answer all questions.

(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6 a) Write the statement of Bernoulli's theorem and derive the Bernoulli's theorem without friction. **(CO2)**

(or)

b) Write the boundary layer separation and its effects on fluid flow. **(CO2)**

7 a) Explain the process of fluidization and applications of fluidization. **(CO2)**

(or)

b) Explain the flow of incompressible fluids in pipes and shear distribution in pipes. **(CO2)**

8 a) Write the principle, construction and working of reciprocating pump. **(CO3)**

(or)

b) With the principle, construction and working of orifice meter with neat sketch. **(CO3)**

***

Q.no	Questions	Bloom's category	Marks allocated	CO addressed
PART – A (30 marks)				
1.	Define compressible and incompressible fluids.	R	3	CO1
2.	What are Newtonian and non-Newtonian fluids? Give example.	R	3	CO1
3.	Define boundary layer.	R	3	CO1
4.	Write short note on roughness.	R	3	CO1
5.	Draw a neat sketch of gate valve and label it.	R	3	CO3
6.	What are the insulators? Give two examples for insulating materials.	U	3	CO1
7.	What is convection? Mention the types of convection with examples.	R	3	CO1
8.	What is radiation? Give example.	R	3	CO1
9.	What do you mean by a black body?	U	3	CO1
10.	List out the accessories used in evaporator.	R	3	CO3
PART –B (40 marks)				
1.	Explain Bernoulli's equation without friction. (or) Explain the boundary layer formation with neat sketch.	AP	8	CO2
2.	Explain friction losses from sudden enlargement with a neat sketch. (or) Explain friction losses from sudden contraction with a neat sketch.	AP	8	CO2
3.	Draw a neat sketch of centrifugal pump and explain its construction and working. (or) Explain the construction and working of orifice meter with neat sketch.	AP	8	CO3

4.	Draw a neat sketch of Rota meter and explain its construction and working. (or) Draw a neat sketch and explain the construction and working of reciprocating pump.	AP	8	CO3
5.	Derive an equation for heat conduction through a cylindrical wall. (or) Derive an expression for heat transfer through a composite wall made of three materials having different thermal conductivities.	AP	8	CO4
PART – C (10 marks)				
1.	Why cavitation will occur in centrifugal pump and not in displacement pumps, justify your answer.	AN	10	CO3

MODEL QUESTION PAPER WITH COs MAPPED

PART A: 30 marks 10 questions, 3 marks each NO CHOICE
-60 minutes (6 minutes each)

PART B: 40 marks, 5 questions, 8 marks each, EITHER OR TYPE
-90 minutes (18minutes for each question)

PART C: 10 marks, 1question, 10marks
-30 minutes (higher order question)

Course code	Course title	No.Of Periods / week	Totalnumber of periods	Marks for FA	Marks for SA
CHPP-305	Mass and Energy Balance	5	75	20	80

S.No.	Chapter/unit title	No. of periods	Cos mapped
1.	Units and Dimensions	10	CO1, CO2
2.	Basic Calculations	20	CO1, CO2
3	Material balance without Chemical Reactions	15	CO1, CO2, CO4, CO5
4.	Material balance with Chemical Reactions	10	CO1, CO2, CO3, CO4, CO5
5	Energy balance	12	CO1, CO2, CO4, CO5
6	Combustion	08	CO1, CO3
Total		**75**	

Course objectives:

1. To familiarize with the terms used in Mass and Energy Balance, Physico-Chemical relations ,and Combustion.
2. To calculate Mass Balance Problems and Energy balance problems and evaluating various parameters used in chemical engineering.
3. To understand and reinforce the Physico-Chemical relation concepts in solving material and energy balance problems of chemical engineering for better production results.

Course outcomes

Course outcomes	**CO1**	CHPP-305.1	Examine the basic concepts of Physico-Chemical relations.
	CO2	CHPP-305.2	Evaluate problems related to Physico-Chemical relations, mass balances and Energy balances.
	CO3	CHPP-305.3	Evaluate the procedures adopted for combustion calculations.
	CO4	CHPP-305.4	Analyse and correlate the mass balance and energy balance solutions of chemical engineering.
	CO5	CHPP-305.5	Apply the mass and energy balance in the chemical industry in the design aspects.

CO-PO/PSO MATRIX:

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-305.1	3							3		
CHPP-305.2		2	2						2	
CHPP-305.3	2	2							2	
CHPP-305.4	2	2							2	
CHPP-305.5	3							2	2	
Average	3	2	2					3	2	

Learning outcomes

After completion of the course, the student will be able to

1.0 Units and Dimensions:

1.1 Know about Physical Quantities

1.2 Know Fundamental and Derived quantities

1.3 Know about Unit and System of units

1.4 Know the Formula, Units in SI system and Dimensional formula of different derived quantities.

1.5 Know the conversion factors for various fundamental quantities (Mass, Length, Time and Temperature) from one system of unit to another system of units.

1.6 Know the conversion factors for the following derived quantities
a) Force b) Newton‘s Law conversion factor c) Pressurefrom one system of unit to another system of units.

1.7 Know the conversion factors for the following derived quantities
a) Work done b) Heat c) Powerfrom one system of unit to another system of units.

1.8 Know the conversion factors for the following derived quantities.
a) Viscosity b) Heat capacity c) Latent heat d) Specific heatfrom one system of unit to another system of units.

1.9 Know the conversion factors for the following derived quantities
a) Kinematic Viscosity b) Surface Tension c) Density d) Specific Volumefrom one system of unit to another system of units.

1.10 Know different dimensionless groups

1.11 Know the conversion of a equation from one system of units into another system of units.

1.12 Numerical problems on all the above topics

2.0 Basic Calculations:

(a) Stoichiometric and composition relationships

2.1 Define Atom, Molecule, Mole, Gram–atom, Gram–molecule, Gram molar volume

2.2 Define Molarity, Normality, Molality, PPM, Weight percent, Volume percent, Mole percent, Analysis on dry basis and wet basis

2.3 Define Density and Specific gravity, different gravity scales , and relation between gravity scale and Specific gravity ,

2.4 know the Variation of density and specific gravity with temperature

2.5 Numerous problems on all the above topics

(b) Behaviour of ideal gases

2.6 Kinetic theory of gases

2.7 Know about Gas laws: Boyle‘s law, Charles law, Gay-Lussac‘s law, Avogadro‘s law,

2.8 Derivation of Ideal gas equation

2.9 Know about Vander Waal‘s equation of state, Critical properties of substances
2.10 Ideal gas constant–Derive the value of ideal gas constant in different system of units
2.11 state and explain Dalton‘s law of partial pressures, Amagat‘s law of partial volumes for gaseous mixtures
2.12 Explain the characteristics of an Ideal gas, Differences between Ideal gas and Real gas
2.13 (i) Derive the equation volume % = mole % = pressure % for an ideal gas mixture
(ii) Know about average molecular weight of a gas mixture and the evaluation procedure
2.14 Know the evaluation procedure for the density of a gaseous mixture
2.15 Numerous problems on all the above topics

(c) Vapour Pressures:

2.16 Define vapour pressure, understand the relation between vapor pressure and boiling point
2.17 Know the effect of temperature on vapor pressure
2.18 Know the methods of evaluation of vapor pressure
(a) Antoine equation
(b) Clausius – Clapeyron equation.
(b) Vapor pressure reference substance plot - Cox chart, Duhring‘s lines
2.19 Ideal solutions and Non-Ideal solutions. Differences between Ideal and Non-Idealsolutions
2.20 Define (a) Raoult‘s Law (b) Henry‘s Law for solutions
2.21 Numerous problems on all the above topics

(d) Humidity and Saturation:

2.22 Define and explain the following.
(a) Un-saturation, Saturation
(b) Humidity, Absolute humidity, Relative Humidity, Molal absolute humidity, %Saturation
(c) Dew Point
2.23 Know about Dry and wet bulb temperature
2.24 Numerous problems on all the above topics

3.0 Material balance without chemical reactions:

3.1 Know Unit operation and Unit Process. Give Examples
3.2 Know about representation of unit operations/unit processes by a process flow chart or ablock diagram
3.3 Know the basis for material balances
3.4 Understand the terms in the general material balance equation
3.5 Define and explain tie substance, key component and inert substance
3.6 Establish the steps to solve material balance problems
3.7 Know about Degrees of Freedom
3.8 Know about steady and un-steady state mass balance
3.9 Solve material balance problems related to Evaporation
3.10 Solve material balance problems related to Drying
3.11 Solve material balance problems related to Mixing
3.12 Solve material balance problems related to Distillation
3.13 Solve material balance problems related to Extraction
3.14 Solve material balance problems related to Crystallization
3.15 Know about Bypass in continuous chemical processes with examples
3.16 Know about Recycle in continuous chemical processes with examples
3.17 Know about Purge streams in continuous chemical processes with examples
3.18 Know about Blow-down streams in continuous chemical processes with examples
3.19 Numerous problems on all the above topics

4.0 Material balance with chemical reactions:

4.1 Know about Stoichiometry, application of stoichiometry, stoichiometric equations, stoichiometric coefficients, and stoichiometric proportions .Give suitable examples
4.2 Define and explain (a) limiting component and (b) excess reactant
4.3 Understand % conversion in a chemical reaction
4.4 Understand % yield in a chemical reaction
4.5 Understand Degree of completion in a chemical reaction
4.6 Know about theoretical quantity of reactant
4.7 Know about selectivity of a chemical process
4.8 Solve problems related to oxidation of sulphur compounds
4.9 Solve problems related to recovery of metals and non-metals from ores
4.10 Solve problems related to all the above concepts

5.0 Energy balance:

5.1 Explain the terms internal energy and enthalpy
5.2 Define Heat and Work
5.3 State and explain 1st law of thermodynamics – problems related to 1st law
5.4 Derive the general energy balance equation for a steady flow process
5.5 Know the terms sensible heat, latent heat of fusion, latent heat of vaporization
5.6 Define Heat capacity and Specific heat
5.7 Explain the importance of mean heat capacity
5.8 Do the problems on heat requirement calculations, using $Q = mcp\Delta T$ and $Q = ncp\Delta T$
5.9 Know about exothermic, endothermic, adiabatic and isothermal reaction systems
5.10 Define and explain Heat of Formation , Heat of combustion and Heat of Reaction,
5.11 Know about Heat of Solution, Heat of Neutralization, Heat of mixing and Heat of Crystallization

6.0 Combustion process:

6.1 Distinguish between Partial and Complete Combustion
6.2 Define and explain Calorific values (Gross and Net Calorific values)
6.3 Calculate the calorific value of a fuel using Dulong's Formulae
6.4 Know about net hydrogen
6.5 Solve combustion problems related to refuse analysis
6.6 Explain the proximate and ultimate analysis of coal
6.7 Know about the composition of flue gas obtained after combustion of a fuel
6.8 Calculate the air requirement for combustion of a specific fuel
6.9 Know the compositions of fuel and flue gases, and calculate the flue gas analysis using fuel analysis
6.10 Calculate the fuel analysis using flue gas analysis for complete combustion and incomplete combustion
6.11 Solve problems related to combustion

Course code CHPP-305		Course Title: Mass and Energy Balance No of Course outcomes 07				No of periods: 75
POs	Mapped with CO No		CO periods addressing PO in Column 1		Level (1, 2, 3)	Remarks
			NO	%		
PO1	CO1, CO3, CO4, CO5	30	40	2	CO1, CO3, CO4, CO5	>40%- level 3 25%-40% level 2 5-25% : level 1 <5%: not addressed
PO2	CO2, CO3, CO4	29	39	2	CO2, CO3, CO4	
PO3	CO2	16	21	1	CO2	
PO4						
PO5						
PO6						
PO7						

Hyponated course content with Reference books:

1.0 Units and Dimensions:

Physical Quantities-Fundamental and Derived quantities-Unit and System of units-Formula, Units in System and Dimensional formula of different derived quantities-Area, Volume, Velocity, Acceleration,Density, Specific volume, Work done-Energy-Enthalpy-Power-Heat Capacity-Humidity-Mass flow rate-Momentum-Acceleration due to gravity-Volumetric flow rate-Viscosity-Specific heat-Latent heat-Surface Tension-Kinematic viscosity- Conversion factors for various fundamental quantities-Mass,Length, Time and Temperature from one system of unit to another system of unit-Conversion factors forvarious derived quantities- Force, Newton‘s Law conversion factor, Pressure, Work done, Heat, Power,Viscosity, Heat capacity, Latent heat, Specific heat, Kinematic Viscosity, Surface Tension, Density,Specific volume from one system of unit to another system of unit-Dimensionless groups-Reynoldsnumber, Prandt number, Nusselt number, Grashof number, Peclet number, Mach number, Schmidtnumber, Graetz number, Lewis number, Sherwood number, Stanton number-Conversion of one systemof equation into another system.

2.0 Basic Calculations:

(a) Stoichiometric and composition relationships:

Define Atom, Molecule, Mole, Gram–atom, Gram–molecule, Gram molar volume-Different methods ofexpressing concentration-Define Molarity, Normality, Molality, PPM, Weight percent, Volume percent, Mole percent, Analyse on dry basis and wet basis-Define Density and Specific gravity, specific gravityscales, Variation of density and specific gravity with temperature-Numerous problems on all the abovetopics.

(b) Behaviour of ideal gases:

Kinetic theory of gases-Gas laws: Boyle‘s law, Charles law, Gay-Lussac‘s law, Avogadro‘s law, Derivation of Ideal gas equation-Vander Waal‘s equation of state, Critical properties of substances-Idealgas constant–Derive the value of ideal gas constant in different system of units-Define and explainDalton‘s law of partial pressures, Amagat‘s law of partial volumes for gaseous

mixtures-Characteristicsof on Ideal gas, Differences between Ideal gas and Real gas-Derive the equation volume % = mole % =pressure % for an ideal gas mixture-Average molecular weight of a gas mixture-Density of a gaseous mixture-Numerous problems on all the above topics.

(c) Vapor Pressures:

Vapor pressure, Relation between vapor pressure and boiling point-Effect of temperature on vaporpressure-Methods of vapor pressure determination-Antoine equations, Clausius–Clapeyron equation-Vapor pressure reference substance plot -Cox chart, Duhring's lines-Ideal solutions and Non-Idealsolutions-Differences between Ideal and Non-Ideal solutions-Define (a) Raoult's Law (b) Henry's Lawfor solutions-Numerous problems on all the above topics.

(d) Humidity and Saturation:

Un-saturation, Saturation-Humidity-Absolute humidity-Relative Humidity-Molal absolute humidity-%Saturation-Dew Point-Dry and wet bulb temperature-Numerous problems on all the above topics.

3.0 Material balance without chemical reactions:

Unit operation and Unit Process-Give examples for unit operation and unit processes-Representation ofunit operations/unit processes by a process flow chart or a block diagram-Basis for material balances-Terms in the general material balance equation-Tie substance, key component and inert substance-Stepsto solve material balance problems-Degrees of Freedom-Steady and un-steady state mass balance-Material balance problems related to Evaporation-Material balance problems related to Drying-Materialbalance problems related to Mixing-Material balance problems related to Distillation-Material balanceproblems related to Extraction-Material balance problems related to Crystallization-Bypass incontinuous chemical processes with examples-Recycle in continuous chemical processes with examples-Purge streams in continuous chemical processes with examples-Blowdown streams in continuouschemical processes with examples-Numerous problems on all the above topics.

4.0 Material balance with Chemical Reactions:

Stoichiometry, application of stoichiometry, stoichiometric equations, stoichiometric coefficients, andstoichiometric proportions-Limiting component-Excess reactant- % conversion in a chemical reactionsystem-% yield in a chemical reaction system-Degree of completion in a chemical reaction system-Theoretical quantity of reactant-Selectivity of a chemical process-Oxidation of sulphur compounds-Recovery of metals and non-metals from ores-Problems related to all the above concepts.

5.0 Energy Balance:

Internal energy and enthalpy-Heat and Work-1st law of thermodynamics-Problems related to 1st law-General energy balance equation for a steady flow process-Sensible heat, Latent heat of Fusion, Latentheat of vaporization-Heat capacity and Specific heat-Importance of mean heat capacity-Problems onheat requirement calculations using $Q = mcp\Delta T$ and $Q = ncp\Delta T$-Exothermic, Endothermic, Adiabaticand Isothermal reaction systems-Heat of Reaction, Heat of Formation and Heat of combustion-Heat ofSolution, Heat of Neutralization, Heat of mixing and Heat of crystallization.

6.0 Combustion process:

Distinguish between Partial and Complete Combustion-Calorific values (Gross and Net Calorificvalues)-Calorific value of a fuel using Dulong's Formulae-Net hydrogen-Combustion problems relatedto refuse analysis-Proximate and ultimate analysis of coal-Composition of flue gas obtained aftercombustion of a fuel-Air requirement for combustion of a specific fuel-Compositions of fuel and fluegases, and calculate the flue gas analysis using fuel analysis-Fuel analysis using flue gas analysis forcomplete combustion and incomplete combustion-Problems related to combustion.

REFERENCE BOOKS:

S.No.	Book Title	Author	Publications
1	Chemical Process Principles	1. Olaf A. Hougen 2. Kenneth M.Watson 3. Ronald A.Ragatz	Asia Publishing House
2	Basic Principles and calculations in Chemical Engineering	1. David M.HimmelBleau	
3	Introduction to Stoichiometry (SI units)	1. K.A.Gavhane	NiraliPrakashan
4	Stoichiometry and Process Calculations	1. K.V.Narayanan 2. B.Lakshmikutty	Prentice Hall of India Pvt Limited, New Delhi
5	Stoichiometry (SI Units)	1. B.I.Bhatt 2. S.M.Vora	Tata McGraw-Hill Publishing company Limited, New Delhi
6.	Process Calculations	1. V.Venkataramani 2. N.Anantharaman	Prentice Hall of India Pvt Limited, New Delhi
7.	Process calculations for Chemical Engineers	1. Ch.DurgaPrasadaRao 2. D.V.S.Murthy	MACMillan India Limited

S.No.	Major Topics	No of Periods	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				COS mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Units and Dimensions	10	11	3		8		1		1		CO1, CO2
2.	Basic Calculations	20	24	6	8		10	2	1		1	CO1, CO2
3.	Material balance without Chemical Reactions	15	11	3	8			1	1			CO2, CO4, CO5
4.	Material balance with Chemical Reactions	10	17	9	8			3	1			CO2, CO4, CO5
5.	Energy balance	12	11	3	8			1	1			CO2, CO4, CO5
6.	Combustion	08	6	3	3			1	1			CO3
Total		**75**	**80**	**27**	**35**	**8**	**10**	**9**	**5**	**1**	**1**	

C-20, CH/CHPC/CHPP/CHOT-305

Subject Name: Mass and Energy Balance

Syllabus split up for Unit Test

Unit test No.	Learning out comes to be covered
Unit test-I	Chapters from 1 to 3
Unit test-II	Chapters from 4 to 6

Model paper

State Board of Technical Education and Training, A.P

Diploma in Chemical Engineering [DCHE, DCHE(PC/PP/OT)]

Subject Name: MASS AND ENERGY BALANCE

SUBJECT CODE: CH/CHPC/CHPP/CHOT-305

Unit Test-1

Time : 90minutes **Max Marks: 40**

PART-A **16 Marks**

Instructions: (1)Answer all questions 2X3=6 Marks

(2) First question carries 4marks and rest of the questionscarries 3marks

1. (a) Write the dimensional formulae for force --- ---- **(CO1)**

   (b)14.7psi = ----------Pa **(CO2)**

   (c) Units of viscosity in SI system are ---------- **(CO1)**

   (d) Name one dimensionless quantity ---------- **(CO1)**
2. Convert 1 BTU/ft^2-hr-^oF into SI units. **(CO2)**
3. State and explain Raoult's law. **(CO1)**
4. Find the quantity of H_2SO_4 required to prepare 500ml of 0.1N sulphuric acid solution **(CO2)**
5. Explain the terms (a) recycle (b) bypass. **(CO5)**

PART-B **8X3=24 Marks**

Instructions: (1) Answer all questions

(2) each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6. (a) A gas mixture has the following composition by volume: Ethylene 30.6%; Benzene 24.5%; Oxygen 1.3%; Methane 15.5%; Ethane 25.0%; Nitrogen 3.1%. Find (i) The average molar mass of the gas mixture,
   (ii) The composition by mass and
   (iii) The density of the gas mixture in Kg/m^3 at NTP. **(CO2)**

   (or)

   (b) A solution of potassium chloride in water contains 384 g KCl per litre of the solution at 300K. The specific gravity of the solution is 1.6. Determine the following:
   (i) the concentration in weight percent
   (ii) the mole fraction of KCl
   (iii) the molarity of the solution (d) the molality of the solution. **(CO2)**

7. (a) the solubility of sodium chloride in water at 290K is 35.8 kg/100kg of water. Express the solubility as the following (i) mass percent of NaCl (ii) mole percent of NaCl (iii) kmol of NaCl per 1000kg of Water **(CO2)**

   (or)

   (b) Explain various methods to express concentration. **(CO1)**

8. (a) It is required to make 1000 Kg mixed acid containing 60% H_2SO_4, 32% HNO_3 and 8% water by blending (a) the spent acid containing 11.3% HNO_3, 44.4% H_2SO_4 and 44.3% H_2O (b)aqueous 90% HNO_3, and (c) aqueous 98% H_2SO_4. (All percentages are by mass). Calculate the quantities of each of the three acids required for blending. **(CO2)**

(or)

(b) 10000 Kg/h of a solution containing 20% methanol is continuously fed to distillation column. Distillate (product) is found to contain 98% methanol and waste solution from the column carries 1% methanol. All percentages are by weight. Calculate

(i) the mass flow rates of distillate and bottom product and

(ii) the percent loss of methyl alcohol. **(CO2)**

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Model question paper

Q.No	Question	Blooms category	Marks allocated	CO addressed
	Part-A(30 marks)			
1.	Convert the following in to SI units? (a) 212 o F (b) 2 Btu/lb-mole	remembering	3	CO2
2.	Define the following terms: (a) Vapour pressure and (b) humidity	Remembering	3	CO1
3.	Write down the standard state condition in SI System?	Remembering	3	CO1
4.	Write briefly about the following items : (a) Ideal solution (b) ideal gas	Remembering	3	CO1
5.	Write short notes on the following : (a) Recycle (b) purge	Remembering	3	CO5
6.	Define the following items? (a) % conversion (b) % excess	Remembering	3	CO4
7.	An alcohol whose molecular weight is 74 analyses as C =64.87 %, H= 13.51 %, 21.62 % .What is its chemical formula?	Remembering	3	CO1, CO2
8.	What do you know about partial combustion and complete combustion?	Remembering	3	CO3
9.	Define the following terms : (a) Std.heat of reaction (b) Std. Heat of solution	Understanding	3	CO4, CO5
10.	Calculate the heat required to heat the water of mass 3.0kg from 298 (k) to 373 (k) ? Data: heat capacity of water = 4.1868 kj/kg (k)	Remembering	3	CO4, CO5
	Part-B(40 marks)			
11	The atmospheric air has the following composition by volume: N2=79%, O2=21 %. Then calculate (a) the average molecular weight of the air and (b) the weight % composition of the air, (c) density of the air at STP ? (or) A wet flue gas mixture has the following composition by Volume: CO2 =10.6 %, Oxygen=2.4%, nitrogen=84 % ,and H2O=3% Then Calculate the density of the flue gas at 50oC and 1.2 atmg. ?	understanding	8	CO1, CO2
12	. An aq. Solution of Na2CO3 is prepared by dissolving 20 g Na2CO3 in 100 g water at 20oC . The density of the solution is measured to	understanding	8	CO1, CO2

	be 1090 Kg/m3. find the molarity, Normality and weight% Na2CO3 of the solution? (or) An aq. Solution of Na2CO3 is prepared by dissolving 106 g Na2CO3 in 100 g water at 20oC . The density of the solution is measured to be 1100Kg/m3. Find the Molarity, Normality and molality of the solution?			
13	It is required to make a mixed acid containing 50 % H2SO4 , 42 % HNO3 , and 8 % water by blending (a) 200 kg the spent acid containing 19.3 % HNO3, 40.4 % H2SO4 , and 40.3 % water (b) aq. 85 % HNO3 and (c) aq. 98 % H2SO4 . All the Percentages are by weight. Calculate(a) the quantities of nitric acid and sulphuric acids to be added to spent acid and(b)the quantity of mixed acid produced ? (or) It is required to make 2000kg of mixed acid containing 48 % H2SO4, 42 % HNO3, and 10 % water by blending (a) the spent acid containing 19.3 % HNO3, 40.4 % H2SO4 and 40.3 % water (b) aq. 70 % HNO3 and (c) aq. 90 % H2SO4. All the Percentages are by weight. Calculate the quantities of each of the three acids to be mixed.	understanding	8	CO2, CO4, CO5 CO4, CO5
14	Calculate the Total pressure , and composition of vapours in contact with a Solution at 100oC containing 30 %benzene , 47% toluene , and 23% ortho- xylene by weight . Data : vapour pressure of benzene at 100oC =1340 mmHg vapour pressure of toluene at 100oC =560 mmHg vapour pressure of ortho-xylene at 100oC =210 mmHg (or) A wet paper pulp is found to contain 75% water. After drying, it is found that 65 % of the original water has been removed . Calculate the following: (a) The composition of the dried pulp (b) The mass of water removed per kilogram of wet pulp	application	8	CO1, CO2 CO4, CO5

15	In the Deacon process for the manufacture of chlorine, hydrochloric acid gas is Oxidised with air. The reaction taking place is: 4HCl +O2 → 2Cl2 + 2H2O If the air is used in excess of 20 % of that theoretically required, and if the oxidation is 80% complete , calculate the composition by weight of gases leaving the reaction chamber (Or) In the Deacon process for the manufacture of chlorine, hydrochloric acid gas is Oxidisedwith air. The reaction taking place is: $4HCl + O_2 \rightarrow 2C_{l2} + 2H_2O$ If the air is used in excess of 20 % of that theoretically required, and if the oxidation is 80% complete , calculate the composition by weight of dry gases leaving the Reaction chamber?	understanding	8	CO4, CO5
Part-C(10 marks)				
16	Recommend latest techniques for calculation of vapour pressures of liquids.	analysing	10	CO1, CO2

Course code	Course title	No. of periods/week	Totalno.of periods	Marks for FA	Marks for SA
CHPP-306	**CAD practice**	3	45	40	60

	in Chemical Engineering				

CAD practice in Chemical Engineering(CHPP-306)

Course title	**: CAD practice in Chemical Engineering(CHPP-306)**	
Course Objectives	(i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant experiments/exercises	
Course Outcomes	C01	Demonstrate the skill of planning and organizing experimental set up for a desired purpose
	C02	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems
	C03	Observe various parameters, their variations and graphically represent the same
	C04	Analyse the experimental results to draw inferences to make recommendations
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

Learning outcome

1. Introduction to CAD and its applications
   a. Features of CAD
   b. Starting and exiting
   c. Drawing screen creation , saving and opening a drawing
   d. Using pull down menu
   e. Key board input
   f. Setting of units and limits of a drawing
2. Drawing commands
   a. Understanding the coordinate systems- Absolute coordinates, relative coordinates, polar coordinates
   b. Creation of lines, arcs, rectangle, polygon, ellipse, donut, polylines and text.
   c. Selecting objects, erasing, undo, redo, oops
3. Modifying commands
   a. Copy, mirror, offset, array, move, rotate, scale, stretch, lengthen, trim, extend, break, chamfer, fillet, explode, editing text, hatching
4. Dimensioning
   a. Dimensioning commands, setting dimensioning style, linear dimensions, aligned, ordinate, radius, diameter, angular, editing a dimension, align text

5. Three dimensionalmodelling
    a. Viewing in three dimensions
    b. Types of three dimensional modelling i.e,wire frame models, surface models and solid models
    c. Editing of solids i.e, joining and substracting of solids.
6. Plotting of an CAD drawing using printer
7. Drawing of symbols for pumps and compressors.
8. Drawing of symbols for vertical and horizontal boiler
9. Drawing of symbols for pipe lines.
10. Flow sheet symbols
    a. Reducer, venturi meter, orifice meter, rotameter, sight flow indicator, pitot tube, burner , air trap bucket trap, vacuum trap, flat trap, separator, ejector
11. Draw the 2D drawings; Knuckle joint, screw jack.
12. Draw the following chemical equipments using CAD
    a) Double pipe heat exchangerb) Mixer
13. Drawing of symbols for agitator, absorbers, fractionating column
14. Basic instrument symbols
    a. Basic symbols for instrument with single service and function
    b. For combination to instrument or device with two services or functions for transmitters and for diaphragm valves
15. Draw the plant layout using CAD
    a. Sugar Industry b. Cement Industry

Course code	Course title	No. of periods/week	Totalno.of periods	Marks for FA	Marks for SA
CHPP-307	Electrical	3	45	40	60

	Technology Lab				

Course Objectives	(i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant experiments/exercises	
Course Outcomes	C01	Demonstrate the skill of planning and organizing experimental set up for a desired purpose
	C02	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems
	C03	Observe various parameters, their variations and graphically represent the same
	C04	Analyse the experimental results to draw inferences to make recommendations
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

List of experiments in Electrical Technology Lab.

1. Verification of ohms Law and Determination of the resistance of the given resistor.
2. Measurement of power in D.C. Circuit consisting of resistance in a) Series b) parallel

   c) Series and parallel combination.
3. Calibrate the given 1-phase energy meter (know how to connect the energy meter in a given circuit)
4. Study of starters a) 3-point starters b) D.O.L starters and c) star/Delta starters.
5. Obtain the speed control of D C Shunt Motor by Field control method.
6. Obtain the speed control of D C Shunt Motor by Armature control Method.
7. Measure the line voltage and phase voltage, line current and phase current in a given a) star connected load and b) Delta connected load.
8. Conduct the Load test on Single phase Capacitor type Induction Motor.
9. Measure the primary and secondary voltages of step-up Transformers and step down transformer
10. Single –phase circuit wiring (single-lamp controlled by a single-way switch)

    Single lamp controlled by two-way switch.

Course code	Course title	No. of periods/week	Totalno.of periods	Marks for FA	Marks for SA

CHPP-308	Organic & physical chemistry lab	6	90	40	60

S. No.	Major Topics	No. of periods
1.	Determination of Melting point of Solid Organic compounds. Determination of Boiling points of liquid organic compounds	05
2.	Detection of Elements	10
3.	Reactions of Functional groups	20
4.	Systematic identification of functional groups in an Organic Compound	20
5.	Preparation of Organic Compounds.	20
	Total	**45**

Course Objectives	(i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant experiments/exercises	
Course Outcomes	C01	Demonstrate the skill of planning and organizing experimental set up for a desired purpose
	C02	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems
	C03	Observe various parameters, their variations and graphically represent the same
	C04	Analyse the experimental results to draw inferences to make recommendations
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

Learning outcome

List of experiments in Organic and Physical Chemistry Lab.

1.0 Conduct

1.1 Determination of Melting Point of solid Organic Compounds.

1.2 Determination of Boiling Point of liquid organic Compounds.

2.0 Know detection of following elements present in organic compounds.

2.1 Carbon

2.2 Hydrogen

2.3 Oxygen

2.4 Nitrogen

2.5 Sulphur

2.6 Halogens.

3.0 Know Reactions of functional groups present in organic compounds.

3.1 Alcohols

3.2 Acids

3.3 Aldehydes
3.4 Ketones
3.5 Amines
3.6 Amides
3.7 Esters.

4.0 Understand Systematic identification of the functional groups in Organic compounds.

5.0 Understand Preparation of following Organic Compounds

5.1 Preparation of Acetanilide.
5.2 Preparation of Bromoacetanilide.
5.3 Preparation of Nitro Benzene.
5.4 Preparation of Azodye.
5.5 Preparation of Aspirin.

COURSE CONTENT:

1. Determination of Melting Points and Boiling Point of Organic Compounds.
2. Detection of elements Carbon – Hydrogen – Oxygen – Nitrogen – Sulphur – Halogens.
3. Reactions of functional groups – OH, -COOH, -CHO, -CO-R, $-NH_2$, $-CONH_2$, -COOR.
4. Identification of functional groups in an Organic Compound.
5. Preparation of organic Compounds – Acetanilide – Bromoacetanilide – Nitro Benzene – Azodye – Aspirin.

Course code	Course title	No. of periods/week	Totalno.of periods	Marks for FA	Marks for SA

CHPP-309	**Unit Operations-I Lab**	6	90	40	60

Course title : Unit Operations-I Lab(CHPP-309)		
Course Objectives	(i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant experiments/exercises	
Course Outcomes	C01	Demonstrate the skill of planning and organizing experimental set up for a desired purpose
	C02	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems
	C03	Observe various parameters, their variations and graphically represent the same
	C04	Analyse the experimental results to draw inferences to make recommendations
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

List of experiments:

1. Calibration of a given Rota meter
2. Verify the Bernoulli's equation using Bernoulli's apparatus.
3. Determination of frictional losses in various pipes and fittings
4. Determination of friction factor of various pipes in the given experimental set up.
5. Calculates the coefficient of discharge of venturi meter and draw graph between Cd VsN_{Re}.
6. Calculates the coefficient of discharge of orifice meter and draw graph between Cd VsN_{Re}.
7. Perform the test to determine the characteristics of a centrifugal pump and draw the characteristic curves.
8. Identification of the laminar and turbulent flow using Reynolds apparatus.
9. Verification of Fourier's law of heat conduction through composite walls.
10. Verification of Fourier's law of heat conduction and determination of thermal conductivity of a metal bar.
11. Determination of overall heat transfer co-efficient in a double pipe heat exchanger for a

Counter current flow.

12. Determination of overall heat transfer co-efficient in a double pipe heat exchanger for a Co-current flow
13. Determination of overall heat transfer co-efficient in a shell and tube heat exchanger for a Counter current flow
14. Determination of overall heat transfer co-efficient in a shell and tube heat exchanger for a Co-current flow
15. Determination of heat transfer co-efficient for natural convection of air.
16. Determination of heat transfer co-efficient for forced convection of air
17. Determination of Stefan Boltzmann‘s constant.
18. Determination of emissivity of a test plate

IV SEMESTER

IVSemester

Subject Code	Name of the Subject	Instruction period / week-Mod(non-mod)		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CHPP - 401	Engineering Mathematics -III	3	-	45	3	20	80	100
CHPP -402	Process Technology	6	-	90	3	20	80	100
CHPP -403	Polymer additives and plastic testing	4	-	60	3	20	80	100
CHPP -404	Polymer products and polymer processing	5	-	75	3	20	80	100
CHPP -405	Basic Mechanical Engineering	4	-	60	3	20	80	100
CHPP-406	Unit Operations-II	5		75	3	20	80	100
PRACTICAL:								
CHPP -407	Unit Operations – II Lab	-	3	45	3	40	60	100
CHPP -408	Communication skills	-	3	45	3	40	60	100
CHPP -409	Polymer testing and polymer technology lab	-	3	45	3	40	60	100
CHPP -410	Process Technology Lab	-	6	90	3	40	60	100
Total		**27**	**15**	**630**		**280**	**720**	**1000**

CHPP-401, 408 common to all branches
CHPP-402,405, 406, 407, 410 common to DCHE(PC/OT)
CHPP-403, 404, 409 not common to any course

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ENGINEERING MATHEMATICS-III

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
CHPP-401	Engineering Mathematics-III	3	45	20	80

S.No.	Unit Title	No. of periods	COs mapped
1	Higher order Linear Differential equations with constant coefficients	15	CO1
2	Laplace Transforms	18	CO2
3	Fourier Series	12	CO3
	Total Periods	**45**	

Course Objectives	(i) To learn the principles of solving differential equations of second and higher order. (ii) To comprehend the concept of Laplace transformations and inverse Laplace transformations. (iii) To understand the concept of Fourier Series expansion of functions.

Course Outcomes	CO1	Solve homogeneous and non-homogeneous differential equations of second and higher order.
	CO2	Find Laplace and inverse Laplace transforms of various functions.
	CO3	Expand given functions as Fourier series and half- range Fourier Sine and Cosine series.

ENGINEERING MATHEMATICS – III

Learning Outcomes

Unit-I

Differential Equations of higher order

C.O. 1 Solve homogeneous and non-homogeneous differential equation of second and higher order.

L.O 1.1 Solve Differential equations of the type $(aD^2 + bD + c)\, y = 0$ where a, b, c are real numbers and provide examples.

1.2 Solve higher order homogeneous differential equations with constant coefficients and provide examples.

1.3 Define complementary function, particular Integral and general solution of a non-homogeneous differential equation.

1.4 Describe the methods of solving *f(D) y = X* where *f(D)* is a polynomial of n^{th} order and *X* is a function of the forms $k,\ e^{ax},\ \sin ax, \cos ax,\ x, x^n$ and their linear combinations where n is a positive integer, with examples.

Unit-II

Laplace Transforms

C.O. 2 Find Laplace and inverse Laplace transforms of various functions.

L.O. 2.1 Define Laplace Transform and explain the sufficient conditions of existence of Laplace Transform

2.2. Obtain Laplace transforms of standard functions and solve simple problems.

2.3 Write the properties of Laplace Transform – Linearity property, First shifting theorem (without proof) and Change of Scale property and solve simple problems.

2.4. Write the Laplace Transform of unit step function and second shifting theorem (without proof) and solve simple problems.

2.5. Write formulae for Laplace transform of functions with multiplication by t^n and division by t, Laplace transform of derivatives, evaluation of some definite integrals using Laplace Transforms and solve simple problems.

2.6 Define inverse Laplace Transform, obtain inverse Laplace Transforms of standard functions and solve simple problems.

2.7 Write linearity property, first and second shifting theorems (without proof), change of scale property of inverse Laplace transform and solve simple problems.

2.8 Write inverse Laplace transforms of derivatives and integrals and solve simple problems.

2.9 Write inverse Laplace transforms of functions with multiplication by s and division by s and solve simple problems.

2.10 Write inverse Laplace transforms of functions using partial fractions and solve some simple problems.

2.10 Define convolution of two functions, state convolution theorem (without proof) and solve simple problems.

Unit-III

Fourier series

C.O. 3 Expand given functions as Fourier series and half- range Fourier Sine and Cosine series

L.O. 3.1 Define the orthogonality of functions in an interval.

3.2 Define Fourier series of a function in the intervals $(c,\ c+2\pi)$ and $(c,\ c+2l)$ and write the Euler's formulae for determining the Fourier coefficients.

3.3 Write sufficient conditions for the existence of Fourier series expansion of a function.

3.4 Find Fourier series of simple functions in the range (0 , 2π) and (-π , π)

3.5 Write Fourier series for even and odd functions in the interval $(-\pi,\ \pi)$ and $(-l, l)$ expand simple functions.

3.6 Write Fourier series expansion of a function over the interval (0, 2l) and $(-l,\ l)$ and expand simple functions.

3.7 Write half-range Fourier sine and cosine series of a function over the interval (0, π) and $(0,\ l)$ and expand simple functions.

Engineering Mathematics – III

CO/PO - Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	2	1	1				2	3	2
CO2	3	3	3	3				3	3	3
CO3	3	3	3	3				3	3	3
Avg	**3**	**2.66**	**2.33**	**2.33**				**2.66**	**3**	**2.66**

3 =Strongly mapped (High), **2 =** Moderately mapped (Medium), **1 =** Slightly mapped (Low)

Note:

PO5: Appropriate quiz programme may be conducted at intervals and duration as decided by concerned teacher.

PO6: Seminars on applications of mathematics in various engineering disciplines are to be planned and conducted.

PO7: Such activities are to be planned that students visit library to refer standard books on Mathematics and latest updates in reputed national and international journals, attending seminars, learning mathematical software tools.

PSO1: An ability to understand the concepts of basic mathematical concepts and to apply them in various areas like computer programming, civil constructions, fluid dynamics, electrical and electronic systems and all concerned engineering disciplines.

PSO2: An ability to solve the Engineering problems using latest software tool, along with analytical skills to arrive at faster and appropriate solutions.

PSO3: Wisdom of social and environmental awareness along with ethical responsibility to have a successful career as an engineer and to sustain passion and zeal for real world technological applications.

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Engineering Mathematics – III

PO- CO – Mapping strength

PO no	Mapped with CO no	CO periods addressing PO in column I		Level (1,2 or 3)	Remarks
		No	%		
1	CO1, CO2, CO3	45	100%	3	>40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5% to 25% Level 1 Low addressed <5% Not addressed
2	CO1, CO2, CO3	37	82.2%	3	
3	CO1, CO2, CO3	32	71.1%	3	
4	CO1, CO2, CO3	32	71.1%	3	
5					
6					
7					
PSO 1	CO1, CO2, CO3	37	82.2%	3	
PSO 2	CO1, CO2, CO3	45	100%	3	
PSO 3	CO1, CO2, CO3	36	80%	3	

ENGINEERING MATHEMATICS – III

(Common Subject)

Course Content

Unit I: Differential Equations of higher order

1. Solve Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.
2. Solve Non-homogenous linear differential equations with constant coefficients of the form f(D)y = X where X is in the form k(constant), e^{ax}, sinax, cosax, x^n, where n is a positive integer, finding complimentary function, particular integral and general solution.

Unit II: Laplace Transforms

3. Definition, sufficient conditions for existence of LT, LT of elementary functions, linearity property, state first shifting theorem, change of scale property, multiplication by t^n, division by t, LT of derivatives and integrals, LT of unit step function, state second shifting theorem, inverse Laplace transforms- state shifting theorems and change of scale property, multiplication by s^n and division by s, derivatives, integrals, examples of inverse LT using partial fractions, state convolution theorem with simple examples.

Unit III: Fourier series

4. Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c\ ,\ c+2\pi)$ and $(c\ ,\ c+2l)$, Euler's formulae , sufficient conditions for existence of Fourier series expansion of a function, Fourier series expansion of basic functions limited to k(constant), $x, x^2, \sin ax, \cos ax, e^{ax}$ and their combinations over the intervals

$(0, 2\pi), (-\pi, \pi), (0, 2l), (-l, l)$, Fourier series for even and odd functions over $(-\pi, \pi)$ and $(-l, l)$, Fourier half-range sine and cosine series over $(0, \pi)$ and $(0, l)$

Textbook:

Engineering Mathematics-I, a textbook for first year diploma courses, prepared & prescribed by SBTET, AP.

Reference Books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers
2. M.R. Spiegel, Schaum's Outline of Laplace Transforms, Schaums' Series
3. M.Vygodsky, Mathematical Handbook: Higher Mathematics, Mir Publishers, Moscow.

Blue print

S. No	Chapter/ Unit title	No of Periods	Weightage allotted	Marks wise distribution of weightage				Question wise distribution of weightage				COs mapped
				R	U	Ap	An	R	U	Ap	An	
1	Unit – I Higher order Linear Differential equations with constant coefficients	15	28	11	11	3	3	2	2	1	1	CO1
2	Unit - II Laplace Transforms	18	33	11	11	11	0	2	2	2	0	CO2
3	Unit - III Fourier Series	12	19	3	3	3	10	1	1	1	1	CO3
Total		**45**	**80**	**25**	**25**	**17**	**13**	**5**	**5**	**4**	**2**	

R: Remembering Type : 25 Marks
U: understanding Type : 25 Marks
Ap: Application Type : 17 Marks
An: Analysing Type : 13 Marks

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Engineering Mathematics – III

Unit Test Syllabus

Unit Test	Learning Outcomes to be Covered
Unit Test-I	From LO 1.1 to 2.5
Unit Test-II	From LO 2.6 to 3.7

State Board of Technical Education and Training, A. P
First Year
Subject name: Engineering Mathematics-III
Sub Code: CHPP -401

Time : 90 minutes **Max.marks:40**

Part-A **16Marks**

Instructions: **(1) Answer all questions.**
(2) First question carries four marks and the remaining questions carry three marks each

1. Answer the following:
   a. Write the auxiliary equation for given differential equation $\left(D^2+4\right)y=0$ **(CO1)**
   b. For given differential equation $f(D)y=0$, if roots of auxiliary equation are 1,-1,then $y=$ _____ **(CO1)**
   c. $L\left\{e^{3t}\right\}=$ _____ **(CO2)**
   d. $L\{f(t)\}=\overline{f}(s)$ then $L\left\{e^{at}f(t)\right\}=\overline{f}(s+a)$: State TRUE/FALSE **(CO2)**
2. Solve $\left(D^2-2D+1\right)y=0.$ **(CO1)**
3. Find the particular integral of $\left(D^2+D+4\right)y=e^x$ **(CO1)**
4. Evaluate $L\left\{(t-1)^2\right\}$ **(CO2)**
5. Evaluate $L\left\{t^2+2\cos t+3\sin t\right\}$ **(CO2)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Solve $\left(D^4-5D^2+4\right)y=0.$ **(CO1)**
   or
   B) Solve $\left(D^2+D-6\right)y=1+e^{-3x}.$ **(CO1)**
7. A) Solve $\left(D^2+3D+2\right)y=x^2+\sin x.$ **(CO1)**
   or
   B) Solve $\left(D^2-D\right)y=2e^x+3\cos x.$ **(CO1)**
8. A) Evaluate $L\left\{e^{3t}\cos^2 t\right\}$ **(CO2)**
   or
   B) Evaluate $L\left\{e^t(t+1)^2\right\}$

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Unit Test II

State Board of Technical Education and Training, A. P
First Year
Subject name: Engineering Mathematics-III
Sub Code: CHPP-401

Time : 90 minutes **Max.Marks:40**

Part-A **16Marks**

Instructions: **(1) Answer all questions.**
(2) First question carries four marks and the remaining questions carry three marks each

1. Answer the following:

   a. $L\{f(t)\} = \overline{f}(s)$ then $L\{tf(t)\} = -\frac{d}{ds}\left(\overline{f}(s)\right)$: State TRUE/FALSE **(CO2)**

   b. $L^{-1}\left\{\frac{1}{s-3}\right\} = ?$ **(CO2)**

   c. $L^{-1}\left\{\frac{1}{s^2+a^2}\right\} = ?$ **(CO2)**

   d. Write the Fourier series for the function $f(x)$ in the interval $c < x < c+2\pi$. **(CO3)**

2. Evaluate $L\{te^t\}$. **(CO2)**

3. Evaluate $\int_0^\infty e^{-3t}\sin 4t dt$. **(CO2)**

4. Evaluate $L^{-1}\left\{\frac{3}{s+4} + \frac{2}{s^2+16} - \frac{s}{s^2-4}\right\}$. **(CO2)**

5. Evaluate Fourier coefficient a_0 for $f(x)$ in the interval $(-\pi, \pi)$. **(CO3)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions.**
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6. A) Evaluate $L\{te^{-t}\cos t\}$. **(CO2)**

   or

   B) Evaluate $L\left\{\frac{\cos at - \cos bt}{t}\right\}$. **(CO2)**

7. A) Evaluate $L^{-1}\left\{\frac{s}{(s+1)(s^2+1)}\right\}$. **(CO2)**

or

B) Evaluate $L^{-1}\left\{\frac{s}{(s-1)^4}\right\}$. **(CO2)**

8. A) Obtain the Fourier series for the function $f(x)=e^x$ in the interval $(0,2\pi)$. **(CO3)**

or

B) Obtain the half range Fourier cosine series of $f(x)=x^2$ in $(0,1)$. **(CO3)**

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END EXAM MODEL PAPER
STATE BOARD OF TECHNICAL EDUCATION, A.P
ENGINEERING MATHEMATICS –III CHPP- 401

TIME : 3 HOURS **MODEL PAPER- I** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. Solve $\left(D^2-3D+2\right)y=0.$ **CO1**
2. Solve $\left(D^2+D+1\right)y=0.$ **CO1**
3. Find the particular integral of differential equation $\left(D^2+4\right)y=\sin 2x.$ **CO1**
4. Find the particular integral of differential equation $\left(D^2+3D+2\right)y=e^{3x}.$ **CO1**
5. Find $L\left\{2e^{3t}+\sin 3t+\cosh t\right\}.$ **CO2**
6. Find $L\left\{e^t\cos 4t\right\}.$ **CO2**
7. Find $L^{-1}\left\{\frac{1}{s^2}+\frac{4}{s^2+4}+\frac{3s}{s^2-9}\right\}.$ **CO2**
8. Find the value of a_0 in the Fourier expansion of $f(x)=e^x$ in the interval $(0,2\pi).$ **CO3**
9. Find the Fourier coefficients of $f(x)$ in the interval $(-\pi,\pi).$ **CO3**
10. Find the value of a_1 in the half range cosine series of $f(x)=k$ in the interval $(0,\pi).$ **CO3**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11. A) Solve $\left(D^3-6D^2+11D-6\right)y=0.$ **CO1**

    Or

    B) Solve $\left(D^2-9\right)y=e^{3x}+e^{-3x}.$ **CO1**

12. A) Solve $\left(D^2-4D+4\right)y=\sin 3x.$ **CO1**

    Or

    B) Solve $\left(D^2+2D+2\right)y=x^2+x+1.$ **CO1**

13. A) Evaluate $L\left\{te^t\cos t\right\}.$ **CO2**

    Or

    B) Evaluate $L\left\{t^2\cos 2t\right\}.$ **CO2**

14. A) Evaluate $L\left\{\frac{\sin 5t\sin t}{t}\right\}.$ **CO2**

    Or

    B) Evaluate $\int_0^\infty \frac{\sin t}{t}dt.$ **CO2**

15. A) Find $L^{-1}\left\{\frac{1}{s(s+1)(s+2)}\right\}$. **CO2**

Or

B) Using convolution theorem find $L^{-1}\left\{\frac{s}{(s^2+1)(s^2+4)}\right\}$. **CO2**

PART-C

Answer the following question. Question carries TEN marks. **1x10=10M**

16. Find the Fourier expansion of $f(x)=x+x^2$ in the interval $(-\pi,\pi)$ and hence deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+=\frac{\pi^2}{12}$. **CO3**

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STATE BOARD OF TECHNICAL EDUCATION, A.P

ENGINEERING MATHEMATICS –IIICHPP-401

TIME : 3 HOURS **MODEL PAPER- 2** **MAX.MARKS : 80M**

PART-A

Answer All questions. Each question carries THREE marks. **10x3=30M**

1. Solve $\frac{x^2}{16}+\frac{y^2}{25}=1$ **CO1**
2. Solve $\int_1^{11} x^3 dx$ **CO1**
3. Find the particular integral of differential equation $2\sin x\frac{dy}{dx}-y\cos x=xy^3e^x.$ **CO1**
4. Find the particular integral of differential equation $\int\left(3e^x-2\cos x+\frac{3}{x}\right)dx.$ **CO1**
5. Find $\int\cos^2 2x dx.$ **CO2**
6. Find $\int\frac{\tan^{-1}x}{1+x^2}dx.$ **CO2**
7. Find $L^{-1}\left\{\frac{1}{s^2}+\frac{4}{s^2+4}+\frac{3s}{s^2-9}\right\}.$ **CO2**
8. Find the value of a_0 in the Fourier expansion of $i=a\sin t$ in the interval $x^2+y^2=9$ **CO3**
9. Write Euler's formula of Fourier expansion of $f(x)$ in the interval $x=2$ **CO3**
10. Find the value of a_1 in the half range cosine series of $\frac{dy}{dx}=e^{2x+y}$ in the interval $(0,\pi).$ **CO3**

PART-B

Answer All questions. Each question carries EIGHT marks. **5x8=40M**

11.A) Solve $\int\frac{1}{2x^2+3x+5}dx.$ **CO1**

Or

B) Solve $\int\sin^3 x\cos^5 x dx.$ **CO1**

12.A) Solve $\left(D^2-3D+2\right)y=\cos 3x.$ **CO1**

Or

B) Solve $\int e^{2x}x^4 dx.$ **CO1**

13.A) Evaluate $\int_0^1\frac{\sec^2 x}{(1+\tan x)^2}dx.$ **CO2**

Or

B) Evaluate $L\left\{t^2\cos 2t\right\}.$ **CO2**

14. A) Evaluate $y=x^2$ **CO2**

Or

B) Using Laplace transforms evaluate $y = 3x + 4$ **CO2**

15. A) Find $\sqrt{\log x}$ **CO2**

Or

B) Using convolution theorem find $L^{-1}\left\{\frac{1}{(s^2+1)(s+1)}\right\}$. **CO2**

PART-C

Answer the following question. Question carries TEN marks. **1x10=10M**

16. Find the Fourier expansion of $x = e^2$ in the interval π and hence deduce that $\int_0^1 \frac{1}{1+x^2}\,dx$

CO3

***

C20_Process Technology_CHPP-402

Course code	Course title	No.Of Periods / week	Totalnumber of periods	Marks for FA	Marks for SA
CHPP-402	Process Technology	6	90	20	80

S.No.	Chapter/unit title	No of Periods	CO's mapped
1.	Basic industrial chemicals	12	CO1, CO2, CO4, CO5
2.	Water and Fertilizer industry	19	CO1, CO2, CO5
3.	Industrial gases and Inorganic products	15	CO1, CO2, CO5
4.	Coal chemicals, Petroleum refining and Petrochemical industry	17	CO1, CO3, CO5
5.	Oils, fats, soap, Pulp, Paper and Sugar industry	16	CO1, CO3, CO5
6.	Polymerization, Rubber polymer and Rubber industries	11	CO1, CO3, CO5
Total		**90**	

Course objectives:

1. To familiarize with different chemical products, unit operations used in the processes.
2. To know the use of unit operations in the manufacturing processes.
3. To understand and reinforce the unit operations concepts in various chemical processes for better production results.

COURSE OUTCOMES

Course outcomes	CO1	CHPP-402.1	Describe the basic concepts, fundamentals, Sources and raw materials (feed stocks) involved in the manufacture of various inorganic and organic chemicals.
	CO2	CHPP-402.2	Illustrate the manufacturing processes of various Inorganic chemicals with the aid of process flow diagram.
	CO3	CHPP-402.3	Illustrate the manufacturing processes of various Organic chemicals with the aid of process flow diagram.
	CO4	CHPP-402.4	Summarize the properties of various inorganic and organic products.
	CO5	CHPP-402.5	Appraise the Uses and industrial applications of various inorganic and organic chemicals.

CO-PO/PSO MATRIX:

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-402.1	3							2		
CHPP-402.2			3						2	1
CHPP-402.3			3							1
CHPP-402.4				2					2	
CHPP-402.5			2						2	
AVERAGE	**3**		**3**	**2**				**2**	**2**	**1**

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Learning outcome:

1.0 Basic industrial chemicals.

1.1 State different industrial manufacturing methods HCl and its uses
1.2 State and explain the manufacturing of sodium carbonate by solvay process and uses of soda ash
1.3 State and explain the manufacturing of sodium hydroxide through electrolytic process, and its properties and uses.
1.4 State and explain the manufacturing of ammonia through steam reforming of naphtha or natural gas, properties and uses of ammonia
1.5 State and explain the manufacture of nitric acid, properties and uses of HNO3
1.6 State and explain the manufacturing process of sulfuric acid by double absorption and double contact process , properties and uses of H2SO4
1.7 State and explain the manufacturing method of sodium sulfate from naturally occurring Glauber's salt, properties and uses of sodium sulphate

2.0 Water and Fertilizer industry.

2.1 List 4 sources of water.
2.2 State the impurities and mineral matter present in water.
2.3 Classify various scales formed and method of removal of scales due to impurities in water.
2.4 Explain the process of purification of water by ion – exchange method.
2.5 Explain permutit method of water purification.
2.6 Explain the stages involved in municipal water treatment.
2.7 Explain sewage water treatment of process plants.
2.8 List the industrial uses of urea, phosporic acid, calcium phosphate, ammonium phosphate, ammonium sulphate, super phosphate and N-P-K fertilizers
2.9 Explain the manufacturing method of urea by Total recycle using ammonia and carbon dioxide.
2.10 Explain the manufacturing of phosphoric acid by wet process
2.11 Explain the manufacturing process of mono calcium phosphate and a di calcium phosphate
2.12 Explain the manufacturing process of monoammonium phosphate (MAP) and diammonium phosphate (DAP).
2.13 Explain the process of making of ammonium sulphate.
2.14 Explain the manufacturing process of single super phosphate and triple super phosphate.
2.15 Explain the manufacture of mixed fertilizers (n-p-k) grades.

3.0 Industrial gases and Inorganic products.

3.1 State two methods of manufacturing of oxygen and nitrogen.
3.2 Explain the concept of conventional linde cycle.
3.3 Explain the manufacturing of oxygen and nitrogen by liquefaction and rectification of air using conventional linde double column rectifier and main condenser.
3.4 List the industrial applications of nitrogen, oxygen, carbon dioxide, silicon carbide, calcium carbide and glass
3.5 State 4 sources of carbon dioxide.
3.6 Explain the manufacture of carbon dioxide from molasses fermentation method
3.7 Explain the manufacture of cement by wet and dry process.
3.8 Explain the manufacturing of silicon carbide and calcium carbide.
3.9 Explain the manufacturing of soda glass.

4.0 Coal chemicals, Petroleum refining and Petrochemical industry.

4.1 Explain the formation of coal.
4.2 List the grades of coal, chemicals obtained from coal, coal tar.

4.3 Explain about coke, coal gas, water gas, producer gas and synthesis gas,
4.4 Explain high temperature carbonization of coal.
4.5 Explain the recovery of chemicals when coal is subjected to coking.
4.6 Explain coal tar distillation
4.7 Describe the origin of crude petroleum.
4.8 Explain the atmospheric distillation and vacuum distillation of crude petroleum in a refinery to obtain different cuts.
4.9 Explain the principles of cracking and process of catalytic cracking.
4.10 Explain the principles of catalytic reforming and process of catalytic reforming.
4.11 State the feed stocks desirable to manufacture different petrochemicals.
4.12 State the petrochemicals obtained from methane, ethylene, propylene and butylene
4.13 Explain the manufacturing process of chloromethanes from methane.
4.14 State the uses of methane, ethylene, propylene and butylene..

5.0 Oils, fats, soaps, Pulp, Paper and Sugar industry.

5.1 Distinguish between fats and oils
5.2 Explain the process of extraction of vegetable oil from seeds using mechanical expeller and solvent extraction method.
5.3 List the raw materials required in the manufacture of soap, pulp and paper.
5.4 Explain the continuous process for the production of soap.
5.5 Explain the recovery of glycerine from soap industry.
5.6 State the two processes followed to produce pulp.
5.7 Explain the sulphate or Kraft process to manufacture pulp.
5.8 Explain the industrial method of manufacturing paper from sulphate pulp.
5.9 Explain the process to which the black liquor should be subjected to recover its chemical constituents for reuse in the manufacture of pulp.
5.10 Explain inversion of sugar.
5.11 Explain the manufacture of sugar from sugar cane.
5.12 Explain the manufacture of industrial alcohol (ethyl alcohol) from molasses.
5.13 List the industrial applications of alcohol (ethyl-alcohol), sugar, glycerine

6.0 Polymerization, Rubber polymer and Rubber industries.

6.1 Differentiate polymer compounds from plastics.
6.2 State the different varieties of polymers and plastics.
6.3 Distinguish between thermoset and thermo plastic.
6.4 Explain the manufacturing method of LDPE, HDPE.
6.5 State the industrial applications of polyethylene.
6.6 Understand the classification of rubbers.
6.7 Explain the manufacturing process of ethyl benzene and styrene.
6.8 Explain the manufacturing of butadiene.
6.9 Explain the manufacturing process of styrene- butadiene rubber.

Course code CHPP-402	Course Title: Process Technology No of Course outcomes 06				No of periods: 90
POs	Mapped with CO No	CO periods addressing PO in Column 1		Level (1, 2, 3)	Remarks
		NO	%		
PO1	CO1	27	30	2	>40%- level 3 25%-40% level 2 5-25% : level 1 <5%: not addressed
PO2					
PO3	CO2, CO3, CO5	53	59	3	
PO4	CO4	10	11	1	

Hyponated course contents

1. **Basic industrial chemicals:**
   Industrial uses of hydrochloric acid, soda ash, caustic soda, ammonia, nitric acid, sulphuric acid, sodium sulphate-Industrial manufacturing methods of sodium carbonate, NaOH, HNO3, sulphuric acid, sodium sulphate- manufacturing processes of HCl, Na2CO3, NaOH, NH3, HNO3, H2SO4,Na2SO4-types of electrolytic cells- cell notations of diaphragm cells, membrane cells and mercury cells
2. **Water and Fertilizer industry :**
   Sources of water-impurities and mineral material present in water-scale formation - methods of removal of scales-, softening of water by ion– exchange and permutit methods- stages involved in municipal water treatment, sewage water treatment. Manufacture of Urea, H3PO4, mono and di calcium phosphates, MAP and DAP, Ammonium phosphate, single super phosphate, triple super phosphate, mixed fertilizers, Industrial applications of urea, H3PO4, ammonium sulphate
3. **Industrial gases and Inorganic products :**
   Industrial manufacturing methods of oxygen and nitrogen, CO2, cement, glass - linde cycle concept-, manufacturing processes of oxygen and nitrogen, CO2 , SiC, CaC2, Cement, glass-applications of O2 and N2, carbon dioxide, SiC, CaC2, soda glass.
4. **Coal chemicals, Petroleum refining and Petrochemicals :**
   Formation of coal- grades of coal- chemicals from coal- coal gas, water gas, producer gas and synthesis gas and their applications-high temperature carbonization of coal-recovery of chemicals when coal is subjected to coking-coal tar distillation - chemicals obtained from coal tar distillation. Origin of crude petroleum-crude petroleum distillation and various refinery products- catalytic cracking, reforming principles. Feed stocks desirable to manufacture petrochemicals-petrochemicals obtained from methane, ethylene, propylene and butylene-manufacturing process of chloroethanes from methane
5. **Oils, fats, soaps, Pulp, Paper and Sugar industry :**
   Difference between Fats and oil -oil extraction by expeller and solvent extraction method - sources of raw materials required to soap production- production of soap, recovery of glycerin from soap Raw materials for pulp - major process to produce pulp, kraft or sulphate process to manufacture of pulp-manufacturing of paper from sulphate pulp- recovery of chemicals from black liquor manufacture of sugar from sugar cane-inversion of sugar-manufacturing of industrial alcohol (ethyl alcohol) -industrial applications of alcohol and sugar.
6. **Polymerization, Rubber polymer and Rubber industries :**
   Differentiate between polymer and plastics- thermo set and thermo plastic- manufacturing of LDPE, HDPE, and polyester, applications of polyethylene.

Classification of rubbers-manufacturing of styrene, butadiene and SBR.

REFERENCE BOOKS :

1. Shreves Chemical Process Industries – George T Austin.
2. Chemtech IIT – Vol. II, III and IV
3. Outlines of Chemical Technology by GopalaRao(Dryden).
4. Chemical Technology Vol – I and Vol – II by Sukla and Pandey.

Model blue print with weightages for blooms category and questions for each chapter and COs mapped

S.No.	Major Topics	No of Periods	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				Cos mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Basic industrial chemicals	12	11	3	8	-	-	1	1			CO1, CO2, CO4, CO5
2.	Water and Fertilizer industry	19	14	3	11			1	2			CO1, CO2, CO5
3.	Industrial gases and Inorganic products	15	14	11	3		-	2	1			CO1, CO2, CO5
4.	Coal chemicals, Petroleum refining and Petrochemical industry	17	16	3	3		10	1	1		1	CO1, CO3, CO5
5.	Oils, fats, soap, Pulp, Paper and Sugar industry	16	14	6	8			2	1			CO1, CO3, CO5
6.	Polymerization, Rubber polymer and Rubber industries	11	11	3	8			1	1			CO1, CO3, CO5
Total		**90**	**80**	**29**	**41**		**10**	**8**	**7**		**1**	

C-20, CHPC/CHPP/CHOT-402
Subject Name: Process Technology
Syllabus split up for Unit Test

Unit test NO	Learning out comes to be covered
Unit test-I	Objectives from 1.1 to 3.13
Unit test-II	Objective from 4.1 to 6.11

Model Paper-1 **C-20, CHPP -402**

State Board of technical Education and Training, A.P

Diploma in Chemical Engineering (P&P)

IV SEMESTER

Subject Name: PROCESS TECHNOLOGY

Subject Code: CHPC/CHPP/CHOT-402

Time: 90 minutes **Unit Test I** **Max .Marks:40**

Part-A **16Marks**

Instructions: (1) Answer all questions.

(2) First question carries four marks; each question of remaining carries three marks

1. Write the use of the following chemicals:
   a) Ammonia:---------- **(CO5)**
   b) Sodium sulfate:---------- **(CO5)**
   c) Urea:---------- **(CO5)**
   d) Triple super phosphate :---------- **(CO5)**

2. Draw the neat sketch of Linde double column rectifier. **(CO2)**

3. Define Portland cement and write different types of cement. **(CO2)**

4. Write a short note on silicon carbide. **(CO1)**

5. Write the industrial applications of soda glass. **(CO5)**

Part-B **3X8=24**

Instructions: (1) Answer all questions.
(2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6 a) Explain the manufacturing of sodium hydroxide through electrolytic process with a neat flow sheet. **(CO2)**

(or)

b) Explain the manufacturing of nitric acid by ammonia oxidation process with a neat flow sheet **(CO2)**

7 a) Explain the process of purification of water by ion exchange method. **(CO2)**

(or)

b) Explain the manufacture of urea by total recycle method with a neat flow sheet. **(CO2)**

8 a) Explain the manufacturing method of phosphoric acid by sulphuric acid leaching. **(CO2)**

(or)

b) Explain the manufacture of mixed fertilizers with a neat flow sheet. **(CO2)**

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Model question paper

Q.No	Question	Blooms category	Marks allocated	CO adressed
Part-A(30 marks)				
1.	State 4 methods of preparation of HCl	remembering	3	CO1
2.	List the raw materials required and chemical reactions involved in the production of urea from ammonia and CO2	Remembering	3	CO1
3.	Explain the boiler troubles due to scales	understanding	3	CO1
4.	List the applications of SiC	Remembering	3	CO5
5.	Why closed circuit grinding is preferred than open circuit grinding during cement production	understanding	3	CO4
6.	List the chemicals obtained from coal	Remembering	3	CO1
7.	Distinguish between high temperature carbonization and low temperature carbonization	understanding	3	CO1
8.	List the chemicals required for sulphate and sulphite pulp	remembering	3	CO1
9.	List the by products obtained from sugar industry	remembering	3	CO1
10.	Give the classification of rubbers	remembering	3	CO1
Part-B(40 marks)				
11	Explain the manufacture of Na2CO3 with a flow sheet (or) Explain the manufacture of NaOH with a flow sheet	understanding	8	CO2
12	Explain the softening of water by ion exchange process.(or) Explain the manufacture of urea with a flow sheet	understanding	8	CO2

13	Explain the manufacture of CO2 from molasses with a flow sheet (or) Explain the manufacture of glass by continuous process with a flow sheet.	understanding	8	CO2
14	Explain the process of manufacture of paper from sulphate pulp with a flow sheet. (or) Explain the manufacture of sugar from cane with a flow sheet	understanding	8	CO3
15	Explain the process of manufacture of SBR rubber (or) Explain the manufacture of LDPE with a flow sheet	understanding	8	CO3
Part-C(10 marks)				
16	What is the need for cracking? Why fluidized catalytic cracking is preferred than fixed or moving bed catalytic cracking? Explain FCC with a sketch	analyzing	10	CO3

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CHPP – 403	Polymer Additives and Plastic Testing	04	60	20	80

Course Outcomes

CO1	Identify various test standard methods of plastics and Plastic materials.
CO2	Illustrate the testing methods for mechanical, physical, chemical, thermal, Electrical and optical properties of plastics.
CO3	Describe the test procedure of mechanical, physical, chemical, thermal, Electrical and optical properties of plastics.
CO4	Describe the working of equipment for mechanical, physical, chemical, thermal, Electrical and optical properties of plastics.
CO5	Find different additives used for plastics and their applications.

S.No.	Chapter/unit title	No. of periods	CO's Mapped
1.	Introduction to Testing of Plastics	03	**CO1**
2.	Testing of Mechanical Properties	12	**CO2 to CO4**
3.	Testing of Physical and Chemical Properties	15	**CO2 to CO4**
4.	Thermal, Electrical and Optical properties	15	**CO2 to CO4**
5.	Additives in Compounding	15	**CO5**
	TotalPeriods	**60**	

Course Outcomes

Course objectives

Course objectives	(i) To familiarize with the testing of plastics. (ii) To know the various test methods for mechanical ,physical ,chemical ,thermal, Electrical and optical properties of plastics. (iii) To understand additives used for compounding of plastics

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP -403.1	**2**	**2**	**3**	**1**	**1**	**1**		**2**	**1**	
CHPP -403.2	**2**	**3**	**3**	**2**	**2**		**1**	**3**	**2**	**1**
CHPP -403.3	**2**	**2**	**3**	**1**	**2**			**2**	**3**	
CHPP -403.4	**3**	**3**	**3**	**3**	**2**	**1**	**1**	**3**	**2**	**2**
CHPP -403.5	**2**	**2**	**3**	**1**	**2**			**2**	**2**	**2**
Average	**2.2**	**2.4**	**3.0**	**1.6**	**1.8**	**0.5**	**0.5**	**2.4**	**2.0**	**1.0**

Learning Outcome

1. Introduction to testing of Plastics.

1.1 Know the importance of testing
1.2 Know the various test standard methods
a)ASTM
b)BSI
c)DIN

d)DNA
e) ISI.

1.3 Know the various methods for identifying plastics.

2.0 Explain the test procedure of determination of following mechanical properties of plastics.

2.1 Tensile strength
2.2 Compression strength
2.3 Impact strength.
2.4 Flexural strength
2.5 Hardness
a) Rockwell hardness
b) Brinell hardness
2.6 Tear resistance
2.7 Abrasion resistance

3.0 Testing of Physical and Chemical Properties.

3.1 Viscosity
3.2 Molecular weight
3.3 Density
3.4 T_g and T_m
3.5 Ash content
3.6 Bulk density
3.7 Water Absorption
3.8 Water Vapour Transmission
3.9 Carbon Black in Olefin Plastics
3.10 Evaluating the Resistance of Plastics to Chemical Reagents
3.11 Volatiles Content of Composite materials
3.12 Moisture Content
3.13 Matrix Solids Content and Matrix Content of Composite

4.0 Explain the test procedure of the following thermal, electrical and optical properties.

Thermal properties

4.1 Introduction.
4.2 Thermal conductivity
4.3 Coefficient of Linear thermal expansion
4.4 H.D.T
4.5 Vicat softening temperature
4.6 Melt flow index
4.7 Melting point
4.8 Flammability.
4.9 Oxygen index
4.10Thermal Index

Electrical properties

4.11 Insulation Resistance
4.12 Dielectric constant
4.13 Tracking resistance.

Optical properties

4.14 Refractive index
4.15 Light transmission
4.16 Haze
4.17 Clarity
4.17 Gloss.

4.18 Degree of yellowness

5.0 Polymer additives and compounding.

5.1 Importance of additives and their selection criteria for commercial polymers

5.2 Additives for plastics and their function ,formulations and their compounding procedures

a) Antioxidants,
b) Lubricants
c) Blowing agents
d) Stabilizing agents.
e) Vulcanizing agents
f) flame-retardants
g) Anti blocking agents
h) Anti static agents
i) Coupling agents
j) Accelerators
k) Plasticizers
l) Foaming agents
m) Cross linking agents
n) Metal deactivators
o) Additives for rubbers
p) Activators
q) Softeners
r) Colours and pigments
s) Surface property modifiers
t) fillers
u) U V light absorbers

Course code CHPP-403	**Course title : Polymer Additives and Plastic Testing Number of course outcomes:05**				**No. of periods: 60**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		**›40% Level 3 Highly addressed**
PO1	**CO2,CO3**	**38**	**51**	**3**	
PO2	**CO4, CO5**	**31**	**41**	**2**	
PO3	**CO1**	**6**	**8**	**1**	**25% to 40% Level 2 Moderately addressed**
PO4					
PO5					
PO6					**5 to 25% Level 1 Low addressed**
PO7					**‹5% Not addressed**

Hyponated course contents with Reference books

1. Importance of testing - various test standard methods-ASTM-BSI-DIN-DNA-ISI-Identification of plastics.

2. Testing of mechanical properties such as : Tensile strength – Compression strength –impact strength – Flexural strength – Hardness – Rockwell –Brinell hardness- Tear resistance-Abrasion resistance.
3. Testing of physical and chemical properties such as: Viscosity – Molecular weight – Density – T_g and T_m- Ash content- Bulk density-Water Absorption-Water Vapor Transmission-Carbon Black in Olefin Plastics-Evaluating the Resistance of Plastics to Chemical Reagents-Volatiles Content of Composite materials-Moisture Content-Matrix Solids Content and Matrix Content of Composite.
4. Test procedure of Thermal, electrical, optical properties such as – Thermal conductivity-coefficient of linear thermal expansion – HDT – Vicat softening point – Melt flow index – Melting point- Oxygen index-Thermal Index-flammability tests- Insulation resistance – Dielectric constant – Tracking resistance- Refractive index – light transmission- Haze – Clarity – Gloss- Degree of yellowness.

5. Additives and compounding of plastics-Stabilizers – Fillers – Antioxidants – Lubricants flameretardents – Colorants – Blowing agents – Antiblocking agents – Anti static agents – Coupling agents – Accelerators- Vulcanizing agents- Plasticizers- Foaming agents- Cross linking agents- Metal deactivators- Additives for rubbers- Activators- Softeners- Colors and pigments- Surface property modifiers-fillers- U V light absorbers.

REFERENCE BOOKS :

1. Polymer Technology – D.C. Miles and J.H. Briston.
2. Plastic Engineering hand book – M.L.Berins.
3. Additives for plastics by J. STEPEK AND H. DAOUST (SPRIGER SCIENCE AND BUSENESS MEDIA)
4. Plastic additives and Testing by MURALI SRINIVASAN, NATAMAI AND SUBRAMANIAN(wiley publications)
5. Plastic additives technology hand book by EIRI
6. Additives in Polymers by ALXANDER A BERLIN(CRC PRESS)

Model blue print with weightages for blooms category and questions for each chapter and COs mapped

S.No.	Major Topics	No of Periods	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				Cos mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Introduction to Testing of Plastics	03	11	3	-	-	-	1				**CO1**
2.	Testing of Mechanical Properties	12	14	3	16			1	2			**CO2 to CO4**

3.	Testing of Physical and Chemical Properties	15	14	6	8		-	2	1			**CO2 to CO4**
4.	Thermal, Electrical and Optical properties	15	16	9	8			2	2			**CO2 to CO4**
5.	Additives in Compounding	15	14	9	8		10	2	2	1		**CO5**
Total		**60**	**80**	**30**	**40**		**10**	**10**	**7**	**1**		

	S.No.	**Chapter/unit title**
Unit Test 1	1.	Introduction to Testing of Plastics
	2.	Testing of Mechanical Properties
	3.	Testing of Physical and Chemical Properties
Unit Test 2	4.	Thermal, Electrical and Optical properties
	5.	Additives in Compounding

C-20, CHPP-403
Subject Name: Polymer Additives and Plastic Testing
Syllabus split up for Unit Test

Unit test NO	**Learning out comes to be covered**
Unit test-I	Objective from 1.1 to 3.13
Unit test-II	Objective from 4.1 to 5.2

Model paper 1
State Board of Technical Education and Training, A.P
Diploma in Chemical Engineering (P&P)
Subject Name: Polymer Additives and Plastic Testing
SUBJECT CODE: CHPP-403
Unit Test-1

Time : 90minutes **Max Marks: 40**

PART-A **16** Marks

Instructions: (1)Answer all questions 2X3=6 Marks
(2) First question carries 4marks and rest of the questions carries 3marks

1) Tensile strength is measured by _____ **CO1**
   Impact strength is measured by_____ **CO1**
   Viscosity is measured by_____ **CO1**
   Hardness is measured by_____ **CO1**
2. What are the objectives of testing? **CO1**
3. What is significance of impact strength. **CO1**
4. Explain about fatigue. **CO1**
5. Explain about molecular weight. **CO2**

PART-B **8X3=24 Marks**

Instructions: (1) Answer all questions
(2) each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6) Explain the test procedure of compressive strength with neat sketch. **CO2**
(or)
7) What is test procedure of Izod test. **CO2**

8) Draw a neat sketch of Rockwell hardness and write. **CO2**
(or)
9) Explain Charpy test of impact strength with a neat sketch. **CO2**

10) Explain about density? Draw a neat sketch of density and write the test procedure? **CO2**
(or)
11) Explain about viscosity? Draw a neat sketch of viscosity measuring equipment and write the test procedure. **CO2**

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Model paper 1

State Board of Technical Education and Training, A.P

Diploma in Chemical Engineering (PP)

Subject Name: Polymer Additives and Plastic Testing

SUBJECT CODE: CHPP-403

Unit Test-II

Time : 90minutes **Max Marks: 40**

PART-A **16**Marks

Instructions*:* (1)Answer all questions 2X3=6 Marks

(2) First question carries 4marks and rest of the questionscarries 3marks

1)	Refractive index is measured by_____	**CO1**
	melt flow index is measured by_____	**CO1**
	Electrical conductivity is measured by_____	**CO1**
	Examples of Plasticizers_____	**CO1**
2)	Define Insulation resistance.	**CO1**
3)	Define opacity and explain it.	**CO1**
4)	write the uses of common Fillers.	**CO1**
5)	Write about the additives of Plasticizers.	**CO2**

PART-B **8X3=24 Marks**

Instructions: (1) Answer all questions

(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6)	Explain the test procedure of Thermal Conductivity.	**CO2**
	(or)	
7)	What is test procedure of coefficient of linear thermal expansion.	**CO2**
8)	What is test procedure of melt flow index (MFI).	**CO2**
	(or)	
9)	Explain the test procedure melting point.	**CO2**
10)	Explain the Additives of anti-blocking agents.	**CO2**
	(or)	
11)	Explain the additives of Blowing Agents.	**CO2**

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Model question paper

Q.No	Question	Blooms category	Marks allocated	CO addressed
Part-A(30 marks)				
1.	What are the objectives of testing	remembering	3	CO1
2.	Define Abrasion resistance	Remembering	3	CO2
3.	What are T_g and T_m	understanding	3	CO2
4.	Explain bout Carbon Black in Olefin Plastics	Remembering	3	CO4
5.	Explain about Degree of yellowness	understanding	3	CO5
6.	What is Tracking resistance	Remembering	3	CO4
7.	Explain about H.D.T	understanding	3	CO1
8.	What are the Additives of antioxidants	remembering	3	CO5
9.	Write short notes on U V light absorbers	remembering	3	CO1
10.	What are Softeners?	remembering	3	CO1
Part-B(40 marks)				
1	Explain the test procedure of compressive strength with neat sketch	understanding	8	CO2
2	Explain about abrasion resistance? Explain the test procedure with diagram.	understanding	8	CO3
3	Explain about Bulk density? Explain the test procedure to find Bulk density.	understanding	8	CO4
4	Explain the test procedure of Thermal Conductivity.	understanding	8	CO3
5	Define gloss? Explain about gloss meter.	understanding	8	CO2
Part-C(10 marks)				
6	What are the impacts adding different additives to the polymers	analyzing	10	CO5

POLYMER PRODUCTS AND POLYMER PROCESSING
CHPP-404

Course code	Course title	No. of periods/week	Totalno.of periods	Marks for FA	Marks for SA
CHPP -404	Polymer products and polymer processing	05	75	20	80

S.No.	Chapter/unit title	No. of periods	CO's Mapped
1.	Introduction to polymerization	10	**CO1**
2.	Properties, applications and manufacturing processes of addition polymers.	16	**CO1, CO2, CO3**
3.	Properties, applications and manufacturing processes of condensation polymers.	16	**CO1, CO2, CO3**
4.	Properties, applications and manufacturing processes of other polymers.	18	**CO1, CO2, CO3**
5.	Polymer processing techniques-1.	15	**CO5**
Total periods		**75**	

Course objectives

Course objectives	(i) To familiarize with different techniques of polymerization, and determination of molecular weight of polymers. (ii) To know the manufacturing process properties and applications of addition polymers and condensation polymers. (iii) To understand the processing techniques of polymers.

Course Outcomes

Course Outcomes	**CO1**	CHPP -404.1	Identify the raw materials for various polymers, illustrate the Polymerization techniques, find the molecular weight of the polymer
	CO2	CHPP -404.2	Explain the manufacturing processes of addition polymers, condensation polymers, and other polymers.
	CO3	CHPP -404.3	Compare the Properties of addition polymers, condensation polymers ,and other polymers.
	CO4	CHPP -404.4	Find the applications of addition polymers, condensation polymers and other polymers.
	CO5	CHPP -404.5	Illustrate the Processing techniques of polymers.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP -404.1	**3**	**2**	**3**		**1**			**3**		**1**
CHPP -404.2	**3**	**1**	**2**	**2**	**2**			**3**	**1**	**1**
CHPP -404.3	**3**	**2**	**3**	**2**	**2**			**3**	**2**	
CHPP -404.4	**3**	**1**	**2**	**2**	**2**			**3**	**2**	**1**
CHPP -404.5	**3**	**2**	**3**	**2**	**1**			**3**		**1**
Average	**3.0**	**1.6**	**2.6**	**1.6**	**1.6**	**0.0**	**0.0**	**3.0**	**1.0**	**0.8**

Learning Outcome

1.0. Introduction to polymerization

1.1 Raw materials for polymers(Oil ,natural gas ,coal)

1.2 Regenerable raw materials for polymers

1.3 Polymerization techniques
(a) Bulk polymerization, Explain with an example
(b) Solution polymerization, Explain with an example
(c) Emulsion polymerization, Explain with an example
(d) Suspension polymerization, Explain with an example

1.4 Define Molecular weight and size of polymer

1.5 Determine the Molecular weight of the polymer-
(a) Determine the Molecular weight of the polymer-Number average method
(b) Determine the Molecular weight of the polymer- weight average method
(c) Determine the Molecular weight of the polymer -viscosity average molecular weight method.

2.0 Properties, applications and manufacturing processes of following addition polymers.

2.1 LDPE.

2.2 HDPE.

2.3 PVC.

2.4 Poly acrylates.

2.5 Poly propylene.

2.6 Poly vinyl acetate.

2.7 EVA.

2.8 Polystyrene.

3.0 Properties, applications and manufacturing processes of the following condensation Polymers

3.1 Phenol – formaldehyde (PF).

3.2 Urea formaldehyde (UF).

3.3 Epoxy resins

3.4 Nylon – 6.

3.5 Nylon-6, 6

3.6 Polyester.

3.7 Polyurethane (PU).

4.0 Properties, applications and manufacturing processes of following other polymers.

4.1 Poly tetra fluoro Ethylene.
4.2 Poly acrylonitriles.
4.3 Poly vinyl alcohol.
4.4 Cellulose acetate.
4.5 Viscose rayon.
4.6 A.B.S.
4.7 Polycarbonates.

5.0 Polymer processing techniques-I.

5.1 Mixing of polymers and compounding of polymers
5.2 Concept and importance of Master batch.
5.3 Different polymer mixing equipments
5.4 Describe the working and general features of the following equipment.
Extruder –single screw, double screw
5.5 Describe the working of the following Moulding equipments
a) Compression moulding.
b) Transfer moulding.
c) Injection moulding.
d) Blow moulding.
e) Rotational moulding.
f) Vacuum forming moulding.
g) Thermo forming.
h) Casting.

Course code CHPP-404	**Course title : Polymer products and polymer processing** **Number of course outcomes:05**				**No. of periods:75**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		›40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed ‹5% Not addressed
PO1	CO2,CO4	45	50	3	
PO2	CO3, CO5	33	37	2	
PO3	CO1	12	13	1	
PO4					
PO5					
PO6					
PO7					

Hyponated course contents with Reference books

1. Introduction to polymerization

Raw materials for polymers-Regenerable raw materials.

Polymerization techniques with examples-Bulk polymerization-Solution polymerization-Emulsion polymerization- Suspension polymerization, Molecular weight and size of polymer-Number average method - weight average method -viscosity average molecular weight method.

2. Properties, applications and manufacturing processes of addition polymers.

Manufacturing process-properties and application of -LDPE - HDPE- PVC- Polyacrylates- Poly propylene- Poly vinyl acetate.- EVA- Polystyrene.

3. Properties, applications and manufacturing processes of the following condensation Polymers

Manufacturing process, properties and applications of -Phenol formaldehyde (PF)- Urea formaldehyde (UF). Epoxy resins- Nylon – 6- Nylon-6,6, Polyester- Polyurethane (PU).

4 Properties, applications and manufacturing processes of the following other polymers.

Manufacturing process properties and application of -Poly tetra fluoro Ethylene.-Poly acrylonitriles-Poly vinyl alcohol-Cellulose acetate-Viscose rayon - A.B.S-Poly carbonates

5. Polymer processing techniques-11.

Mixing of polymers –compounding of polymers-master batch preparation-mixing equipments Working and general features-Extruder –single screw-double screw, Working of the following Moulding equipments- Compression moulding, Transfer moulding,Injection moulding, ,Blow moulding,RotationalMoulding,Vacuum forming moulding, ,Thermo forming,Casting.

REFERENCE BOOKS:

1. Polymer Science – Gowarikar.
2. Polymer Chemistry – B.K. Sharma.
3. Outlines of Polymer Technology (manufacturing) – R. Sinha.
4. Hand book of Plastics.
5. Processing of polymers – R. Sinha.
6. Polymer science - Bill mayer
7. Plastics materials by J.A Brydson
8. Polymer technology- Visu sha.
9. Fundamentals of polymers by NIRANJAN KARAK(PHI publications)
10. Polymer Chemistry by ALKA L GUPTA(PRAGATI PUBLICATIONS)
11. Polymer science and Technology by PREMAMOYGHOSH(MC GRAHILL PUBLICATIONS)

Model blue print with weightages for blooms category and questions for each chapter and COs mapped

S.No.	Major Topics	No of Periods	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				Cos mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Introduction to polymerization	10	11	3	8	-	-	1	1			**CO1**
2.	Properties, applications and manufacturing processes of addition polymers.	16	14	3	13			1	2			**CO1, CO2, CO3**
3.	Properties, applications and manufacturing processes of condensation polymers.	16	14	6	9		10	2	3			**CO1, CO2, CO3**
4.	Properties, applications and manufacturing processes of other polymers.	18	16	3	11			1	2			**CO1, CO2, CO3**
5.	Polymer processing techniques-1.	15	14	3	3	8		1	1	1		**CO5**
Total		**75**	**80**	**18**	**44**	**8**	**10**	**8**	**7**	**1**		

C-20, CHPP-404

Subject Name: Polymer Products and Polymer Processing

Syllabus split up for Unit Test

Unit test No.	Learning out comes to be covered
Unit test-I	Objective from 1.1 to 3.7
Unit test-II	Objective from 4.1 to 5.5

	S.No.	Chapter/unit title	No. of periods
Unit Test -I	1.	Introduction to polymerization	10
	2.	Properties, applications and manufacturing processes of addition polymers.	16
	3.	Properties, applications and manufacturing processes of condensation polymers.	16
Unit Test -II	4.	Properties, applications and manufacturing processes of other polymers.	18
	5.	Polymer processing techniques-1.	15
		Total periods	**75**

Model paper 1
State Board of Technical Education and Training, A.P
Diploma in Chemical Engineering (PP)
Subject Name: Polymer Products and Polymer Processing
SUBJECT CODE: CHPP-404
Unit Test-1

Time : 90minutes **Max Marks: 40**

PART-A **16** Marks

Instructions: (1)Answer all questions **2X3=6 Marks**
(2) First question carries 4marks and rest of the questionscarries 3marks

1. (a) Name one regenerable raw material for polymer. **CO1**
   (b) List the primary sources of synthetic polymers **CO1**
   (c) Differentiate between polymer and plastic **CO2**
   (d) Name the polymerization technique by which expandable polystyrene is prepared **CO2**
2. Define molecular weight and size of polymer. **CO1**
3. Write the chemical and physical and chemical properties of PVC **CO2**
4. List the industrial applications of phenol formaldehyde. **CO1**
5. Classify polyesters and give an example to each. **CO2**

PART-B **8X3=24 Marks**

Instructions:(1) Answer all questions (2) each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6. (a)With a flow sheet explain the manufacture of LDPE by high pressure process. **CO2**

   Or

   (b) With a flow sheet explain the manufacture of PVC by continuous process. **CO2**
7. (a) Explain the manufacture of PMMA by suspension polymerization. **CO2**

   or

   (b) Explain the process of preparation of poly vinyl acetate **CO2**
8. (a) Explain the process of manufacture of urea formaldehyde resin. **CO2**

   Or

   (b) Explain the process of manufacture of Nylon 6,6 **CO2**

***

Model paper 1

State Board of Technical Education and Training, A.P

Diploma in Chemical Engineering (PP)

Subject Name: Polymer Products and Polymer Processing

SUBJECT CODE: CHPP-404

Unit Test-II

Time : 90minutes **Max Marks: 40**

PART-A **16 Marks**

Instructions: (1)Answer all questions **2X3=6 Marks**

(2) First question carries 4marks and rest of the questionscarries 3marks

1.

a) write the chemical reaction for the manufacture of PC **CO1**

b) write the chemical reaction for the manufacture of viscose rayon **CO1**

c) articles made by the rotational casting **CO1**

d) articles made by the extrusion machine **CO1**

2. State any four important uses of PTFE. **CO2**

3. Describe the compression moulding operation with a neat sketch. **CO2**

4. List any four important uses of ABS. **CO2**

5. Write down the basic principles of mixing. **CO2**

PART-B **8X3=24 Marks**

Instructions: (1) Answer all questions (2) each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6. With a neat flow diagram explain the manufacturing process of PTFE. **CO2**

(or)

7. With a neat flow diagram explain the manufacturing process of PAN. **CO2**

8. Describe the manufacture of viscose rayon with neat flow sheet. **CO2**

(or)

9. Describe the manufacture of ABS with a neat flow sheet. **CO2**

10. Describe the extrusion operation with a neat sketch. **CO2**

(or)

11. Describe the injection moulding operation with a neat sketch. **CO2**

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Model question paper

Q.No	Question	Blooms category	Marks allocated	CO addressed
	Part-A(30 marks)			
1.	Define Molecular weight and size of polymer.	remembering	3	**CO1**
2.	State four important properties of PVC.	Remembering	3	**CO3**
3.	List four important applications of Polyacrylates.	understanding	3	**CO4**
4.	List four important applications of A.B.S	Remembering	3	**CO4**
5.	State four important applications of viscose rayon.	understanding	3	**CO4**
6.	State the Applications of Polyurethanes.	Remembering	3	**CO4**
7.	State the applications of Nylon 6,6.	understanding	3	**CO3**
8.	Write short notes on Compression moulding technique with a neat sketch.	remembering	3	**CO5**
9.	Define the terms mixing and compounding.	remembering	3	**CO5**
10.	Explain the processing technique of Rotational moulding.	remembering	3	**CO5**
	Part-B(40 marks)			
1	Explain the Bulk polymerization, Explain with an example.	understanding	8	**CO1**
2	Explain the high pressure process for the manufacture of LDPE.	understanding	8	**CO2**
3	Explain the manufacturing process of Polystyrene with a neat flow diagram.	understanding	8	**CO2**
4	Describe the manufacturing process of PTFE.	understanding	8	**CO2**
5	Describe the manufacture of Poly acrylonitriles with a neat flow sheet.	understanding	8	**CO2**
	Part-C(10 marks)			
6	What is the impact of different polymerization techniques in the manufacturing process of PET	analyzing	10	**CO2**

Course code	Course title	No. of	Total no. of	Marks for FA	Marks for SA

		periods/week	periods		
CH-PP-405	Basic Mechanical Engineering	04	60	20	80

S.No.	Chapter/Unit title	No.of periods	CO's Mapped
1	Measuring Instruments	10	C01,C02,C03,C04,C05
2	Friction and Lubrication	05	C01,C02,C03,C04,C05
3	I C Engines	15	C01,C02,C03,C04,C05
4	Steam Boilers	10	C01,C02,C03,C04,C05
5	Air Compressors	10	C01,C02,C03,C04,C05
6	Steam Turbines & Nozzles	10	C01,C02,C03,C04,C05
Total periods:		**60**	C01,C02,C03,C04,C05

Course objectives:

Course Objectives	(i)	To familiarize with the knowledge of different tools, equipment and machinery used in the field of Mechanical Engineering
	(ii)	To use various tools for mechanical measurements and to know fabricating methods of mechanical products
	(iii)	To know the different methods of producing and transmitting mechanical power

Course outcomes:

Course outcomes	C01	CHPP-405.1	Familiarize with the concepts of measurement and measuring instruments.
	C02	CHPP-405.2	Explain about friction and lubrication in various mechanical tools & equipment.
	C03	CHPP-405.3	Enumerate the working of IC Engines and Boilers.
	C04	CHPP-405.4	Describe the working of Air compressors with the help of diagrams.
	C05	CHPP-405.5	Explain about the concept of steam turbines and nozzles.

CO-PO/PSO MATRIX:

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-405.1	3						2	2		
CHPP-405.2	3	2					2		3	
CHPP-405.3	3	2					2			
CHPP-405.4	3						2	2		2
CHPP-405.5	3	2					2			
AVERAGE	**3**	**2**					**2**	**2**	**3**	**2**

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Learning outcome:

Objectives:

1.0 Know about Measuring Instruments.

1.1 Know about Measurement, types of measurement
1.2 Familiarise with the use of checking and measuring Instruments.
1.3 Line diagrams of different measuring tools.
1.4 Specific use of each Instrument
1.5 Least count of different measuring tools. Differentiate measuring and checking Instruments.

2.0 Friction and Lubrication

2.1 To appreciate the existence of friction in elements of power transmission
2.2 Understand the concept of friction
2.3 Explain the necessity of lubrication
2.4 Give the classification of lubricants
2.5 Explain the properties of good lubricant
2.6 State different methods of lubrication

3.0 I.C. Engines

3.1 Define Heat engine
3.2 Classify Heat engines.
3.3 Give examples for each type.
3.4 Summarize the advantages of I.C.engines and E.C.engines.
3.5 Give the classification of I.C.engines.
3.6 Draw a neat sketch of an I.C engine and name the various parts.
3.7 Explain the working of 4 stroke petrol engine with a line diagram
3.8 Explain the working of 2 stroke petrol engine with a line diagram
3.9 Explain the working of a 4 stroke and 2 stroke diesel engine with a line diagram.
3.10 Compare two stroke engine with 4 stroke engine
3.11 Compare SI engine with CI engine
3.12 Explain the help of a line sketch ignition system of an SI engine.
3.13 Explain the help of a line sketch ignition system of an CI engine.
3.14 Necessity of scavenging and super charging

4.0 Boilers

4.1 Define Boiler
4.2 Give the classification of Boiler
4.3 Differentiate fire tube and water tube boiler
4.4 Name different types of Boilers
4.5 Explain the construction and working of a simple Vertical Boiler with a line diagram
4.6 Explain Lancashire Boiler with a line diagram.
4.7 Explain the construction and working of a Babcock and Wilcox Boiler with a line diagram.
4.8 List the different Boiler mountings
4.9 State the specific use of each mounting.
4.10 List the different Boiler accessories.
4.11 State the functions of the boiler accessories.

5.0 Air Compressors

5.1 State the functions of air compressors.
5.2 Enumerate the uses of compressed air.
5.3 Name the different types of compressors.
5.4 Explain with line diagram the working of a single acting reciprocating air compressor.
5.5 State the advantages of multi stage compressors over single stage compressors.
5.6 Explain the use of inter cooler.
5.7 Name the types of rotary compressors.
5.8 Explain with line diagram the working of a centrifugal compressor.

5.9 Explain with line diagram the working of an axial flow type compressor.

6.0 Steam Turbines & Nozzles

6.1 State the function of steam nozzle in a turbine.

6.2 Name different types of nozzles.

6.3 Define steam turbine

6.4 Explain the working of impulse turbine with a line diagram

6.5 Explain the working of a Reaction turbine with a line diagram

COs-POs mapping strength:

Course code CH-PP-405	**Course Title: Basic Mechanical Engineering**				**No.of Periods 60**
POs	Mapped with CO No.	CO Periods addressing PO In Column 1		Level (1, 2, 3)	Remarks
		No	%		
PO1	CO1 to CO5	25	42	3	
PO2	CO2, CO3, CO5	20	33	2	
PO3					
PO4					
PO5					
PO6					
PO7	CO1 to CO5	15	25	2	

Hyponated Course contents with Reference books:

1. Measuring Instruments

Dividers:- Sizes and uses, Combination square, Bevel protractor, Universal bevel protractor, Sinebar, Universal surface guage, Engineers parallels, Slip gauges, Screw pitch guage, Vernier caliper, Vvernier height guage – least count of the measuring tools – comparison between measuring and checking instruments.

2. Friction and Lubrication

Friction in elements of power Transmission. Concept of friction - different types of friction-lubrication – concept – necessity of lubrication – classification of lubricants – properties of a good lubricant - different methods of lubrication – wick lubrication – ring lubrication – splash lubrication – forced lubrication.

3. I.C. Engine

Heat engines - examples for each type – advantages- classification of I.C.engines- neat sketch of I C engine indicating component parts, the function of each part – cylinder, crank case, crank pin, crank, crank shaft, connecting rod, wrist pin, piston, cooling fins, cylinder head, exhaust valve, inlet valve. 4 stroke petrol engine- 2 stroke petrol engine - 4 stroke and 2 stroke diesel engines – Comparison of 4 stroke with 2 stroke engine – Diesel engine with Petrol engine – Fuel and ignition system of SI engines (fuel tank, fuel pump, fuel filter, carburetor and spark plug) – injection system of CI engine (fuel tank, fuel feed pump, fuel filter, injection pump and injector) with simple sketch and explanation of each component of the above systems – importance of scavenging and super charging.

4. Boilers

Classification of Boilers - fire tube and water tube boilers- construction and working of a simple Vertical Boiler - Lancashire Boiler – Babcock and Wilcox Boiler – Boiler mountings: water level indicator – pressure gauge – safety valve – steam stop valve – feed check valve – blow off cock – fusible plug . Boiler accessories – steam trap and separator – economizer – super heater – air pre heater - feed water pump.

5. Air Compressors

Functions of air compressor – uses of compressed air – types of air compressors – single stage reciprocating air compressor , its construction and working with a line diagram – multistage compressors – advantages over single stage compressors – use of air cooler – rotary compressors – types – centrifugal compressor – axial flow type compressor.

6. Steam Nozzles & Steam turbines

Steam nozzles – functions – types – convergent – divergent – convergent and divergent – Steam turbines – classification – impulse – reaction turbines – working principle with line diagram of the above two types – governing of steam turbines – throttle – by pass – nozzle control.

REFERENCE BOOKS :

1. Basic Mechanical Engineering : Roy and Chowdary
2. Workshop Technology I & II by Hazra Chowdary
3. Elements of Heat Engines vol II by R C Patel &Karmachandani
4. Thermodynamic Vol I & II by Pakirappa.
5. General Mechanical Engg. By Pakirappa.
6. Hydraulic Machinery by R S Kurmi.

Blue print with weightages for Blooms category and questions for each chapter and Cos mapped:

S.No.	Chapter/Unit title	No.of periods	Weightage allocated	Marks wise Distribution of weightage				Question wise Distribution of weightage				CO's Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Measuring Instruments	10	14	3	3	8	-	1	1	1	-	C01,C02,C03,C04,C05
2	Friction and Lubrication	05	10	-	-	10	-	-	-	1	-	C01,C02,C03,C04,C05
3	I C Engines	15	14	-	3	3	8	-	1	1	1	C01,C02,C03,C04,C05
4	Steam Boilers	10	14	3	3	8	-	1	1	1	-	C01,C02,C03,C04,C05
5	Air Compressors	10	14	3	3	8	-	1	1	1	-	C01,C02,C03,C04,C05
6	Steam Turbines & Nozzles	10	14	-	3	3	8	-	1	1	1	C01,C02,C03,C04,C05
Total:		**60**	**80**	**9**	**15**	**40**	**16**	**3**	**5**	**6**	**2**	**C01,C02,C03,C04,C05**

C-20, CHPP-405
Subject Name: BASICS OF MECHANICAL ENGINEERING
IV SEMESTER
Syllabus split up for Unit Test

Unit test NO	Learning out comes to be covered
Unit test-I	Objective from 1.1 to 3.14
Unit test-II	Objective from 4.1 to 6.5

(Model Paper-1) **C-20, CHPC/OT/PP-405**

State Board of technical Education and Training, A.P

Diploma in Chemical Engineering (P&P)

IV SEMESTER

Subject Name: BASICS OF MECHANICAL ENGINEERING

Subject Code: CHPC/OT/PP-405

Time: 90 minutes **Unit Test I** **Max .Marks:40**

Part-A 16Marks

Instructions: (1) Answer all questions.

(2) First question carries four marks; each question of remaining carries three marks

1.
   a) Sine bar is used for setting and measuring …… **(CO1)**
   b) Coefficient of friction is defined as the ratio of limiting friction to **(CO2)**
   c) 2-stroke engines have ……..instead of valves. **(CO3)**
   d) The air -fuel mixture in SI engine is supplied by ……. **(CO3)**

2. List different types of measurements. **(CO1)**

3. State the necessity of lubrication. **(CO2)**

4. Classify heat engines. Give examples for each. **(CO3)**

5. Distinguish SI engine from CI engine. **(CO3)**

Part-B 3X8=24

Instructions: (1) Answer all questions.

(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6 a) Draw the neat sketch of combination set. Explain the use of different parts. **(CO1)**

(or)

b) Describe the working procedure of vernier height gauge with neat sketch. **(CO1)**

7. a) Explain desirable properties of good lubricants. **(CO2)**

(or)

b) Explain different constructional features of IC engine with neat sketch. **(CO3)**

8. a) Explain the working of 4-stroke diesel engine with neat diagram. **(CO3)**

(or)

b) Draw the layout of fuel system in SI engine. Explain the functions of different components. **(CO3)**

***

Model question paper with COs mapped:

Q.No	Question	Bloom's category	Marks allocated	CO addressed
PART – A (30 marks)				
1	Classify the measuring instruments	R	3	CO1
2	Denote the differences between measuring and checking instruments	U	3	CO1
3	Define heat engine and classify heat engines.	U	3	CO3
4	What is scavenging in IC engines? State its importance.	Ap	3	CO3
5	What is fire tube boiler? Give examples	R	3	CO3
6	How boiler mountings are different from boiler accessories?	U	3	CO3
7	Enumerate the uses of compressed air?	R	3	CO4
8	State the use of intercooler in multistage compression?	U	3	CO4
9	What are the basic elements of steam power plant?	U	3	CO5
10	What do you understand by governing of steam turbines? State its importance.	Ap	3	CO5
PART–B (40 marks)				
11	Explain the working principle of universal bevel protractor with neat diagram. (or) Draw a neat sketch of Sine bar. Explain its use.	Ap	8	CO1
12	Draw the neat sketch of 2-stroke petrol engine and explain its working. (or) Explain the working principle of fuel injector in diesel engines.	An	8	CO3
13	Explain the working principle of Bobcock and Wilcox boiler with neat diagram (or) Draw a neat sketch of Lancashire boiler and describe its working.	Ap	8	CO3
14	Explain the working principle of centrifugal air compressor with neat diagram (or) Draw a neat sketch of axial flow type air compressor and describe its working.	Ap	8	CO4
15	Explain the construction and working principle of reaction turbine with a line diagram (or) Explain the working principle of Impulse turbine with neat diagram.	An	8	CO5
PART –C (10 marks)				
16	Critically analyze different methods of lubrication with their areas of application.	Ap	10	C02

Course code	Course title	No. of periods/week	Total no of periods	Marks of FA	Marks for SA
CHPP - 406	Unit operations - II	05	75	20	80

S.No	Chapter / unit title	No. of periods	CO's Mapped
1.	Fundamentals of mass transfer or separation operations	18	CO1
2.	Distillation	18	CO2, CO3, CO4, CO5
3.	Absorption and Stripping	08	CO2, CO3, CO4, CO5
4.	Humidification and Drying	12	CO2, CO3, CO4, CO5
5.	Extraction and Leaching	11	CO2, CO3, CO4, CO5
6.	Crystallization and Adsorption	08	CO2, CO3, CO4, CO5
	Total	**75**	

Course Objectives

COURSE OBJECTIVES	i. To familiarize with the knowledge of fundamentals of mass transfer or separation operations, diffusion, types of diffusion, in gases and liquids, study state diffusion of A through non-diffusing B , molar flux and statement of Fick's Law, concept of phase equilibria , Azeotrope, equilibrium curves Bubble point and Dew point diagrams. ii. To use various basic industrial applications of Distillation and absorption and stripping types of distillations, equilibrium driving force in distillation , industrial equipment of distillation, (HETP) , types of packing materials, packed bed columns, Mc-Cabe Thiele method of determine the number of stages, limiting operating conditions, stage and efficiency of distillation of column. iii. To know the operating equation for absorption and stripping, equilibrium diagrams, stages, characteristics, equipment used, problems based on for absorptions and stripping Humidification and drying equipment , basic terminology associated, psychrometric charts, constant rate and falling rate, drying rate curves problems on drying. iv. To reinforce theoretical concepts of extraction and Leaching, crystallization and adsorption, equipment required for conducting extraction and leaching, crystallization and adsorption .

Course outcomes

CO NO		COURSE OUTCOMES
CO1	**CHPP-406.1**	Develop the basics of mass transfer operations like distillation absorption, stripping, humidification, drying ,extraction, Leaching, and crystallization – adsorption
CO2	**CHPP-406.2**	Deduce the derivation for the equation related to 1) Molecular diffusion in gases and liquids 2) Operating equations for various mass transfer operations.
CO3	**CHPP-406.3**	Describe the Construction and working of equipments used for distillation, absorption, humidification, extraction, Leaching and crystallization.
CO4	**CHPP-406.4**	Explain the various applications of mass transfer operations.
CO5	**CHPP-406.5**	Solve numerical problems related to various mass transfer operations.

CO-PO/PSO MATRIX:

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-406.1	3							3		
CHPP-406.2	2	2								
CHPP-406.3			3						2	
CHPP-406.4	2							2		
CHPP-406.5	3	2							2	
AVERAGE	**3**	**2**	**3**					**3**	**2**	

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Learning outcome

CHAPTER – 1

1.1 List the basics of mass transfer operations, diffusivity in gases and liquids
1.2 Illustrations of mass transfer separation techniques, the role of mass transfer operations in an industrial chemical processes.
1.3 Give the classification of mass transfer diffusivity in gases separation operations, significance of equilibrium in mass transfer operations
1.4 Distinguish between molecular diffusion and eddy diffusion ,molecular diffusion in gases and liquids.
1.5 Define molar flux, statement of Fick's law of molecular diffusion, phase, phase rule and degrees of freedom.
1.6 Evaluate the derivation of equation for steady state molecular diffusion in fluids at rest and in laminar flow.
1.7 Evaluate the derivation of equation for steady state diffusion of A through non-diffusing B in gases and liquids
1.8 Evaluate the derivation of equation for steady state Equi-molal counter diffusion in gases and liquids.

1.9 Solve the simple problems on Fick's law, steady state diffusion of A through non-diffusing B and steady state Equi-molal counter diffusion in gases and liquids.

CHAPTER – 2

2.1 Distinguish between distillation and absorption or stripping , stage, equilibrium or Ideal or theoretical stage.

2.2 List the industrial applications of distillation, feed stage conditions, the limiting operating conditions of a distillation column, a stage and efficiency.

2.3 Explain the flash vaporization or equilibrium distillation, differential distillation and Rayleigh's equation.

2.4 Describe steam distillation and steam distillation law, equilibrium and driving force in distillation.

2.5 Explain the continuous rectification or distillation or fractionation column with stripping section and enriching section, industrial equipment required for distillation.

2.6 Demonstrate Height equivalent to theoretical plate (HETP) ,the arrangements of condensers, trays, reboilers for distillation column.

2.7 Categorize the different types of packing material used in the packed bed columns.

2.8 Use the Mc-Cabe Thiele method to determine the number of stages required to obtain certain degree of separation.

2.9 Solve the problems on Mc-Cabe Thiele method to determine the number of stages.

CHAPTER – 3

3.1 List the basics of absorption and stripping, industrial applications of absorption and stripping.

3.2 Evaluate the operating equation for absorption and stripping.

3.3 Explain the equilibrium diagrams for absorption and stripping, minimum absorbent flow rate.

3.4 Explain the about number of equilibrium stages for absorption and stripping,operating characteristics of absorption and stripping column.

3.5 Describe the equipment used for absorption and stripping.

3.6 Solve the problems in absorption and stripping.

CHAPTER – 4

4.1 List the basics of humidification, dehumidification operations, industrial applications of humidification, drying operations.

4.2 Define dry and wet bulb temperatures, basic terminology associated with drying.

4.3 Explain the psychrometer charts, cooling towers.

4.4 Describe the various humidification equipment, drying equipment and its classification .

4.5 Practice the constant rate and falling rate period associated with drying, drying rate curves, the factors that influence the rate of drying.

4.6 Solve the problems on time of drying, the time of drying and related problems

CHAPTER – 5

5.1 Differentiate among liquid-liquid extraction, absorption and distillation.

5.2 List the industrial applications of extraction – Leaching and basics of Leaching

5.3 Select the criteria for solvent required for conducting extraction.

5.4 Explain the single stage and multistage extraction.

5.5 Explain the different kinds of equipment required for conducting extraction.

5.6 Explain the different types of equipment required for leaching.

CHAPTER – 6

6.1 List the classification of crystallizers, major types of adsorbents and their properties.

6.2 Explain the solubility, un-saturation, saturation and super saturation, mechanism of crystallization.
6.3 Explain the equipment required for crystallization.
6.4 Distinguish between chemisorption and physical adsorption.
6.5 Explain the various devices employed for conducting adsorption.

Course code CHPP-406	**Course Title: Unit operations -II Number of course Outcomes: 08**				**No. of periods 75**
POs	**Mapped with CO No.**	**CO periods addressing PO in column 1**		**Level (1,2,3)**	**Remarks**
		NO.	**%**		
PO1	CO1, CO2, CO4, CO5	42	57	3	>40% Level3 Highly addressed 25% to 40% Level2 Moderately addressed 5 to 25 % Level1 Low addressed <5% Not addressed
PO2	CO2, CO5	15	20	2	
PO3	CO3	18	23	1	

Course Contents:

1.0 Fundamentals of mass transfer or separation operations:

Definition of mass transfer operation--Separation by phase creation, separation by phase addition, separation by barrier, separation by solid agent, separation by force field or gradient--Experimental illustrations of mass transfer operations--Direct contact of two immisciblephases, Phases separated by membrane, Direct contact of miscible phases, Use of surfacephenomenon, Examples regarding various mass transfer operations involving all possiblecombination of the three aggregates of matter i.e. solid, liquid and gas--Industrial applications of mass transfer operations-- Significance of equilibrium in mass transfer operations—Molecular diffusion and eddy diffusion-- Molar flux and statement of Fick's law of molecular diffusion--Diffusion in gases and liquids-- Steady state diffusion of A through non-diffusing B and steady state equi-molal counter diffusion in gases-- Steady state diffusion of A through non-diffusing B and steady state equi-molal counter diffusion in liquids—Diffusivity or diffusion coefficient of gases and liquids-- Phase, phase rule and degrees of freedom--Concept of phase equilibria in terms of temperature, pressure, chemical potential, activity, activity coefficient and other thermodynamic variables--Concept of vapor pressure, Characteristics of ideal solution and non-ideal solution and differences between ideal and non-ideal solutions—Raoult's law and Henry's law-- Vapor-liquid equilibria and equilibrium curves (x-y curve and T-x-y curve)-- Relative volatility between two components of a vapor-liquid mixture--Azeotrope, their equilibrium curves and their formation reasons--Bubble point and dew point--Triangular phase diagram for ternary systems--Definition of mass transfer coefficient

2.0 Distillation:

Difference between distillation and absorption or stripping--Industrial applications ofdistillation--Flash vaporization or equilibrium distillation--Differential distillation andRayleigh's equation--Steam distillation and steam distillation law--Equilibrium and drivingforce in distillation--Stage, Equilibrium or Ideal or Theoretical stage—Continuousrectification, Feed line equation, Operating equations for stripping section and enrichingsection--Equipment for conducting distillation, Tray columns, Packed columns, Bubble capcolumns, Condensers for distillation column, Reboilers for distillation column, Arrangement of condensers and reboilers, Effect of pressure drop on distillation, Packing material, Random packing and regular packing, Height equivalent to theoretical plate (HETP)--Assumptions of Mc-Cabe Thiele methods and Use of Mc-Cabe Thiele method to calculate the number of stages required for separation--Feed stage conditions, Sub-cooled liquid, Bubble point liquid, Partially vaporized feed, Dew point vapor, Super heated vapor--Limiting operating conditions of a distillation column, Minimum reflux ratio, Total reflux ratio, Optimum reflux ratio, stage, point efficiency, Murphree tray efficiency, overall efficiency.

3.0 Absorption and Stripping:

Basics of absorption and stripping—Definition of absorption and stripping—Industrialapplications of absorption and stripping--Operating equation for absorption and stripping--Equilibrium diagrams for absorption and stripping-- minimum absorbent flow rate ----equilibrium stages for absorption and stripping--General operating characteristics ofabsorption and stripping column, Liquid entrainment, High pressure drop, Flooding, Loading,Coning, Weeping, Dumping-- Equipment used for absorption and stripping, Tray tower,Packed column, Packing material, Random packing and Random packing, Spray tower,Bubble column, Centrifugal contractor, Venturi scrubber.

4.0 Humidification and Drying:

Industrial applications of humidification operations, Absolute humidity, Molal absolutehumidity, Relative humidity, Percentage saturation-- Dry and wet bulb temperatures--Psychrometer charts-- Various humidification equipments, Tray tower, Spray chamber, Spray ponds, Cooling towers--Natural draft cooling tower, Mechanical draft cooling tower, Induced draft cooling tower--Typical cooling tower arrangements, Atmospheric cooling tower, Countercurrent induced draft, Cross-flow induced draft cooling tower- Industrial applications of drying-- Basic terminology associated with drying, Moisture content on wet basis, Moisture content on dry basis, Equilibrium moisture content, Bound and Un-bound moisture, Free moisture content, Critical moisture content--Constant rate and falling rate period associated with drying--Drying rate curves, Moisture content Vs time, Drying rate Vs moisture content--Time of drying and related problems on time of drying--Factors that influence the rate of drying, Gas velocity, Humidity of gas, Area of drying surface, Temperature--Drying equipment and its classification, Batch dryer, Continuous dryer, Tray dryer, Rotary dryer, Drum dryer, Spray dryer.

5.0 Extraction and Leaching:

Industrial applications of extraction--Selection criteria for solvent required for conductingextraction, Selectivity, Recoverability, Distribution coefficient, Capacity, Density, Insolubilityof solvent, Interfacial tension-- single stage and multistage extraction--Different kinds ofequipment required for conducting extraction-- industrial applications of leaching—Differenttypes of equipment required for leaching, Batch extractors for leaching of oil from seeds,Bollman extractor or Basket extractor, Rotocell extractor, Pachuca tank and Continuousextractors for leaching.

6.0 Crystallization and Adsorption:

Industrial applications of crystallization--Solubility, un-saturation, saturation and super saturation--Methods of super saturation--Mechanism of crystallization--Equipment required for crystallization, Batch crystallizer, Continuous crystallizer, Stirred tank crystallizer, Swenson walker crystallizer, Agitated tank crystallizer, Double pipe crystallizer, Vacuum crystallizer, Evaporative crystallizer, Double tube baffle crystallizer --Classification of crystallizers--Industrial applications of adsorption, Pressure swing adsorption--Major types of adsorbents and their properties--Differences between chemisorption and physical adsorption--Devices employed for conducting adsorption, Stirred tank, cyclic models, continuous counter current operation models.

REFERENCE BOOKS:

1. Mass transfer operations by Robert E. Treybal.
2. Unit Operations of Chemical Engineering by Warren L. McCabe, Julian C.Smith, PeterHarriot.
3. Mass Transfer-I by Kiran D. Patil.
4. Mass Transfer-II by K.A.Gavhane.
5. Separation Process Principles by J.D.Seader, Ernest J. Henley

S.NO	Chapter/ unit title	No. of periods	Weightage Allocated	Marks Wise Distribution of Weightage				Question Wise Distribution of Weightage				Cos Mapped
				R	U	AP	An	R	U	AP	An	
1	Fundamental of mass transfer operations	18	14	3	3	8	-	1	1	1	-	CO1
2	Distillation	18	24	3	3	8	10	1	1	1	1	CO2, CO3, CO4, CO5
3	Absorption and Stripping	08	06	3	3	-	-	1	1	-	-	CO2, CO3, CO4, CO5
4	Humidification and Drying	12	14	3	3	8	-	1	1	1	-	CO2, CO3, CO4, CO5
5	Extraction and Leaching	11	11	3	-	8	-	1	-	1	-	CO2, CO3, CO4, CO5
6	Crystallization and Adsorption	08	11	3	-	8	-	1	-	1	-	CO2, CO3, CO4, CO5
	Total	**75**	**80**									

C-20, CHPC/CHPP/CHOT-406
Subject Name: Unit Operations-II
Syllabus split up for Unit Test

Unit test NO	Learning out comes to be covered
Unit test-I	Objectives from 1.1 to 3.9
Unit test-II	Objective from 4.1 to 6.12

(Model Paper-1) **C-20, CHPP-406**

State Board of technical Education and Training, A.P

Diploma in Chemical Engineering (P&P)

IV SEMESTER

Subject Name: UNIT OPERATIONS -II

Subject Code: CHPP-406

Time: 90 minutes **Unit Test I** **Max .Marks:40**

Part-A **16Marks**

Instructions: (1) Answer all questions.

(2) First question carries four marks; each question of remaining carries three marks

1. Write the following : **(CO1)**
   a) Fick's Law of diffusion
   b) Phase rule equation
   c) Reflux ratio formula
   d) Name any one adsorbent:----------

2. Define molecular diffusion, eddy/turbulent diffusion and explain role of diffusion in mass transfer **(CO2)**

3. Write the industrial applications of distillation. **(CO3)**

4. Write about the height equivalent to theoretical plate (HETP). **(CO2)**

5. Write about the equipment used for absorption and stripping. **(CO3)**

Part-B **3X8=24**

Instructions: (1) Answer all questions.

(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

6 a) Derive an equation for steady state diffusion? A through non-diffusing B in gases **(CO2)**

(Or)

b) Derive an equation for steady state diffusion of A through non-diffusing B in liquids **(CO2)**

7 a) Write the industrial applications of absorption and stripping. **(CO3)**

(or)

b) A mixture of benzene and toluene containing 60 mole % benzene is 10 to be separated to give a product of 95 mole % benzene and a bottom product containing 10 mole % benzene. The feed enters a column at its point. It is proposed to operate the column with reflux ratio 2.5. It is required to find the number of theoretical plates needed and the position of feed plate.**(CO4)**

X	0	0.05	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Y	0	0.13	0.21	0.375	0.5	0.6	0.7	0.77	0.83	0.9	0.95	1.0

8) a)Describe the continuous distillation operation with a neat sketch **(CO4)**

(Or)

b) 100Kmol of a mixture containing 50 mole % n-heptane (more volatile) and 50 mole% n-octane is subjected to a differential distillation at atmospheric pressure with 60 mole % of the liquid distilled. Fin d the composition of the composited distilled and the reside using the Rayleigh equation. **(CO4)**

X	0.5	0.46	0.42	0.38	0.34	0.32
Y	0.689	0.648	0.608	0.567	0.523	0.497

MODEL QUESTION PAPER WITH COs MAPPED

PART A: 30 marks 10 questions, 3 marks each NO CHOICE

-60 minutes (6 minutes each)

PART B: 40 marks, 5 questions, 8 marks each, EITHER OR TYPE

-90 minutes (18minutes for each question)

PART C: 10 marks, 1question, 10marks

-30 minutes (higher order question)

Q.no	Questions	Bloom's category	Marks allocated	CO addressed
PART – A (30 marks)				
1.	State and explain the Fick's law and diffusion.	R	3	CO1
2.	Define Flux,Molar diffusion,	R	3	CO1
3.	State Raoult's Law and Dalton's law.	R	3	CO1
4.	What do you mean by an Azetrope.	R	3	CO1
5.	List out the types of packing used in industry.	R	3	CO3
6.	Define gas absorption.Give suitable example	U	3	CO1
7.	Define Selectivity and state what it indicates.	R	3	CO1
8.	Write classification of extraction equipment.	R	3	CO1
9.	Give the classification of Crystallisers.	U	3	CO1
10.	Define Critical moisture content and Bound moisture content.	R	3	CO1
PART –B (40 marks)				
1.	Derive the equation for steady state diffusion of A through non-diffusing B (Or) In an Oxygen-nitrogen gas mixture at 101.3KPa and 298K,the concentration of Oxygen at two planes 2mm apart are 20 and 10% by volume respectively.Calculate the flux of diffusion of oxygen for the cases where: i)Nitrogen is non-diffusing ii) There is equimolar counter diffusion of the two gases.Diffusivity of O_2 in N_2 is $1.81*10^{-5}$ m^2/s	AP	8	CO2
2.	Explain in brief the rectification on an ideal plate. (or) Draw a feed line on the equilibrium diagram for various values of feed conditions.	AP	8	CO3
3.	What do you mean by HETP? State the factors on which HETP depends (or) What do you mean by channeling? How it can be avoided/minimized ?	AP	8	CO3
4.	Explain in brief the selection criteria for solvent to be used for liquid – liquid extraction (or) Give the construction and working of batch operated mixer – settler with a neat sketch?	AP	8	CO3
5.	Explain in brief with a neat sketch Swenson walker crystallizer (or) Explain in brief solubility curves?	AP	8	CO3
PART – C (10 marks)				
1.	What are the consequences when operating the distillation column at very high gas velocity and very low liquid rate.	AN	10	CO5

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-407	Unit Operations - II Lab	3	45	40	60

UNIT OPERATIONS -II LAB

Course title :Unit Operations -II Lab(CHPP--407)		
Course Objectives	(i)To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant Experiments/exercises	
Course Outcomes	CO1	Demonstrate the skill of planning and organizing experimental set up for a desired purpose
	CO2	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems
	CO3	Observe various parameters, their variations and graphically represent the same
	CO4	Analyse the experimental results to draw inferences to make recommendations
	CO5	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

List of experiments:

1. Draw a standard plot between mole fraction of more volatile component and specific gravity of the liquid mixture.
2. Draw a standard plot between mole fraction of more volatile component and refractive index of the liquid the mixture.
3. Verify Rayleigh's equation by conducting simple distillation experiment.
4. Verify Steam distillation law by conducting steam distillation experiment.
5. to determine the height equivalent to theoretical plate (HETP).
6. To obtain the liquid- liquid equilibrium data and determine the distribution coefficient ($K= y/x$)for the system Toluene, water and acetic acid and to plot a liquid-liquid-equilibrium (L-L-E) diagram between y and x.
7. To obtain the vapour liquid equilibrium data and to plot a V-L-E diagram for a given mixture.
8. To obtain the solid liquid equilibrium data and to plot a Langmuir adsorption isotherm for the system activated charcoal, acetic acid and water.
9. To determine the vapour diffusion coefficient for a highly volatile liquid (acetone).
10. To determine the rate of drying of a given sample and plot the drying rate curve

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-408	Communication Skills	3	45	40	60

S. No.	Unit Title	No of Periods	COs Mapped
1	Listening Skills	6	CO1
2	Introducing Oneself	3	CO1, CO2, CO3
3	Short Presentation (JAM)	6	CO1, CO2, CO3
4	Group Discussion	6	CO1, CO2, CO3
5	Preparing Resume with Cover Letter	3	CO3
6	Interview Skills	9	CO1, CO2, CO3
7	Presentation Skills	9	CO1, CO2
8	Work place Etiquette	3	CO1, CO2
Total Periods		**45**	

Course Objectives	To comprehend the features of communication needed for professional success and display the use of these competently
	To present ideas, opinions in group discussions and presentations on topics of general and technical interest
	To prepare for job selection processes

CO No.	Course Outcomes
CO1	Interacts in academic and social situations by comprehending what is listened to when others speak.
CO2	Demonstrates effective English communication skills while presenting ideas, opinions in group discussions and presentations on topics of general and technical interest.
CO3	Exhibits workplace etiquette relevant in classroom situations for easy adaptation in professional setting in the future.

CO-PO Matrix

Course Code CHPP-408	**Course Title: English Number of Course Outcomes: 4**				**No. of Periods: 45**
POs	Mapped with CO No.	CO Periods Addressing PO in Column 1		Level of Mapping (1,2,3)	Remarks
		Number	Percentage %		
PO1		Not directly applicable for Communication Skills Course however interactive activities that use content from science and technology relevant to the Programme taken up by the student shall be exploited for communication in the Course.			
PO2					
PO3					
PO4					
PO5	CO1, CO2, CO3	11	25%		>60%: Level 3
PO6	CO1, CO2, CO3	27	60%		16 -59%: Level 2
PO7	CO1, CO2, CO3	7	15%		Up to 15%: Level 1

Level 3 – Strongly Mapped
Level 2- Moderately Mapped
Level 1- Slightly Mapped

Mapping Course Outcomes with Program Outcomes:

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO 1					✓	✓	✓
CO 2					✓	✓	✓
CO3					✓	✓	✓

Blue Print for evaluation based on Course Outcomes for SA:

Note: Every Question based on CO has to be given marks for the following parameters of communication in the rubric.

- Fluency and Coherence
- Lexical Resource (Vocabulary)
- Grammatical Range and Accuracy

***Rubric Descriptors 'Good/ Competent / Fair /Poor' for Communication**

LEVEL OF COMPETENCE	**Fluency and Coherence**	**Lexical Resource (Vocabulary)**	**Grammatical Range and Accuracy**
GOOD (9-10*)	Speaks at length without noticeable effort or loss of coherence. May demonstrate language-related hesitation at times, or some repetition and/or self-correction.	Uses vocabulary resources flexibly during discussion. Uses paraphrase effectively.	Uses a range of complex structures with some flexibility.

	Uses a range of connectives and discourse markers with some flexibility. **Articulates and adapts to near naturalization.**	Uses some less common vocabulary and shows some awareness of style and collocation	Mostly produces error-free sentences.
COMPETENT (6-8)	Is willing to speak at length, though may lose coherence at times due to occasional repetition, self-correction or hesitation.	Has enough vocabulary to discuss topics and make meaning clear in spite of inappropriacies.	Uses a mix of simple and complex structures, but with limited flexibility.
	Uses a range of connectives and discourse markers but not always appropriately.	Generally paraphrases successfully	May make mistakes with complex structures though these rarely cause comprehension problems.
FAIR (3-5)	Tries to maintain a flow of speech but t uses repetition, self correction and/or slow speech to keep going.	Manages to talk about familiar and unfamiliar topics but uses vocabulary with limited flexibility.	Produces only basic sentence forms, however, errors persist.
	Produces simple speech fluently, but more complex communication causes fluency problems.	Attempts to use paraphrase but with mixed success.	Uses a limited range of more complex structures, but these usually contain errors and may cause some comprehension problems
POOR (0 *-2)	Speaks with long pauses. Pauses lengthy before most words. **Merely imitates**	Uses simple vocabulary to convey personal information	Attempts basic sentence forms but with limited success, or relies on apparently memorized utterances
	Has limited ability to link simple sentences	Has insufficient vocabulary for less familiar topics	Makes numerous errors except in memorized expressions
	Gives only simple responses and is frequently unable to convey basic message	Only produces isolated words or memorized utterances	Struggles to produce basic sentence forms

s*10 marks to be awarded only if competence level shows flawless expertise in English.
***0 marks to be awarded when student shows incoherence and gives irrelevant responses.**

Blue Print for evaluation based on Course Outcomes for SA of each student:

Note: Marks are awarded for each student as per the Rubric descriptors.

S. No.	Questions based on Course Outcomes	Periods Allocated for practical work	Marks Wise Distribution of Weightage	Marks allotment for each Student in the Rubric*				Mapping of COs
				Poor 0-2	Fair 3-5	Competent 6-8	Good 9-10	
1	Describe the given object in a minute	6	10					CO 2
2	Exchange ideas/ views in a group discussion on _____ issue (academic, technical or social)	6	10					CO1, CO 2
3	Present your ideas /opinions on the given issue/ topic (individual to an audience)	9	10					CO1, CO2, CO 3
4	Role play an imaginary work-place situation	6	10					CO1, CO2, CO 3
5	Individual interaction with the Examiner duly submitting Resume (Facing the Interview) – Introducing oneself and answering questions	12	10					CO1, CO2, CO 3
6	*Listen to and comprehend any audio communication/ content	6	10					CO1, CO2, CO 3
TOTAL		**45**	**60**					

***Listen to and comprehend the given audio content**: Giving the Students time to read the questions (Fill in the Blanks, Select from Alternatives, True or False, Table fill, etc.) in chunks before listening to audio inputs also played in chunks.

Blue Print for evaluation based on Course Outcomes for Formative Assessment:

Note: Every Question based on CO has to be given marks for the following parameters in the rubric.

- Fluency and Coherence
- Lexical Resource
- Grammatical Range and Accuracy

S. No.	Questions based on Course Outcomes	Periods Allocated for practical work	Marks Wise Distribution of Weightage	Marks allotment for each Student in the Rubric*				Mapping of COs
				Poor 0-2	Fair 3-5	Competent 6-8	Good 9-10	
Formative Assessment - 1								
1	Describe the given object in a minute	3	10					CO 2
2	Exchange ideas/ views in a group discussion on _____ issue (academic, technical or social)	6	10					CO1, CO 2
3	Present your ideas /opinions on the given issue/ topic (individual to an audience)	6	10					CO1, CO2, CO 3
4	*Listen to and comprehend any audio communication/ content	3	10					CO1, CO2, CO 3
Total		**18**	**40**					
Formative Assessment -2								
1	Present your ideas /opinions on the given issue/ topic (individual to an audience)	3	10					
2	Role play an imaginary work-place situation	6	10					CO1, CO2, CO 3

3	Individual interaction with the Examiner duly submitting Resume (Facing the Interview) – Introducing oneself and answering questions	15	10					CO1, CO2, CO 3
4	*Listen to and comprehend any audio communication/ content	3	10					CO1, CO2, CO 3
TOTAL		**27**	**40**					

Learning Outcomes

1. Listening Skills:

1.1 Listen to audio content (dialogues, interactions, speeches, short presentations) and answer questions based on them

1.2 Infer meanings of words / phrases / sentences / after listening to audio content as mentioned above

2. Introducing Oneself:

2.1 Prepare a grid different aspects for presentation about a person / oneself

2.2 Present a 1 or 2 minute introduction of oneself for an audience

3. Short Presentation:

3.1 Define an object

3.2 Describe an object, phenomenon, event, people

3.3 Speak on a topic randomly chosen

4. Group Discussion:

4.1 Practice Group Discussion. Techniques

4.2 Participate in group discussions

5. Resume Writing and Cover Letter:

5.1 Prepare resumes of different sorts – one's own and others.

5.2 Write an effective cover letter that goes with a resume

6. Interview Skills:

6.1 Prepare a good Curriculum Vitae

6.2 Exhibit acceptable (Greeting, Thanking, Answering questions with confidence)

7. Presentation Skills:

7.1 Prepare Posters, Charts, PPT's on issue of general and technical interest

7.2 Present one's ideas before an audience with confidence using audio visual aids and answer questions that are raised.

8. Workplace Etiquette:

8.1 Show positive attitude & adaptability / appropriate body language to suit the work place

8.2 Display basic of etiquette like politeness, good manners.

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-409	Polymer testing and polymer technology lab	3	45	40	60

Course title :Polymer testing and polymer technology lab **Course code : CHPP-409**		
Course Objectives	(i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant Experiments/exercises	
Course Outcomes	C01	Demonstrate the skill of planning and organizing experimental set up for a desired purpose
	C02	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems
	C03	Observe various parameters, their variations and graphically represent the same
	C04	Analyse the experimental results to draw inferences to make recommendations
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

List of experiments to be conducted:

1. Preparation of specimen for impact, tensile, compressive strengths.
2. Identification of plastics.
3. Measurement of impact strength of plastics.
4. Measurement of tensile strength of plastics.
5. Measurement of compressive strength of plastic materials.
6. Measurement of melt flow index of plastics.
7. Preparation of phenol formaldehyde resin.
8. Manufacture of articles with hand operated injection moulding machine.
9. Manufacture of articles in semi-automatic hydraulically operated injection moulding machine.
10. Determination of density and bulk density of plastics.
11. Determine the softening point of polymer.
12. Determine the melting point of polymer.
13. Preparation of cellulose acetate.
14. Preparation of polyurethane

PROCESS TECHNOLOGY LAB(CHPP-410)

Course code	Course title	No.Of Periods / week	Totalnumber of periods	Marks for FA	Marks for SA
CHPP-410	Process Technology Lab	6	90	40	60

Course objectives:

i. To familiarize with the knowledge of different chemicals, tools and instruments used in the laboratory
ii. To know the etiquette of working with the fellow workforce
iii. To reinforce theoretical concepts by conducting relevant experiments

Course outcomes

Course outcomes	**CO1**	Demonstrate the skill of planning and organising experimental set up for a desired purpose
	CO2	Observe various parameters and graphically represent the same
	CO3	Analyse the experimental results to draw inferences
	CO4	Practice ethics and etiquette while working in a group and display professionalism while communicating as a member and leader in a group

Learning objects:

On completion of the study of the subject the student should be able to,

1 Determination of Total solids in PPM in tap water/Seawater.
2 Estimation of dissolved solids PPM in tap water/seawater
3 Determination of the Total hardness & permanent hardness in water by E.D.T.A method
4 Determination of the Total hardness and permanent hardness in water by soap solution method
5 Determination of chlorides present in water
6 Estimation of sulphates present inwater.
7 Estimate the percentage loss on ignition in sample of Portland cement
8 Determination of acid value of coconut oil / vegetable oil.
9 Estimation of Saponification value of the given sample.
10 Determination of iodine value of given vegetable oil.
11 Determination of pH of the given sample of solution by using P^H meter.
12 Estimation of sugar content in a given sample by using polarimeter.
13 Determination of conductivity of the give sample of solution by conductivity meter.
14 Determine the R.I of the given sample by Refractometer.
15 Calculate the flash and fire point of oil sample using Abel'sapparatus
16 Calculate the flash and fire point of oil sample using PenskyMartin'sapparatus
17 Find the percentage composition of moisture content, volatile matter, ash content and fixed carbon content of coal using proximate analysis ofcoal
18 Find the percentage of CO, CO_2 and O_2 of a sample of flue gas by Orsat apparatus

Analysis of common salt

19 Estimating of chlorides content present in commonsalt.
20 Determination of sulphates content in a givensample.

V & VI Semesters
(Industrial Training)

V & VI Semesters (Industrial Training)

DIPLOMA IN CHEMICAL ENGINEERING (PLASTICS & POLYMERS)

SCHEME OF INSTRUCTIONS AND EXAMINATIONS

INDUSTRIAL TRAINING

Subject Title : Industrial Training
Subject Code : CHPP-501
Duration : 6 months

Time schedule

S.NO	Code	TOPICS	Duration
1	CHPP-501	• Practical training in Industry • Training Report Preparation Report Preparation: Title Page, Certificate, Acknowledgements, Abstract, Contents(introduction of Industry, Plant Layout, Organization Chart, List of Major Equipments, List of Processes: Skills Acquired; Conclusions; References	Six Months

Course Objectives and Course Outcomes

Upon completion of the course the student shall be able to		
Course Objectives		1.Expose to real time working environment 2. Enhance knowledge and skill already learnt in the institution. 3. Acquire the required skills of manufacturing processes, assembling, servicing, supervising in the engineering fields. 4. Install the good qualities of integrity, responsibility and self confidence.
COURSE OUT COMES	CO1	Apply theory to practical work situations
	CO2	Cultivate sense of responsibility and good work habits
	CO3	Exhibit the strength, teamwork spirit and self-confidence
	CO4	Write report in technical projects

PO-CO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2				2		1	3		2
CO2						3		3		2
CO3						3		3		2
CO4						3		3		2

3: High, 2: Moderate,1: Low

Learning Outcomes

The student shall be able to display the following skill sets

1) Technical Skills *(*Manufacturing/Service/Drafting/Maintenance etc)
2) Reading drawings and analysing Specifications
3) Recognize and Practice safety Measures
4) Handling Tools/Instruments/Materials/Machines
5) Assess and Control of quality parameters
6) Planning, Organizing and recording Skills

Sl.No.	*Subject*	*Duration*	*Scheme of evaluation*		
			Item	*Nature*	*Max. Marks*
1	*Industrial Training*	*6 months*	*1.First Assessment at Industry (After 12 Weeks)*	*Assessment of Learning outcomes by both the faculty and training Mentor of the industry*	*120*
			2.Second Assessment at the Industry (After 22 weeks)	*Assessment of Learning outcomes by both the faculty and training Mentor of the industry*	*120*
			Final Summative assessment at institution level	*Training Report*	*20*
				Demonstration of any one of the skills listed in learning outcomes	*30*
				Viva Voce	*10*
TOTAL MARKS					*300*

Weightage of marks for Assessment of Skill sets during first and second assessment.

Skill Set Sl.No	*SKILL SET*	*Max Marks Allotted For each parameter*
1	Handling of various Equipments/Instruments	*15*
2	Supervising the Process of various manufacturing units in Chemical Engineering	*20*
3	Working with equipments, Instruments	*25*
4	Troubleshooting Skills	*25*
5	Safety aspects and crisis management	*15*
6	Soft skills and Reporting skills	*20*
	Total	*120*

During assessment the performance of the students shall be assessed in those skills in which the student has been trained and be awarded the marks as per the weightage assigned as above. In case the student has undergone training in a few skill sets then the total marks obtained shall be raised to 120 marks for the given assessment i.e. either assessment 1 or 2. However the performance of the student shall be assessed at the most skill sets listed above but not less than three skill sets.

Illustration

If the student has undergone training in only 4 skill sets (namely serial number 1, 3, 4, 5 of above skill sets) and marks awarded during assessment is 50 out of 80 marks, then the marks of 50 shall be enhanced to 120 proportionately as (50/80)*120=75.

GUIDELINES FOR INDUSTRIAL TRAINING

1. Duration of the training: 6 months.
2. Eligibility: The As per SBTET norms
3. Training Area: Students may be trained in the fields Fabrication/Foundry/Manufacturing/Service/Drafting/Maintenance etc.
4. The candidate shall put a minimum of 90% attendance during Industrial Training.
5. If the student fails to secure 90% attendance during industrial training, the student shall reappear for 6 months industrial training.
6. Formative assessment at industry level shall be carried out by the Mentor from of the industry, where the student is undergoing training and the faculty in charge (Guide) from the concerned section in the institution.
7. The Industrial training shall carry 300 marks and pass marks is 50% in assessments at industry (first and second assessment) and final summative assessment at institution level put together i.e. 150 marks out of 300 marks.
8. If the student fails to secure 50% marks in final summative assessment at institution level, the student should reappear for final summative assessment in the subsequent board examination.
9. Final Summative assessment at institution level is done by a committee including1. Head of the section(Concerned discipline ONLY),2. External examiner and3. Faculty members who assessed the students during Industrial Training as members.

No gap/holidays between one spell to another

Guidelines and responsibilities of the faculty members who are assessing the students' performance during Industrial Training:

1. Every Teacher (Including HoD, if not holding any FAC) shall be assigned a batch of students of 10 to 15 for Industrial Training irrespective of students' placements for training
2. Shall guide the students in all aspects regarding training.
3. Shall create awareness regarding safety measures to be followed in the industry during the training period, and shall check it scrupulously.
4. Shall check the logbook of the students during the time of their visit for the assessment.

5. Shall monitor progress at regular intervals and make appropriate suggestions for improvement.
6. Shall visit the industry and make first and second assessments as per stipulated schedules.
7. Shall assess the skill sets acquired by the students during their assessment.
8. Shall award the marks for each skill set as per the marks allotted for that skill set during 1st and 2nd assessments
9. Shall voluntarily supplement students learning through appropriate materials like photographs, articles, videos etc.
10. Shall act as co-examiner along with other examiners in the final assessment at institution.
11. Shall act as liaison between the student and mentor.
12. Shall maintain a diary indicating his observation with respect to the progress of students learning in all three domains (Cognitive, Psychomotor and Affective).

Guidelines to the Training Mentor in the Industry:

1. Shall train the students in all the skill sets as far as possible.
2. Shall assess and award the marks in both the assessments along with the faculty member .
3. Shall check and approve the log books of the students.
4. Shall approve the attendance of each student at the end of the training period.
5. Shall report to the guide about student's progress, personality development or any misbehaviour as the case may be.

Department of Technical Education

Name of the institution:	**Visit (I /II)**
PIN:	**Date of visit**
Name of the student:	**Period of training**
Semester:	
Name of the Industry	**Maximum marks (120)**

Skill Set Sl. No	*SKILL SET*	*Max Marks Allotted For each parameter*	*Precisely completes the task*	*Completes the task, mistakes are absent, but not Precise*	*Completes the task, Mistakes are a few*	*Makes attempt, Mistakes are many*
1	***Handling of various Equipments/Instruments(15)***					
	(i)Specifications of equipment and instruments	*10*	*10*	*8*	*6*	*2*
	(ii) Measuring the process parameters	*5*	*5*	*4*	*3*	*1*
2	***Supervising the Process of various manufacturing units in Chemical Engineering (20)***					
	(i) Raw materials and Product, byproducts	*4*	*4*	*3*	*2*	*1*
	(ii) Process Flow diagram, Line diagrams	*3*	*3*	*2*	*1*	*1*
	(iii) Process monitoring	*5*	*5*	*4*	*3*	*1*
	(iv) Design aspects	*4*	*4*	*3*	*2*	*1*
	(v) Quality control and Quality assurance	*4*	*4*	*3*	*2*	*1*
3	***Working with equipments, Instruments (25)***					
	(i) Working condition parameters	*8*	*8*	*6*	*5*	*2*
	(ii) Startup-Shutdown	*5*	*5*	*4*	*3*	*1*
	(iii) Maintenance	*12*	*12*	*10*	*7*	*3*
4	***Troubleshooting Skills (25)***					
	(i) Fault-Finding	*15*	*15*	*12*	*9*	*3*
	(ii) Rectification	*10*	*10*	*8*	*6*	*2*
5	***Safety aspects and crisis management (15)***					
	(i) Safety procedures	*4*	*4*	*3*	*2*	*1*
	(ii) Use of Personnel Protection Equipment	*5*	*5*	*4*	*3*	*1*
	(iii) Crisis management during hazards, accidents	*3*	*3*	*3*	*2*	*1*
	(iv) Pollution control techniques	*3*	*3*	*3*	*2*	*1*
6	***Soft skills and Reporting skills(20)***					
	(i)Communication Skills (oral/writing skills)	*4*	*4*	*3*	*2*	*1*
	(ii) Human relations.	*4*	*4*	*3*	*2*	*1*
	(iii) Supervisory abilities.	*4*	*4*	*3*	*2*	*1*
	(iv) Reporting technical issues	*4*	*4*	*3*	*2*	*1*
	(v)Maintenance of records in the industry.	*4*	*4*	*3*	*2*	*1*

(Marks in words:)

Signature of the Training In-charge (Mentor) **Signature of the visiting staff Name(Guide)**

Name **Name:**

Designation: **Designation:**

INDUSTRIAL TRAINING

Subject Title : Industrial Training
Subject Code : CHPP-601
Duration : 6 months

Time schedule

S.NO	Code	TOPICS	Duration
1	CHPP-601	• Practical training in Industry • Training Report Preparation Report Preparation: Title Page, Certificate, Acknowledgements, Abstract, Contents(introduction of Industry, Plant Layout, Organization Chart, List of Major Equipments, List of Processes: Skills Acquired; Conclusions; References	Six Months

Course Objectives and Course Outcomes

Upon completion of the course the student shall be able to		
Course Objectives		1.Expose to real time working environment 2. Enhance knowledge and skill already learnt in the institution. 3. Acquire the required skills of manufacturing processes, assembling, servicing, supervising in the engineering fields. 4. Install the good qualities of integrity, responsibility and self confidence.
COURSE OUT COMES	CO1	Apply theory to practical work situations
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PO-CO Mapping

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CO2						3		3		2
CO3						3		3		2
CO4						3		3		2

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Learning Outcomes

The student shall be able to display the following skill sets

1) Technical Skills *(*Manufacturing/Service/Drafting/Maintenance etc)
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				Demonstration of any one of the skills listed in learning outcomes	*30*
				Viva Voce	*10*
TOTAL MARKS					*300*

Skill Set Sl.No	*SKILL SET*	*Max Marks Allotted For each parameter*
1	Handling of various Equipments/Instruments	*15*
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3	Working with equipments, Instruments	*25*
4	Troubleshooting Skills	*25*
5	Safety aspects and crisis management	*15*
6	Soft skills and Reporting skills	*20*
	Total	***120***

During assessment the performance of the students shall be assessed in those skills in which the student has been trained and be awarded the marks as per the weightage assigned as above. In case the student has undergone training in a few skill sets then the total marks obtained shall be raised to 120 marks for the given assessment i.e. either assessment 1 or 2. However the performance of the student shall be assessed at the most skill sets listed above but not less than three skill sets.

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Department of Technical Education

Name of the institution:	**Visit (I /II)**
PIN:	**Date of visit**
Name of the student:	**Period of training**
Semester:	
Name of the Industry	**Maximum marks (120)**

Skill Set Sl.No	*SKILL SET*	*Max Marks Allotted For each parameter*	*Precisely completes the task*	*Completes the task, mistakes are absent, but not Precise*	*Completes the task, Mistakes are a few*	*Makes attempt, Mistakes are many*
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	(ii) Measuring the process parameters	*5*	*5*	*4*	*3*	*1*
2	***Supervising the Process of various manufacturing units in Chemical Engineering (20)***					
	(i) Raw materials and Product, byproducts	*4*	*4*	*3*	*2*	*1*
	(ii) Process Flow diagram, Line diagrams	*3*	*3*	*2*	*1*	*1*
	(iii) Process monitoring	*5*	*5*	*4*	*3*	*1*
	(iv) Design aspects	*4*	*4*	*3*	*2*	*1*
	(v) Quality control and Quality assurance	*4*	*4*	*3*	*2*	*1*
3	***Working with equipments, Instruments (25)***					
	(i) Working condition parameters	*8*	*8*	*6*	*5*	*2*
	(ii) Startup-Shutdown	*5*	*5*	*4*	*3*	*1*
	(iii) Maintenance	*12*	*12*	*10*	*7*	*3*
4	***Troubleshooting Skills (25)***					
	(i) Fault-Finding	*15*	*15*	*12*	*9*	*3*
	(ii) Rectification	*10*	*10*	*8*	*6*	*2*
5	***Safety aspects and crisis management (15)***					
	(i) Safety procedures	*4*	*4*	*3*	*2*	*1*
	(ii) Use of Personnel Protection Equipment	*5*	*5*	*4*	*3*	*1*
	(iii) Crisis management during hazards, accidents	*3*	*3*	*3*	*2*	*1*
	(iv) Pollution control techniques	*3*	*3*	*3*	*2*	*1*
6	***Soft skills and Reporting skills(20)***					
	(i)Communication Skills (oral/writing skills)	*4*	*4*	*3*	*2*	*1*
	(ii) Human relations.	*4*	*4*	*3*	*2*	*1*
	(iii) Supervisory abilities.	*4*	*4*	*3*	*2*	*1*
	(iv) Reporting technical issues	*4*	*4*	*3*	*2*	*1*
	(v)Maintenance of records in the industry.	*4*	*4*	*3*	*2*	*1*

(Marks in words:)

Signature of the Training In-charge (Mentor) **Signature of the visiting staff Name(Guide)**

Name **Name:**

Designation: **Designation:**

VII Semester

VII Semester

DIPLOMA IN CHEMICAL ENGINEERING (PLASTICS AND POLYMERS)
SCHEME OF INSTRUCTIONS AND EXAMINATIONS
C-20, VII Semester

Subject Code	Name of the Subject	Instruction period / week- Mod(non-mod)		Total Period / year	Scheme of Examination			
		Theory	Practical		Duration (hours)	Sessional Marks	End Exam Marks	Total Marks
THEORY:								
CHPP -701	Industrial ManagementandEntrepreneurship	5	-	75	3	20	80	100
CHPP -702	Thermodynamics and Reaction Engineering	5	-	75	3	20	80	100
CHPP -703	Instrumentation & Process Control	5	-	75	3	20	80	100
CHPP -704	Unit Operations –III	4	-	60	3	20	80	100
CHPP -705	Plastic Technology	5	-	75	3	20	80	100
PRACTICAL:								
CHPP-706	Chemical Plant Equipment Drawing	-	6	90	3	40	60	100
CHPP -707	Instrumentation, process control & Reaction Engineering Lab	-	3	45	3	40	60	100
CHPP -708	Life skills	-	3	45	3	40	60	100
CHPP-709	Project Work/ plastic technology lab	-	3	45	3	40 (20+20)	60 (30+30)	100 (50+50)
CHPP-710	Unit Operations-III Lab		3	45	3	40	60	100
Total		**24**	**18**	**630**		**300**	**700**	**1000**

CHPP- 708 common to all
CHPP-701,702, 703, 706, 707 Common to DCHE, DCHE(PC), DCHE(OT)
CHPP-701 separate not common with all branches, but common to DCHE, DCHE(PC/OT)
CHPP-704,710 Common DCHE(PC), DCHE(OT)
CHPP-705, 709 not common to any course

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Course code	Course title	No.Of Periods / week	Totalnumber of periods	Marks for FA	Marks for SA
CHPP-701	Industrial Management and Entrepreneurship	5	75	20	80

S.No.	Chapter/unit title	No of Periods	CO's mapped
1.	Principles and functions of Management	5	CO1
2.	Organisation structure & organisational behaviour	14	CO1
3	Production Management	10	CO2
4.	Materials Management	10	CO2
5.	Marketing ,Sales & Feasibility study	10	CO1
6.	Industrial legislation & safety	8	CO4, CO1
7.	Introduction to ISO 9000 & T.Q.M.	8	CO4
8	Role of Entrepreneur and Entrepreneurial Development	10	CO3
	Total	**75**	

Course objectives:

1. To familiarize with different management, productionand material principles and different structures of organization.
2. To know the role and expectations of entrepreneur.
3. To understand and reinforce the subject to establish a small scale industry

Course outcomes	**CO1**	CHPP-701.1	To familiarize with the basics, principles and functions of management, ownership and marketing
	CO2	CHPP-701.2	To familiarize with materials and production management
	CO3	CHPP-701.3	To know the role of entrepreneur and feasibility report
	CO4	CHPP-701.4	To understand safety , quality and iso standards to in the industry

CO-PO/PSO Matrix:

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-701.1	3		2			1		3		2
CHPP-701.2	3							3		
CHPP-701.3	3	1		1	1				1	
CHPP-701.4	3	1		1	1	1			1	
AVERAGE	**3**	**1**	**2**	**1**	**1**	**1**		**3**	**1**	**2**

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Learning out comes:

On completion of the course the student will be able to

1.0 Understand the principles of management as applied to industry.

1.1 Define industry, commerce (Trade) and business.
1.2 Know the need for management.
1.3 Understand the evolution of management
1.4 Explain the principles of scientific management.
1.5 Understand functions of Management.
1.6 Differentiate between management and administration.

2.0 Know the organisation structure of an industry and the behaviour of an individual in an organisation.

2.1 Understand types of ownerships
2.2 Differentiate types of ownerships.
2.3 Understand salient features of joint stock companies.
2.4 Understand the philosophy and need of organisation structure of an industry.
2.5 Understand the line and staff organisations.
2.6 List the advantages and limitations of line and staff organisations.
2.7 List different departments in a large scale industry.
2.8 Explain the factors of effective organisation.
2.9 Understand organisational behaviour.
2.10 Conduct for analysis.
2.11 Assess the incurring applicants.
2.12 Outline the selection process.
2.13 Understand the sources of manpower.
2.14 State motivation theories.
2.15 State Maslow's Hierarchy of needs.
2.16 Explain the phenomena of satisfaction.
2.17 Explain the performance levels.
2.18 Design reward system
2.19 Explain quality of work life.
2.20 Explain socio-technical and socio-psychological approach.
2.21 List out different leadership models.
2.22 Explain the trait theory of leadership.
2.23 Explain behavioural theory of Leadership.
2.24 Explain the process of decision Making.
2.25 Outline the communication process.
2.26 Analyse the behaviour of groups in an organisation.
2.27 Explain group dynamics.
2.28 Detail the process of managing conflict.
2.29 Explain conflict resolution strategies.

3.0 Understand the different aspects of production management.

3.1 Differentiate and integrate production, planning and control.
3.2 Relate the production department with other departments.
3.3 State the need for planning and it's advantages.
3.4 Explain the stages of Production, planning and control.
3.5 Explain routing methods.
3.6 Explain scheduling methods.
3.7 Explain dispatching.

3.8 Draw PERT/CPM networks.
3.9 Identify the critical path.

4.0 Understand the role of materials management industries.
4.1 Explain the role of the materials in Industry.
4.2 Derive expression for inventory control.
4.3 Explain ABC analysis.
4.4 Define safety stock.
4.5 Define reorder level.
4.6 Derive an expression for economic ordering quantity.
4.7 Explain stock layout.
4.8 List out stores records.
4.9 Explain the Bin card.
4.10 Describe Cardex method.
4.11 Explain purchasing procedures.
4.12 List out purchase records.
4.13 Describe the stores equipment
4.14 Describe material handling methods and need.
4.15 Describe material lifting methods. List out hoists, cranes, conveyers, trucks, and forklift trucks.
4.16 Explain the concept of cost.
4.17 List out the elements of cost.
4.18 Explain the concept of contribution.
4.19 Explain break-even analysis.

5.0 Understand marketing, sales and feasibility study.
5.1 Explain marketing functions.
5.2 Explain Sales function.
5.3 List out market conditions.
5.4 Differentiate Sellers and Buyers' market.
5.5 Differentiate monopoly, oligarchy, and perfect competition.
5.6 Conduct market and demand surveys.
5.7 Differentiate product and production analysis.
5.8 Identify the input materials, i.e. Bill of materials
5.9 Define the main policy requirements.
5.10 Decide the location.
5.11 Evaluate Economic and Technical factors.
5.12 Preparation of feasibility study.
5.13 List out different products currently in demand with market or industry.
5.14 Role of advertising, media of advertising and selection of media

6.0 Comprehend the provisions of industrial legislation in India. & Safety procedures
6.1 Describe employer and employee relations.
6.2 Describe the mechanics of Trade Unions.
6.3 Describe mechanics of settlement of in outs.
6.4 Explain the significance of collective bargain.
6.5 List out Welfare activities.
6.6 List out subsidy schemes.
6.7 Explain the Totalwelfare concept.
6.8 List out the rights and responsibilities of employees and employers.
6.9 List out the salient features of Indian Factories Act.

6.10 List out the salient features of Minimum Wages Act.
6.11 List out the salient features of Industrial Disputes Act.
6.12 List out the salient features of Workmen's Compensation Act
6.13 List out the salient features of E. S .I. Act.
6.14 List out the salient features of consumer protection rights Act
6.15 Explain the importance of safety at Work place.
6.16 List out the important provisions related to safety.
6.17 Explain the significance and mechanics of safety education.
6.18 Explain hazard and accident.
6.19 List out different hazards in the Industry.
6.20 Explain the causes of accidents.
6.21 Explain the direct and indirect cost of accidents.
6.22 List out Electrical Hazards.
6.23 List out types of fire extinguishers.
6.24 Describe the method of artificial Respiration.
6.25 Describe the method of CPR.
6.26 Describe the mechanics of safety Drills.
6.27 List out provisions of Indian Electricity Rules laid in the electricity act1923.

7.0 Understand ISO 9000 & TQM.

7.1 Understand the concept of quality.
7.2 Know the quality systems and elements of quality systems.
7.3 Know the principles of quality Assurance.
7.4 Know the Indian Standards on quality systems.
7.5 Know the evolution of ISO standards.
7.6 Discuss ISO standards and ISO 9000 series of quality systems.
7.7 State the constituents of ISO 9000 series of standards for quality systems.
7.8 State the outstanding features and drawbacks of ISO 9000 series of standards.
7.9 List the beneficiaries of ISO 9000.
7.10 Understand 5-Sprinciples and ZERO DEFECT.

8.0 Understand the role of entrepreneur in economic development and in improving the quality of life.

8.1 Outline the concepts of Entrepreneurship.
8.2 Define the word entrepreneur.
8.3 Determine the role of Entrepreneurship.
8.4 Describe the profile of an entrepreneur.
8.5 Explain the requirements of an entrepreneur.
8.6 Outline the expectations of Entrepreneurship.
8.7 Determine the role of entrepreneurs in promoting Small Scale Industries.
8.8 Describe the details of self-employment schemes.
8.9 Explain the method of product selection.
8.10 Explain the method of site selection.
8.11 Outline the method of plant layout.
8.12 State the needs for a planned and co-ordinated effect.
8.13 State the importance of follow up.
8.14 Describe the small business scheme.
8.15 List the financial assistance programmes.
8.16 List out the organisations that help an entrepreneur.
8.17 Conduct a demand survey.
8.18 Conduct a market survey.

Course code CHPP-701	Course Title: Industrial management and entrepreneurship No of Course outcomes 05				No of periods: 75
POs	Mapped with CO No	CO periods addressing PO in Column 1		Level (1, 2, 3)	Remarks
		NO	%		
PO1	CO1, CO2, CO3, CO4	75	54	3	>40%- level 3
PO2	CO3, CO4	26	19	1	25%-40% level 2
PO3	CO1	38	27	2	
					5-25% : level 1
					<5%: not addressed

Hyponated course outcomes

1. **Principles and functions of management :**

   Definitions of Industry, Commerce and Business. Evolution of management theories. Principles of Scientific Management, functions of management. Difference of administration and management.

2. **Organisation Structure & organisational behaviour :**

   Role of industry, Types of ownership – Sole proprietorship, Partnership, Private limited, Public limited company, Industrial Cooperatives, Philosophy, types of Organisations, Line and Staff and functional organisations. Advantages and limitations, departments in a large scale industry. Effective organisation. Job analysis, Assessing applicants, selection, motivation, different theories, satisfaction, performance reward systems quality of work life, socio-technical and socio-psychological approaches, Leadership in organisation, decision making, communication, group dynamics, Managing conflict.

3. **Production Management :**

   Production, planning and control, relation with other departments, need for planning and advantages Routing, scheduling, despatching, PERT and CPM, simple problems.

4. **Materials Management :**

   Materials in industry, inventory control model, ABC Analysis, Safety stock, re-order, level, Economic ordering quantity, Cost Elements of Cost, Contribution, Break even analysis, Stores layout, stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex, Material handling, Manual lifting, Hoist, Cranes, conveyors, trucks, fork trucks.

5. **Marketing, Sales & Feasibility Study :**

   Sellers and Buyers markets, Marketing, Sales, Market conditions, monopoly, oligarchy, perfect competition, Budgets, Pricing Policies. Market Survey, Product and production Analysis, Materials input, Manpower, Location, Economic and Technical Evaluation, preparation of Feasibility study reports, - different products – Mechanical, Electrical, Electronics, consumer items, Consumer desires etc.

6. Industrial Legislation &safety :

Employer – Employee relations, Trade, Union Settlement of disputes, collective bargaining, Welfare activities, subsidies, TotalWelfare concept, rights and responsibilities and Employers and employees. Salient features of (i) Indian Factories Act, (ii) Minimum Wages Act, (iii) Industrial Disputes Act, (iv) Workmen's compensation Act, (v) E.S.I Act. (Vi) Consumer protection act Important of Safety at work places, factories Act- Provisions, Safety Education, Hazards, causes of accidents, Cost of accidents, Electrical Hazards, Fire Extinguishers Artificial respiration, safety drills, Indian Electricity rules.

7. Introduction to ISO 9000 and TQM :

Concept of quality discussed by B. Crosby W. Edward, Deming, Joseph M. Jura Kooru Ishikawa, Genichi Taguchi, ShigcoShingo.Quality systems – Definitions of the terms used in quality systems like, quality policy, quality management, quality systems, quality control and quality assurance.Elements quality systems : Management responsibility, Quality system, contract review, design control, document control, purchasing, purchaser – supplied product, product identification and traceability, process control, Inspection and testing.Principles of quality assurance – Definition of quality assurance.Indian standards on quality systems – Main features of IS 13999 : 1990, IS 14000 : 1990, IS 14004 : 1990, IS 14001: 1990, IS 14002 : 1990, IS 14003: 1990.Know the necessity of International standards – Evolution of ISO. **5-S** principles – importance – meaning – approach – benefits.Various standards under ISO – Outstanding features of ISO 9000 series of standards – ISO 9000 Phenomenon ISO 9000 series of quality systems – Constituents of ISO 9000 series of standards for quality systems. Drawbacks of ISO 9000 series of standards, list the beneficiaries of ISO 9000 (Whom does ISO 9000 help).

8. Role of Entrepreneur & Entrepreneurial Development :

Concept, definition, role, expectation, entrepreneurship Vs Management, promotion of S.S.I. Self – employment schemes. Product selection, site selection, plant layout, profile and requirement, need for a planned and co-coordinated effort, following, Institutional support needed, Financial assistance programmes, Demand survey, Market survey.

REFERENCE BOOKS :

1. Industrial Engineering and Management-by O.P Khanna
2. Production Management- by Buffa.
3. Engineering Economics and Management Science - by Banga & Sharma.
4. S.S.I Hand Book by S.B.P. Publishers.
5. Personnel Management by Flippo.
6. Industrial Management and Entrepreneurship by ZakriaBaig.
7. Entrepreneurship – by NITTT&R, Chennai.

S.No.	Major Topics	No of Periods	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				Cos mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Principles and functions of Management	5	3	3		-	-	1				CO1
2.	Organisation structure & organisational behaviour	14	14	6	8			2	1			CO1
3.	Production Management	10	13	3			10	1		1		CO2
4.	Materials Management	10	14	6	8			2	1			CO2
5.	Marketing ,Sales & Feasibility study	10	11	3	8			1	1			CO1
6.	Industrial legislation & safety	8	6	6				2				CO4, CO1
7	Introduction to ISO 9000 & T.Q.M.	8	8		8				1			CO4
8	Role of Entrepreneur and Entrepreneurial Development	10	11	3	8			1	1			CO3
Total		**75**	**80**	**30**	**40**		10	**10**	**5**	**1**		

C-20, CHPP-701
Subject Name: Industrial ManagementandEntrepreneurship
Syllabus split up for Unit Test

Unit test NO	Learning out comes to be covered
Unit test-I	Objective from 1.1 to 4.19
Unit test-II	Objective from 5.1 to 8.18

Model paper 1
State Board of Technical Education and Training, A.P
Diploma in Chemical Engineering (PP)
Subject Name: Industrial ManagementandEntrepreneurship
SUBJECT CODE: CHPP-701
Unit Test-1

Time : 90minutes **Max Marks: 40**

PART-A **16** Marks

Instructions*:* (1)Answer all questions **2X3=6 Marks**
(2) First question carries 4marks and rest of the questionscarries 3marks

1.
   a) Card attached tothe bin is called_____
   b) Example for joint stock company_____
   c) Top level people have _____skills.
   d) Rate of production of goods is known as_____
2. Define the terms Business and Commerce **CO1**
3. Distinguish between sole proprietorship and partnership **CO2**
4. Write short notes on dispatching. **CO2**
5. Explain about Bin cards. **CO1**

PART-B **8X3=24 Marks**

Instructions: (1) Answer all questions
(2) each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6. Explain ABC analysis in inventory control with a graph. **CO2**

(or)

7. Explain about Cardex method. **CO2**

8. A Project has 7 activities, the expected time in weeks for each activity is as follows. Show that earliest and latest expected time on the network diagram. Find the critical path and duration of the project. **CO3**

S.No.	1	2	3	4	5	6	7
Activity	1-2	1-3	1-4	2-5	3-5	5-6	4-6
Duration inWeeks(to)	2	4	3	6	9	2	4

(or)

9. A Project has 7 activities the expected time in weeks for each activity is as follows. Show that earliest and latest expected time on the network diagram. Find the critical path and duration of the project. **CO3**

S.No.	1	2	3	4	5	6	7
Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Duration inWeeks(to)	1	2	4	6	8	3	2

10. Explain about functional organization structure? **CO3**

(or)

11. What is a co-operative society? What are its chief characteristics? Explain. **CO3**

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Model paper 1
State Board of Technical Education and Training, A.P
Diploma in Chemical Engineering (PP)
Subject Name: Industrial ManagementandEntrepreneurship
SUBJECT CODE: CHPP-701
Unit Test-II

Time : 90minutes **Max Marks: 40**

PART-A **16** Marks

Instructions*:* (1)Answer all questions **2X3=6 Marks**
(2) First question carries 4marks and rest of the questions carries 3marks

1.
   a) The scientific study of all the problems relative to transfer and sale of goods is_____
   b) An entrepreneur should posses the qualities of _____
   c) Which institution in India, monitors the quality systems_____
   d) Age group of people who are considered for self-employment under PMRY is_____
2. Write short notes on quality. **CO1**
3. What is meant by market survey and demand survey **CO2**
4. Explain about Quality Assurance **CO2**
5. What is Monopoly Market, give examples **CO1**

PART-B **8X3=24 Marks**

Instructions*:* (1) Answer all questions
(2) each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6. What are the rights and responsibilities of employer **CO3**

(or)

7. Explain the factors influencing the site selection for a plant location **CO3**

8. Write the differences between entrepreneurial style and management style of managing the business. **CO3**

(or)

9. Explain the principles of TQM. **CO2**

10. What factors must be considered in selection of a product? Explain **CO3**

(or)

11. Explain different types of self employment schemes? **CO2**

***

Model question paper

Q.No	Question	Blooms category	Marks allocated	CO adressed
Part-A(30 marks)				
1.	List out Scientific Management principles	remembering	3	CO1
2.	What is a joint stock company	Remembering	3	CO1
3.	What is the importance of motivation	understanding	3	CO2
4.	Write about scheduling	Remembering	3	CO2
5.	Explain about Re-orderlevel	understanding	3	CO2
6.	Explain about Bincard	Remembering	3	CO3
7.	List out the components of cost	understanding	3	CO3
8.	Define Trade Union. What are its objectives	remembering	3	CO1
9.	List out Major Trade Unions in India	remembering	3	CO4
10.	Mention the qualities of a good entrepreneur	remembering	3	CO4
Part-B(40 marks)				
1	Differentiate job description and job specification? (Or) Explain about selection procedure	understanding	8	CO1
2	Derive an expression for EOQ (Or) Explain about Cardex method	understanding	8	CO2
3	Explain and compare marketing conditions (Or) Explain the steps in preparing Feasibility report	understanding	8	CO2
4	State the benefits of ISO 9000 and explain whom does it help? (Or) Explain the elements of quality systems?	understanding	8	CO3
5	What factors must be considered in selection of a product? (Or) What is the need for market survey? How is it conducted.	understanding	8	CO4
Part-C(10 marks)				
6	Explain various terms used in network diagrams	analyzing	10	CO3

Course code	Course title	No.Of Periods / week	Totalnumber of periods	Marks for FA	Marks for SA
CHPP-702	Thermodynamics and reaction engineering	5	75	20	80

S.No.	Chapter/unit title	No. of periods	Cos mapped
1.	Introduction, First law of thermodynamics and Volumetric properties of pure fluids	18	CO1, CO2, CO3, CO4, CO5
2.	The second law of thermodynamics	12	CO2, CO3, CO4, CO5
3	Refrigeration and Liquefaction	10	CO2, CO4, CO5
4.	Chemical reaction equilibrium	10	CO1, CO2, CO3, CO5
5	Chemical kinetics and ideal reactors	18	CO2, CO3, CO5
6	Catalysis and Industrial reactors	07	CO1, CO2, CO4
	Total	**75**	

Course objectives:

1. To familiarize with the terms used in thermodynamics, thermodynamic processes, properties of fluids, second law of thermodynamics, refrigeration and liquefaction, Lechleiter's principle, rate of reaction, factors affecting rate of reaction, methods to analyse rate data, industrial reactors and catalysis
2. To apply thermodynamic laws for steady state flow process and feasibility of a chemical process, Lechleiter's principle to Haber's and contact process
3. To understand and reinforce the thermodynamic concepts in various chemical processes for better production results.

Course outcomes

CO1	CHPP-702.1	Interpret the basic concepts and definitions of thermodynamics, reaction engineering and catalysis
CO2	CHPP-702.2	Analyse various thermodynamic properties and their evaluation, applications of thermodynamics, reactors and catalysts
CO3	CHPP-702.3	Deduce the derivations of thermodynamics and reaction engineering
CO4	CHPP-702.4	Illustrate with the help of neat diagrams the construction and working of heat engines, heat pumps and various reactors
CO5	CHPP-702.5	Solve the problems on first and second law of thermodynamics and reaction engineering

CO-PO/PSO MATRIX:

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-702.1	3							2		
CHPP-702.2		2						1		
CHPP-702.3	2	2							2	
CHPP-702.4			2						2	
CHPP-702.5	2	2							2	
AVERAGE	**2**	**2**	**2**					**2**	**2**	

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Course code CHPP-702		**Course Title: thermodynamics and reaction engineering No of Course outcomes 07**				**No of periods: 75**
POs	**Mapped with CO No**		**CO periods addressing PO in Column 1**		**Level (1, 2, 3)**	**Remarks**
			NO	**%**		
PO1	CO1, CO3, CO5	43	44	3		>40%- level 3
PO2	CO2, CO3, CO5	25	33	2		25%-40% level 2
PO3	CO4	17	23	1		5-25% : level 1
PO4						
PO5						<5%: not addressed
PO6						
PO7						

Learning outcome
After completion of the course, the student will be able to

1.0 Introduction, First law of thermodynamics and volumetric properties of pure fluids

1.1 Describe importance of thermodynamics.
1.2 Define internal energy, enthalpy and their units in SI system.
1.3 Define the statement for 1st law of thermodynamics.
1.4 Derive an expression of first law of thermodynamics for the following processes:
a) Closed process
b) Steady state flow process.
1.5 Differentiate between state and path functions.
1.6 Distinguish extensive and intensive properties.
1.7 Derive the relation of constant volume and constant pressure processes
1.8 Define heat capacity and specific heat
1.9 Explain (a) Equilibrium (b) Reversible process.
1.10 Describe the PVT behaviour of pure substances.
1.11 Define ideal gas and the characteristics of ideal gas.
1.12 Define compressibility factor and know about compressibility Charts.

1.13 Derive $C_p - C_v = R$ for a mole of an ideal gas.
1.14 Explain about the following processes.
A) Isobaric b) Isochoric c) Isothermal and d) Adiabatic.
1.15 Derive expression for ΔU, ΔH, Q and W in the above processes connecting PVT properties.
1.16 Solve problems on calculation of ΔU, ΔH, Q and W in the above processes connecting PVT Properties.

2.0 The second law of thermodynamics.

2.1 Explain second law of thermodynamics.
2.2 Distinguish between heat engine and heat pump.
2.3 Give the schematic representation of heat engine and heat pump.
2.4 Define cop in heat engine and heat pump.
2.5 Define and explain Carnot cycle for an ideal gas.
2.6 Explain Carnot cycle principle.
2.7 Define entropy and its SI units.
2.8 Explainthe entropy characteristics.
2.9 Describe the entropy changes of an ideal gas.
2.10 Derivethe mathematical statement of 2^{nd} law of thermodynamics.
2.11 Define third law of thermodynamics.

3.0 Refrigeration and Liquefaction.

3.1 Define refrigeration.
3.2 Explain the cycle of refrigeration.
3.3 List the methods of refrigeration.
3.4 list the applications of refrigeration.
3.5 Define refrigerant.
3.6 Describe classification of refrigerants (primary and secondary).
3.7 Explain the principle of Carnot cycle refrigerator.
3.8 Explain about choice of refrigerant.
3.9 Explain the method of obtaining vapour compression refrigeration.
3.10 Explain the method of obtaining vapour absorption refrigeration.
3.11 Solve simple problems on ton of refrigeration, COP on refrigeration
3.12 Explainabout liquefaction
3.13 Explain Linde and Claude liquefaction processes

4.0 Chemical reaction equilibria.

4.1 Define equilibrium.
4.2 Explain about the standard Gibbs free energy change and the equilibrium constant.
4.3 Explain the effect of temperature on the equilibrium constants.
4.4 Evaluation of equilibrium constants.
4.5 Explain the relation between equilibrium constants and composition.
4.6 Simple problems on equilibrium constant calculations

5.0 Chemical kinetics and ideal reactors.

5.1 Introduction to chemical kinetics
5.2 Explain the importance of reaction kinetics in chemical industries.
5.3 Explain the classification of reactions.
5.4 Define reaction rate and know its units.
5.5 Explain the variables affecting the rate of reaction.
5.6 Define single, multiple, elementary and non-elementary reactions.
5.7 Explain about molecularity and order of reaction.

5.8 Explain about rate constant k, representation of a rate equation.
5.9 Explain about temperature – dependent term of a rate equation.
5.10 Explain temperature dependency from Arrchenius law.
5.11 Explain about constant – volume batch reactor.
5.12 Describe about
a) Integral method of analysis of data.
b)Differential method of analysis of data.
5.13 Define the following with examples.
a) Zero order
b) First order
c) Second order .
5.14 Explain broad classification of reactor types.
5.15 Explain ideal batch reactor with diagram and design equation.
5.16 Define space time and space velocity.
5.17 Explain the steady state mixed flow reactor with diagram and design equation.
5.18 Explain steady state plug flow reactor with diagram and design equation.

6.0 Catalysis and Industrial reactors.

6.1 Define catalysis.
6.2 Describe about the types of catalysis.
6.3 Scribe the characteristics of a catalytic reactions.
6.4 Define auto catalysis.
6.5 Explain the function of promoters, accelerators, carriers, inhibitors in catalytic reaction with examples.
6.6 Explain catalyst poisoning.
6.7 List out some important commercially available catalysts.
6.8 List six industrial catalytic processes.
6.9 Explain the working principle of the following with the help of neat sketches.
a) Fixed bed reactors
b) Moving bed reactors
c) Fluidized bed reactors

HYPONATED COURSE

1.0 Introduction and First law of thermodynamics.

The importance of thermodynamics- Internal energy – Formulation of first law –closed process - State functions and path functions – Enthalpy – Steady state flow process – –Constant volume and constant pressure processes - heat capacity and specific heat- Equilibrium – Reversible process.

Volumetric properties of pure fluids.

PVT behaviour of pure substances – Ideal gas —Definition of compressibility factor- Derivation of $C_p - C_v = R$ for a mole of an ideal gas-State and explain about the following processes : A) Isobaric b) Isochoric c) Isothermal and d) Adiabatic.

The different expressions for ΔU, ΔH, Q and W in the above processes connecting PVT properties- Problems on calculation of ΔU, ΔH, Q and W in the above processes

2.0 The second law of thermodynamics:

Statement – The heat engine and heat pump- Carnot cycle for an ideal gas – Entropy – Entropy changes of an ideal gas – Mathematical statement of the second law – The third law of thermodynamics – Statement – Problems.

3.0 Refrigeration and Liquefaction:

The Carnot refrigerator – Vapor – Compressioncycle – Comparison of refrigeration cycles – Refrigerant – Choice of refrigerant – Absorption refrigeration – Heat pump- Liquefaction- Linde and Claude liquefaction Processes.

4.0 Chemical reaction equilibria :

Application of equilibrium criteria to chemical reactions – The standard Gibbs energy change and the equilibrium constant – Effect of temperature on the equilibrium constant – Evaluation of equilibrium constants – Relation between equilibrium constants and composition.

5.0 Chemical kinetics and ideal reactors.

Chemical kinetics – Classification of reactions – Variables affecting the rate of reaction – Reaction rate- Concentration – Dependent term of a rate equation – Single and multiple reactors, elementary and non-elementary reactions – Molecularity and order of a reaction – Rate constant K – Representation of a rate equation – Constant volume batch reactor – Integral method of analysis of data and differential method of analysis of data. – Broad classification of reactor types – Ideal batch reactor – Space time and space velocity – Steady state mixed flow reactor – Steady stated plug flow reactor – Holding time and space time for flow systems – Problems.

6.0 Catalysis and Industrial Reactors :

Types of catalysis – Characteristics of catalytic reactions – Auto catalysis – Accelerators, Promoters, inhibitors, poisons- some important catalysts- industrial catalytic processes-Important industrial reactors

REFERENCE BOOKS :

1. Introduction to Chemical Reaction Engineering – by K.A. Gavane, Nirali Publications.
2. Chemical Kinetics – by J.M. Smith.
3 Introduction to Chemical Engineering Thermodynamics – by Smith and Vannes, 4th Edition.
4. Chemical reaction Engineering – by Octave Levenspiel, 2nd edition.

MODEL BLUE PRINT WITH WEIGHTAGES FOR BLOOMS CATEGORY AND QUESTIONS FRO EACH CHAPTER AND Cos MAPPED

S.No.	Major Topics	No of Periods	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				COS mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Introduction and First law of thermodynamics Volumetric properties of pure fluids	18	17	6	3	8		2	1	1		CO1, CO2, CO3, CO4, CO5
2.	The second law of thermodynamics	12	11		3	8			1	1		CO2, CO3, CO4, CO5
3.	Refrigeration and Liquefaction	10	11	3	8			1	1			CO2, CO4, CO5
4.	Chemical reaction equilibria	10	11		8	3			1	1		CO1, CO2, CO3, CO5
5.	Chemical kinetics and ideal reactors	18	19	6	3		10	2	1		1	CO2, CO3, CO5
6.	Catalysis and Industrial reactors	07	11	3	8			1	1			CO1, CO2, CO4
Total		**75**	**80**	**18**	**33**	**19**	**10**	**6**	**6**	**3**	**1**	

C-20-CHPP-702

Subject Name: THERMODYNAMICS AND REACTION ENGINEERING

VII SEMESTER

Syllabus split up for Unit Test

Unit test No.	Learning out comes to be covered
Unit test-I	Objective from 1.1 to 3.13
Unit test-II	Objective from 4.1 to 6.9

C-20,CH/CHPC/CHPP/CHOT-702

(Model Paper 1)

State Board of Technical Education and Training , A.P

Diploma in Chemical Engineering (P&P),D.Ch.E.(P&P),

VII SEMESTER

Subject Name: Thermodynamics and Reaction Engineering

Subject Code: CH/CHPC/CHPP/CHOT-702

Time: 90 minutes **Unit Test I** **Max .Marks:40**

Part-A **16Marks**

Instructions: (1) Answer all questions.

(2) First question carries four marks, each question of remaining carries three marks.

1. Define the following
   (a) Extensive properties with example **(CO1)**
   (b) Compressibility factor **(CO1)**
   (c) Carnot's theorem **(CO1)**
   (d) Refrigeration capacity **(CO1)**
2. Differentiate between state and path functions with examples **(CO1)**
3. Derive $Q = W = nRT\ln(V_2/V_1)$ for an ideal gas at constant temperature **(CO3)**
4. A Carnot's engine receives 150KJ/S of heat from a heat source reservoir at 425^{o}C and rejects heat to a sink reservoir at 30^{o}C.What are the power produced and heat rejected? **(CO5)**
5. Define refrigerant and list the few common refrigerants **(CO2)**

Part-B **3X8=24Marks**

Instructions: (1) Answer all questions

(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer .

6. (a) Derive an expression of first law of thermodynamics for a steady state flow process **(CO3)**

   or

   (b) An ideal gas undergoes the following reversible processes **(CO5)**

   (i) From an initial state of 343K and 1bar it is compressed adiabatically to 423K
   (ii) It is then cooled to 343K at constant pressure (c) Finally it is expanded to its original state isothermally. Calculate ΔU, ΔH, Q and W for each process and for the entire cycle with Cp = (5/2)R

7. (a) Derive Carnot's equations for an ideal gas using Carnot's cycle **(CO3)**

   or

   (b) A steel casting with Cp = 0.5KJ/KgK weighing 40Kg at a temperature of 450^{o}C is quenched in 150Kg of oil at 25^{o}C with Cp of oil = 2.5KJ/KgK. If there are no heat losses, What is the change in entropy of steel casting, change in entropy of oil and total entropy change? **(CO5)**

8. (a) Explain the method of obtaining vapor compression refrigeration **(CO4)**

   or

   (b) Define liquefaction and explain Linde - Claude liquefaction process **(CO4)**

***

Model question paper

Q.No	Question	Blooms category	Marks allocated	CO addressed
Part-A(30 marks)				
1.	Define heat capacity and how it is classified.	remembering	3	CO1
2.	Define and explain phase rule	Remembering	3	CO1
3.	Describe a few equation of state of a real fluid	understanding	3	CO3
4.	Distinguish between heat engine and heat pump	understanding	3	CO1
5.	List six refrigerants	Remembering	3	CO1
6.	factors favours the forward reaction in the following reaction at 300K, $N_2+3H_2 \rightarrow 2NH_3$ $\Delta H=-22$Kcal	application	3	CO2
7.	Define molecularity and order of reaction	remembering	3	CO1
8.	Define space time and space velocity		3	CO1
9.	The half life of a first order reaction is 10min. what percent of reactant remains after 15 min	application	3	CO5
10.	Explain the classification of catalysis		3	CO2
Part-B(40 marks)				
1	Explain first law of thermodynamics for steady state flow process (or) derive PV^{γ}= constant for an adiabatic process	understanding	8	CO1 CO3
2	Explain the principle of increase of entropy (or) Explain that carnot engine has maximum efficiency than any other engine which is operating between the same temperature reservoirs	understanding	8	CO1 CO3
3	Explain vapor compression refrigeration with a sketch (or) explain the process of liquefaction of air by linde process	understanding	8	CO4 CO4
4	Apply lechatlier's principle for habers process (or) Describe the relation between standard gibbs energy and equilibrium constant	application	8	CO2 CO3
5	Explain the role of promoters, accelerators in catalysis (Or) Explain the construction and working of fluidized bed reactor		8	CO2 CO4
Part-C (10 marks)				
1	Explain briefly how first and second order kinetics can be analysed using integral method of analysis	analysing	10	CO2

Course code	Course title	No. of periods/week	Totalno.of periods	Marks for FA	Marks for SA
CH-PP-703	Instrumentation & Process Control	05	75	20	80

S.No.	Chapter/unit title	No. of periods	CO's Mapped
1.	Introduction and Qualities of measurement.	8	CO1
2.	Measurement of Temperature.	12	CO2 to CO5
3.	Measurement of pressure and Vacuum:	10	CO2 to CO5
4.	Measurement of Liquid level, Density and Viscosity.	10	CO2 to CO5
5.	Measurement of composition.	10	CO2 to CO5
6.	Process Instrumentation & Instrumentation diagrams for Chemical Engineering processes and operations:	10	CO2 to CO5
7.	Principles of automatic process control and modes available for process control.	15	CO7
	Total periods	**75**	

Course objectives

Course objectives	(i)	To familiarize with the measurement, control of process and process instrumentation.
	(ii)	To use various instruments to measure the temperature, pressure, vacuum, level, density, viscosity and composition.
	(iii)	To know the principle ,construction ,and working of different instruments.

Course Outcomes

CO1	**CHPP-703.1**	Illustrate with example the Definitions and concepts of First and Second order systems with various inputs and responses.
CO2	**CHPP-703.2**	Derive the response equations for various inputs related to First and Second order systems.
CO3	**CHPP-703.3**	Illustrate the Principle, Construction and working of various instruments to measure temperature, pressure, vacuum, level, density, viscosity and composition with diagram.
CO4	**CHPP-703.4**	Compare the applications of the temperature, pressure, vacuum, level, density, viscosity and composition measuring instruments
CO5	**CHPP-703.5**	Describe the Instrumentation diagrams and working of automatic process control systems both pneumatic and hydraulic operated.

CO-PO/PSO Matrix:

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP-703.1	3	2						2		
CHPP-703.2	2	2						2		
CHPP-703.3			2						2	
CHPP-703.4	2				2			2		2
CHPP-703.5			2						2	
AVERAGE	**2**	**2**	**2**		**2**			**2**	**2**	**2**

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Learning Outcome

Unit-1: Introduction and Qualities of measurement

Know the importance of Instrumentation and process control in Chemical Industries.

1.0 Know the meaning of measurement.
1.1 Know the differences between direct and in-direct measurement.
1.2 Know about different elements of an instrument.
1.3 Know about the Static characteristics of an instrument.
1.4 Know about the Dynamic characteristics of an instrument.
1.5 Know about a First order system and physical examples of first order system.
1.6 Know about a Second order system and physical examples of second order system.
1.7 Know about various input functions like Step input, Impulse input, Sinusoidal inputand Linear input.
1.8 Know about the response of a first order system for a given input functions with derivations.
1.9 Know about the parameters that characterize a first order system and a second order system.

Unit-2 Measurement of Temperature.

2.1 Know about different temperature scales in different units.
2.2 Know about Principle, construction and working of expansion thermometers.
2.3 Know about Vapor actuated thermometer.
2.4 Know about the sources of static error in industrial pressure spring thermometers.
Know about thermo-electricity and thermo-electric circuit or Thermocouple.
Know about Seebeck effect, Pelteir effect and Thomson effect.
2.5 Know the types of industrial thermocouples.
2.6 Know about the accessories of an industrial thermocouple.
2.7 Know the mechanical properties of thermal well materials.
2.8 Know the effect of location of reference junction and lead wires for a Thermocouple.
2.9 Know about the principle, construction, working of Milli-voltmeter and its application.
2.10 Know about the principle, construction, working of Null Potentiometer circuit and its and its application.
2.11 Know about temperature coefficient of resistance.
2.12 Know about industrial resistance thermometer bulbs.
2.13 Know about resistance thermometer elements.
2.14 Know about thermal wells and lead wires for resistance thermometers.

2.15 Know the indicating elements of industrial resistance thermometers like Wheat stone bridge circuit and Modified wheat stone bridge circuit also known as "Callender Griffith circuit".
2.16 Know about radiation temperature measurement.
2.17 Know about radiation receiving elements.
2.18 Know the types of radiation pyrometers.
2.19 Know about Optical pyrometer and its principle, construction and working.

Unit-3: Measurement of pressure and Vacuum:

3.1 Know the basic concepts of pressure measurement.
3.2 Know different types of pressures.
3.3 Know about different types of liquid column manometers, their principle construction and working.
3.4 Know different types of pressure measuring elements.
3.5 Know the mechanical indicating elements.
3.6 Know about inductance coil method of an indicating element.
3.7 Know about resistance rod indicating element.
3.8 Know about electric pressure gauge of indicating element.
3.9 Know about different types of vacuum gauges.

Unit-4: Measurement of Liquid level, Density and Viscosity.

4.1 Know the principle construction and working of liquid level method of measuring density.
4.2 Know the direct methods of liquid level measurement.
4.3 Know the principle construction and working of bubbler system for measurement of liquid level.
4.4 Know the level measurement in pressure vessels.
4.5 Know about principle construction and working of displacement float liquid level system.
4.6 Know about principle construction and working of pneumatic balance displacement float liquid level system.
4.7 Know the basic concepts for measuring density.
4.8 Know the principle construction and working of displacement-meter for measuring density by republic flow-meter Company.
4.9 Know the principle construction and working of hydrometer for density measurement.
4.10 Know the basic concept of viscosity measurement.
4.11 Know the principle construction and working of viscosity measurement by Viscosity meter-Brabender Corporation.
4.12 Know the principle construction and working of viscosity measurement by Continuous Viscosity meter.

Unit-5: Measurement of composition.

5.1 Know the determination of gas analysis by thermal conductivity method.
5.2 Know the determination of moisture content in gases by Psychrometer.
5.3 Know the determination of moisture in Paper and Lumber.
5.4 Know the determination of PH of a solution by PH cell (Measuring cell & Calomel cell) method.
5.5 Know about Spectroscopic methods of analysis
5.6 Know about Working Principle of Spectro-Photometer.
5.7 Know about Working Principle of Gas-Liquid Chromatography.

Unit-6: Process Instrumentation & Instrumentation diagrams for Chemical Engineering processes and operations:

6.1 Know about recording instruments used for process instrumentation.
6.2 Know about indicating and signalling instruments.
6.3 Know about control centre.
6.4 Know about signal conversion devices.
6.5 Know about the instrumentation diagrams.

6.6 Know about the instrumentation diagram for a distillation column.
6.7 Know about the instrumentation diagram for an evaporator.
6.8 Know about the instrumentation diagram for a reactor.
6.9 Know about the instrumentation diagram for extractor

Unit-7: Principles of automatic process control and modes available for process control.

7.1 Know about a simple automatic process control.
7.2 Know about components of a control system.
7.3 Know about types of control systems.
7.4 Know the basic nomenclature associated with a control system.
7.5 Know about control actions.
7.6 Know the expressions for the transfer function for the proportional control, Proportional-Derivative, Proportional-Integral, Proportional-Integral-Derivative control actions.
7.7 Know about the components of a hydraulic system.
7.8 Know about the construction, working of a hydraulic system incorporated with roportional, Proportional-Integral, Proportional-Derivative and Proportional-Integral-Derivative control action.
7.9 Know about the components of a pneumatic system.
7.10 Know about the construction, working of a Pneumatic system incorporated with Proportional, Proportional-Integral, Proportional-Derivative and Proportional-Integral-Derivative control action.
7.11 Know about Control valve, its components, working and characteristics.
7.12 Know about the Elaborate Explanation of programmable logic control and Distributive control system.

Course code CH-PP-703	**Course title : Instrumentation & Process Control Number of course outcomes:07**				**No. of periods:75**
POs	**Mapped with CO No.**	**CO Periods addressing PO in Column 1**		**Level (1,2,3)**	**Remarks**
		No	**%**		›40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed ‹5% Not addressed
PO1	CO2, CO3	35	38	2	
PO2	CO4,CO5	45	50	3	
PO3	CO1, CO7	20	22	1	
PO4					
PO5					
PO6					
PO7					

Hyponated course contents with Reference books

Unit-1: Introduction and Qualities of measurement

Importance of instrumentation --Meaning of measurement - Different elements of an instrument - Static characteristics of an instrument - Dynamic characteristics of an instrument - First order system and physical examples - Second order system and physical examples of second order system -Various input functions like Step input, Impulse input, Sinusoidal input and Linear input

Unit-2: Measurement of Temperature.

Different temperature scales in different units—Principle, working and working of expansion thermometers like Mercury in glass thermometer, Bi-metallic thermometer and Pressure spring thermometer - Vapor actuated thermometer--Sources of static error in industrial pressure spring thermometers - Thermo-electricity and thermo-electric circuit or Thermocouple - Accessories of an industrial thermocouple - Milli-voltmeter and its application - Null Potentiometer circuit and its and its application - Resistance thermometer elements - Wheat stone bridge circuit and Modified wheat stone bridge circuit -Radiation temperature measurement - Radiation receiving elements - construction and working - Optical pyrometer and Radiation pyrometer.

Unit-3: Measurement of pressure and Vacuum:

Basic concepts of pressure measurement - liquid column manometers - pressure spring gauge, Bellow pressure element, Diaphragm element, Differential pressure indicating manometer, Bell differential pressure gauge--Mechanical indicating elements, Principle, working and construction of Pressure tight shaft and torque tube shaft--Principle, construction and working of inductance coil method of an indicating element--Principle, construction and working of resistance rod indicating element--Principle construction and working of electric pressure gauge of indicating element--Principle construction and working of different types of vacuum gauges like Mc-leod vacuum gauge, Pirani vacuum gauge, Thermocouple vacuum gauge, Thermionic type ionization vacuum gauge.

Unit-4: Measurement of Liquid level, Density and Viscosity:

Basic concepts for measuring density--Principle construction and working of displacement-meter for measuring density by republic flow-meter Company--Principle construction and working of hydrometer for density measurement--Principle construction and working of liquid level method of measuring density--Direct methods of liquid level measurement, Float and tape liquid level system, Hydraulic remote transmission of liquid level system--Principle construction and working of bubbler system for measurement of liquid level--Level measurement in pressure vessels, Principle construction and working of differential pressure manometer for measuring liquid level in pressure vessels-- Principle construction and working of displacement float liquid level system--Principle construction and working of pneumatic balance displacement float liquid level system--Basic concepts of viscosity measurement--Principle construction and working of viscosity measurement by Viscosity meter-Brabender Corporation--Principle construction and working of viscosity measurement by Continuous Viscosity meter.

Unit-5: Measurement of composition:

Gas analysis by thermal conductivity method--Determination of moisture content in gases by Psychrometer--Determination of moisture in Paper and Lumber--Determination of P^H of a solution by P^H cell (Measuring cell & Calomel cell) method--Spectroscopic analysis methods, Absorption spectroscopy, Emission spectroscopy, Mass spectroscopy, Working Principle of Spectro -Photometer, Gas -Liquid Chromatography.

Unit-6: Process Instrumentation & Instrumentation diagrams for Chemical Engineering processes and operations:

Recording instruments used for process instrumentation, Circular recording chart and concentric indicating scale, Strip recording chart and linear indicating scale, Multi-record

recorder-- Indicating and signalling instruments, Eccentric scale indicator, Concentric indicating scale--Control centre--Signal conversion devices, Transducer, Amplifier--Instrumentation diagrams--Instrumentation diagram of Control schemes for heat exchangers-- Instrumentation diagram for a distillation column--Instrumentation diagram for an evaporator--Instrumentation diagram for a reactor, Instrumentation diagram for extractor.

Unit-7: Principles of automatic process control and modes available for process control.

Simple automatic process control system--Components of a control system, Process, measuring element, Controller, Comparator, Final control element, Types of control systems, Feedback control system or closed loop control system - Feed forward control system (Open loop control system)--Basic nomenclature associated with a control system, Load, Controlled variable, set point, error, measured variable, manipulated variable, Proportional gain, Proportional band, Offset--Control actions, Proportional control action, Integral control action, Derivative control action, Proportional-Integral control action, Proportional-Derivative control action, ON-OFF Control action, Proportional-Integral-Derivative control action--Expressions for the transfer function for the proportional control, Proportional-Derivative, Proportional-Integral, Proportional-Integral-Derivative control actions-- Know about the components of a hydraulic system--Construction, working of a hydraulic system incorporated with Proportional, Proportional-Integral, Proportional-Derivative and Proportional-Integral-Derivative control action--Components of a pneumatic system, Construction, working of a Pneumatic system incorporated with Proportional, Proportional-Integral, Proportional-Derivative and Proportional-Integral-Derivative control action--Control valve, its components, working and characteristics—Elaborate Explanation of programmable logic control and Distributive control system.

REFERENCE BOOKS:

1. Industrial Instrumentation by Donald P. Eckmann
2. Industrial Instrumentation & Control by S K Singh.
3. Process systems analysis & Control by Donald R. Coughanowr.
4. Chemical Process Control by George Stephanopoulos.
5. Process Control by Peter Harriot.
6. Instrumentation & Process Measurements by W Bolton.

MODEL BLUE PRINT WITH WEIGHTAGES FOR BLOOMS CATEGORY AND QUESTIONS FRO EACH CHAPTER AND COs MAPPED

S.No.	Major Topics	No of Periods	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				Cos mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Introduction and Qualities of measurement	8	6	6		-	-	1	1			CO1
2.	Measurement of Temperature.	12	13	3			10	1	1			CO2 to CO5
3.	Measurement of pressure and Vacuum:	10	11	3	8		-	1	1			CO2 to CO5
4.	Measurement of Liquid level, Density and Viscosity.	10	11	3	8			1	1			CO2 to CO5
5.	Measurement of composition.	10	11	3	8			1	1			CO2 to CO5
6.	Process Instrumentation & Instrumentation diagrams for Chemical Engineering processes and operations:	10	14	3	11			1	2			CO2 to CO5
7	Principles of automatic process control and modes available for process control.	15	14	6		8		2		1		CO7
Total		**75**	**80**	**27**	**35**	**8**	**10**	**8**	**7**	**1**		

C-20-CHPP-703

CH-PP-703, Instrumentation & Process Control VII SEMESTER

Syllabus split up for Unit Test

Unit test NO	Learning out comes to be covered
Unit test-I	Objective from 1.1 to 4.12
Unit test-II	Objective from 5.1 to 7.12

C-20,CH/CHPC/CHPP/CHPP-703

(Model Paper 1)

State Board of Technical Education and Training , A.P

Diploma in Chemical Engineering (P&P) D.ChE(P&P),

VII SEMESTER

Subject Name Instrumentation & Process Control

Subject Code: CH/CHPC/CHPP/CHPP-703

Time: 90 minutes **Unit Test I** **Max .Marks:40**

Part-A **16Marks**

Instructions: (1) Answer all questions.

(2) First question carries four marks, each question of remaining carries three marks.

1. Write the following

   (a) Time constant is the product of resistance and capacitance (true / false)

   (b) First order instrument will have ------ no.resistances and ------no of capacitances in series

   (c) what is the positive wire in the iron-constantan thermocouple

   (d) The Ph of a basic solution ranges from ---------- to ----------

2. Differentiate between Ist. Order instrument and 2^{nd} order instrument.
3. Write about the elements of a instrument.
4. State the accuracy of an instrument
5. Write a short notes on psychrometer.

Part-B **3X8=24Marks**

Instructions: (1) Answer all questions(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer .

6. (a) Derive the first order response equation for a first order instrument for a step change of A units.

   or

   (b) Describe the static and dynamic characteristics of instruments.

7. (a) Describe the working principles of thermocouples with figures

   or

   (b) Explain the working principles of radiation pyrometers with neat sketches

8. (a) Describe the mass spectroscopy with a neat diagram

   or

   (b) Explain the working principles of a pH meter with neat diagrams

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Q.No	Question	Blooms category	Marks allocated	CO adressed
Part-A(30 marks)				
1.	Write the response equation for First Order Instrument for sinusoidal Input	remembering	3	CO1
2.	Explain about thermal walls.	Remembering	3	CO1
3.	List the various indicating elements for pressure gages.	understanding	3	CO2
4.	Explain the principle of Pirani gage.	Remembering	3	CO1
5.	Write the principle of a hydrometer-specific gravity meter.	understanding	3	CO5
6.	Explain about Fluorescence Spectroscopy	Remembering	3	CO1
7.	Write short notes on Central layout.	understanding	3	CO1
8.	Write short notes on Indicating instruments.	remembering	3	CO1
9.	List the different types of control actions.	remembering	3	CO1
10.	DefineCapacitance Self-regulation.	remembering	3	CO1
Part-B(40 marks)				
11	Explain about Dynamic characteristics of an Instrument. (or) Find the response of first order system for a step input.	understanding	8	CO2
12	Explain the principle, construction and working of a bimetallic thermometer. (or) Write the mechanical properties of thermal well materials.	understanding	8	CO2
13	Describe the principle construction and working of resistance thermometer. (or) Explain the principle and working of optical pyrometer	understanding	8	CO2
14	Explain the construction and working of Mcleod gage.(or) Explain the working of Pirani gauge with a sketch.	understanding	8	CO2
15	Describe the principle construction and working of Bubbler system for liquid level measurement. (or) Explain the principle construction and working of continuous viscometer.	understanding	8	CO2
Part-C(10 marks)				
16	Suggest different working fluids for pressure spring thermometer for different temperature ranges and explain its working process.	analyzing	10	CO5

Course code	Course title	No. of periods/week	Totalno of periods	Marks for FA	Marks for SA
CHPP-704	Unit Operations-III	4	60	20	80

S.No.	Chapter / unit title	No of periods	Co's Mapped
1.	Introduction and Properties of particulate solids	10	CO1,CO2,CO4,CO5
2.	Storage and conveyance	6	CO1,CO2, CO5
3.	Mixing	7	CO1,CO2,CO5
4.	Size Reduction	17	CO1,CO2,CO3,CO4,CO5
5.	Mechanical Separations	10	CO1,CO2,CO3,CO4,CO5
6.	Filtration	10	CO1,CO2,CO3,CO4,CO5
	Total Periods	**60**	

Course objectives (1 to 3) (Representing broader aim of the course)

Course Objectives	(i) To Impart the basic concepts of mechanical operations and develop an understanding of Size analysis, Size reduction and solid handling. (ii) To Familiarize with mechanical separation method such as filtration, sedimentation, transportation of solids etc. and associated equipment used for achieving these methods. (iii) The students are exposed to basic theory, calculations and machines involved in various solid handling operations.

Course outcomes

Course outcomes (max8) (Representing the outcome of each or two chapters together)

CO NO		Course Outcomes
CO1	**CHPP-704.1**	Explain Mechanical Unit Operations and their role in chemical engineering industries.
CO2	**CHPP-704.2**	Describe the Characterization of particulate solids, phenomenon of screening and principle involved in various separation techniques, size reduction operations, agitators, mixers, conveyers etc.
CO3	**CHPP-704.3**	Illustrate the working of various mechanical separations, size reduction equipments etc with diagram.
CO4	**CHPP-704.4**	Estimate the power consumption of the equipments for mixing ,size reduction operations
CO5	**CHPP-704.5**	Interpret the concept of filtration, size reduction and other mechanical separations in chemical and allied industries.

CO-PO/PSO Matrix:

CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3

CHPP-704.1	2				1			2		
CHPP-704.2	2		2						2	
CHPP-704.3			2						3	
CHPP-704.4	2	1						2		
CHPP-704.5	2		2						2	
AVERAGE	**2**	**1**	**2**		**1**			**2**	**2**	

3=STRONGLY MAPPED
2=MODERATELY MAPPED
1=SLIGHTLY MAPPED

Learning Outcome

1.0 Understand properties of particulate solids.

1.1 Importance of mechanical operations in chemical industries.
1.2 State the importance of size, shape, density and sphericity of a particle
1.3 Know about volume –surface mean diameter.
1.4 Know about the mixed particle sizes and size analysis.
1.5 Know about the specific surface, average particle size and particle population.
1.6 Specify various standard screening sieves viz. Taylor standard series & Indian standard series.
1.7 Know about differential & cumulative screen analysis.
1.8 Compare actual& ideal screens.
1.9 Distinguish between screen effectiveness and screen capacity.
1.10. Derive the equation for screen effectiveness
1.11. Solve problems on screen analysis and screen effectiveness.

2.0 Understand the storage and conveyance of solids.

2.1 Know about storage of solids.
2.2 Understand the bulk storage of solids.
2.3 Know about bin storage-Flat bottomed bins, sloped bottomed bins
2.4 Know about silos and hoppers.
2.5 List out various conveyors.
2.6 know the working principles of various conveyors-belt conveyors, screw conveyors, BucketElevators, pneumatic conveyors

3.0 Understand the objective of mixing.

3.1 State the various mixing equipments.
3.2 Explain the mixing of various systems like liquid-liquid, solid-liquid, gas-liquid, solid-solids.
3.3 Explain the working principle of mixing equipments used for liquid-liquid mixing-propellers, Paddles and turbines.
3.4 Describe the working principle of mixing equipments used for solid mixing-Ribbon blenders, Tumbling mixers, kneading machines, and Banbury mixer
3.5 Draw the diagrams of Ribbon blender and Banbury mixer.
3.6 Know the difference between mixing, agitation and blending.
3.7 Explain about vortex formation and its significance.

4.0 **Understand the size reduction operation**.

4.1 Explain the principle involved in size Reduction.

4.2 Calculate the mechanical efficiency and crushing efficiency.
4.3 State and explain (a) Rittinger's Law (b) Kick's Law (c) Bond's crushing law and work index.
4.4 Evaluate the power requirement for crushing and grinding.
4.5 Classify the size reduction equipment.
4.6 Distinguish the crushing and grinding equipment.
4.7 Explain the working principles of following crushing equipment: Jaw crusher, Gyratory Crusher, Roll crusher.
4.8 Explain the working principles of the following grinding equipment: Hammer mill, Rod mill,Ball mill and Ultrafine grinders.
4.9 Draw the line sketches of Jaw crusher, Roll mill and Ball mill.
4.10 Evaluate angle of nip in crushing rolls.
4.11 Evaluate the critical speed of Ball mill.
4.12 Mention the applications of various crushers and grinders.
4.13 Distinguish between closed circuit grinding and open circuit grinding.
4.14 Solve simple problems based on Rittinger's Law, Kick's Law and Bond's crushing law.
4.15 Solve problems on evaluating critical speed of a ball mill
4.16 Solve problems on evaluating angle of nip of Roll Crusher

5.0 Understand mechanical separations.

5.1 List out the industrial screens and mention their applications.
5.2 Know about Grizzlies, Trommels, Shaking and vibrating screens.
5.3 Understand various classifiers.
5.4 Know about hydraulic classifiers-Mineral jig, Wilfley table
5.5 know the working principle of froth flotation.
5.6 Know about magnetic separation and electro separation.
5.7 Know about air separation methods-Air separator, cyclone separator, Bag filter.
5.8 Know about the working principles of Electrostatic precipitator and scrubber.
5.9 Draw a neat sketch of cyclone separator.
5.10 Discuss the process of batch sedimentation and identify various zones.
5.11 Explain the Stokes law and Newtons law.
5.12 Know about free settling and hindered settling.
5.13 Define terminal velocity.
5.14 know the principle of working of industrial thickener with diagram.
5.15 Solve simple problems on terminal velocity.

6.0 Know about filtration.

6.1 State the principles of cake filtration.
6.2 State the principles of constant rate filtration and constant pressure filtration.
6.3 Know about working principle of plate and frame filter press and leaf filter.
6.4 Draw a neat sketch of rotary drum filter.
6.5 Know about working principle of continuous rotary drum vacuum filter.
6.6 Know the various types of filter medium used and its requirements.
6.7 Know the functions of filter aid and mention various filter aid.
6.8 State the principles of centrifugal filtration.
6.9 Know the application and selection of various filters.
6.10 Draw the neat sketches of centrifugal filters.
6.11 Explain the working principle of Batch and continuous centrifugal filters.

Cos-Pos mapping strength (as per given time table)

Course Code:	Course Title: Unit Operations-III	No of periods

CHPP-704	Number of course outcomes: 05				60
POs	Mapped with CO No.	CO Periods addressing PO in Column 1		Level (1,2,3)	Remarks
		No.	%		
PO1	CO1,CO2	27	17	1	
PO2	CO2,CO3,CO4	44	27	2	
PO3	CO2,CO3	39	24	1	
PO4	CO3,CO4	25	16	1	
PO5	CO3	20	12	1	
PO6	CO2,CO3	39	24	1	
PO7	CO5	8	1	-	

Hyponated Course contents with Reference books:

1. **Properties of particulate solids:** Particle size, shape, density and sphericity-mixed particleSizes and size analysis-specific surface, average particle size and particle population-Standard screening sieves viz Taylor standard series& Indian standard series-differential &Cumulative screen analysis- actual& ideal screens- Screen effectiveness-problems onscreen Effectiveness.

2. **Storage and conveyance of solids :**Various types of storage of solids- Bin storage- flat Bottomed bin, sloped bottomed bin, silos, hoppers and bulk storage-Conveying-types of Conveyors- Working principles- Belt conveyor, screw conveyor, pneumatic conveyor and Bucket elevator.

3. **Mixing :**Objectives of mixing, Liquid-liquid mixers-paddles, turbines, propellers, agitators-Solid-liquid mixers, mixer for viscous masses-Banbury mixer, ribbon blenders, tumblingMixers.

4. **Size Reduction :**Principles of communition-Size Reduction laws-Efficiencies in size reduction-Size reduction equipment(crushers and grinders)-Evaluation of angle of nip-critical speed of ball mill-Closed circuit grinding and open circuit grinding- simple Problems on size reduction laws.

5. **Mechanical Separations :**Industrial screens-Their applications-Grizzlies, Trommels, Shaking, vibrating screens, classifiers-hydraulic classifiers, jigging, tabling, froth Flotation-Magnetic separation and electrostatic separation-Air separation-cyclone Separator, bag filters, electrostatic separators.

6. **Filtration :**Application of filters-Classification of filters-Selection of filters-Plate and Frame filter press, leaf filters, continuous rotary filters-Filter aids-Constant pressure and Constant rate filtration-Centrifugal filtration-Batch, semi continuous, continuous centrifuges.

REFERENCE BOOKS :

1. “Unit Operations of Chemical Engineering” by Warren L. McCabe, Julian C.Smith, Peter Harriot.Mc. Graw Hill Publication, Fifth Edition.
2. Introduction to chemical Enginneering by Warren L. Badger & Julius T. Banchero, McGraw – Hill publication.
3. Unit Operations –I & II, K.A.Ghavane, NiraliPrakasham Publications.

Model blue print with weight ages for Blooms category and questions for each chapter and COs mapped

S.No.	Chapter/Unit title	No. of periods	Weightage allocated	Marks wise Distribution of Weightage				Question wise Distribution of Weightage				CO’s Mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Introduction andProperties of particulate solids	10	13	3	-	-	10	1	-	-	1	CO1,CO2, CO4, CO5
2.	Storage and conveyance	6	11	3	8	-	-	1	1	-	-	CO1,CO2, CO5
3.	Mixing	7	11	3	8	-	-	1	1	-	-	CO1,CO2, CO5
4.	Size Reduction	17	17	9	8	-	-	3	1	-	-	CO1,CO2, CO3,CO4, CO5
5.	Mechanical Separations	10	14	6	8	-	-	2	1	-	-	CO1,CO2, CO3,CO4, CO5
6.	Filtration	10	14	6	8	-	-	2	1	-	-	CO1,CO2, CO3,CO4, CO5,
	Total	**60**	**80**	**30**	**40**	**-**	**10**	**10**	**5**	**0**	**1**	

C-20, CHPC/CHPP/CHOT-704
Subject Name: Unit Operations-III
Syllabus split up for Unit Test

Unit test No.	Learning out comes to be covered
Unit test-I	Objective from 1.1 to 4.6
Unit test-II	Objective from 4.7 to 6.11

C-20-CHPP-704

(Model Paper-1)

State Board of technical Education and Training ,A.P

Diploma in Chemical Engineering (P&P)

First Year

Subject Name: Unit Operations-III

Subject Code: CHPP-704

Time: 90 minutes **Unit Test I** **Max .Marks:40**

Part-A **16Marks**

Instructions: (1) Answer all questions.

(2) First question carries four marks, each question of remaining carries three marks

1. a) Write the equation for specific surface.---------- **(CO1)**
   b) What is the sphericity of a rectangular particle. ----------
   c) Main assumption in the differential screen analysis is ----------
   d) write the equation for critical speed of a ball mill.----------
2. Draw a neat sketches of flat bottomed bins and stopped bottomed bins. **(CO2)**
3. List out the various mixers used for mixing viscous masses. **(CO2)**
4. What is Comminution and write the criteria for Comminution **(CO3)**
5. Define Work Index. What is its value for Coal? **(CO4)**

Part-B **3X8=24**

Instructions: (1) Answer all question.(2) Each question carries eight marks

(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer .

6. (a) Explain about various storages adopted in Industries with neat diagrams. **(CO2)**

   OR

   (b) Explain bucket conveyor with a neat sketch. Differentiate Belt conveyors and screw conveyors. **(CO2)**
7. (a) Explain in detail about the classification and working of Impellers with neat sketches.**(CO4)**

   OR

   (b) Explain the construction and working of Ribbon blenders with a neat sketch. **(CO4)**
8. (a) A machine is fed with crushy material which has been supplied with a power of SHP at the rate of l ton/hr from 0.6 inch3 to a product having 0.14 inch size. What would be the HP required to crush l ton/hr of same material from 0.35 inch3 to 0.09 inch using Rittinger's law. **(CO4)**

   OR

   (b) Explain the working principle of jaw crusher with neat diagram. **(CO3)**

***

Model question paper with CO's mapped

Part A: 30 marks 10 questions, 3 marks each, **NO CHOICE**

- 60 minutes(6 minutes each)

Part B: 40 marks 5 questions, 8 marks each, Either Or type

- 90 minutes(18 minutes for each question)

Part C: 10 marks, 1 questions, 10 marks

- 30 minutes(Higher order question)

Q.No.	Question	Blooms Category	Marks allocated	CO addressed
	Part-A(30 marks)			
1	*Define sphericity of a particle.*	Remembering	3	CO1
2	*Differentiate silos and Hoppers*	Remembering	3	CO2
3	*Write about propellers and paddles.*	Remembering	3	CO2
4	*State and explain Rittinger's law.*	Remembering	3	CO2
5	*Draw a neat sketch of a roll crusher.*	Remembering	3	CO3
6	*Define critical speed of a ball mill.*	Remembering	3	CO1
7	*Draw a neat sketch of a Trommel.*	Remembering	3	CO3
8	*Define terminal velocity. Write its significance.*	Remembering	3	CO1
9	*What is filtration and give the types of filtration.*	Remembering	3	CO2
10	*What is a filter aid? Give an example.*	Remembering	3	CO2
	Part-B(40 marks)			
11	*(a) Explain about various storages adopted in Industries with neat diagrams* *Or* *(b)Explain working principle of screw conveyors and Belt conveyor with a neat sketch.*	*Under standing*	8	CO3
12	*(a) Explain in detail about the classification and working of Impellers with neat sketches.* *(Or)* *(b)Explain the construction and working of Ribbon blenders with neat sketch.*	*Under standing*	8	CO3
13	*(a) What is the power required to crush 100 tons/hr. of lime stone if 80% feed passes through 51 mm and 80% of the product passes through the 3.2mm screen Work index of lime stone (W_i) = 12.74* *D_{Pa} = 2" screen = 51 mm. K_b = 0.3l62W_i.Use Bond's law. (Or)* *(b)Explain the working principle of a hammer mill with neat diagram.*	*Under standing*	8	CO4
14	*(a) Write the working principles of Grizzlier, Trommels, Shaking and Vibrating Screens and Draw the neat sketches of them* *(Or)* *(b) Explain working principle of Magnetic separator with neat sketch*	*Under standing*	8	CO3
15	*(a) Explain the working principle of plate and frame filter with a neat sketch. (Or)* *(b) Explain the working principle of continuous rotary drum filter with a neat sketch*	*Under standing*	8	CO3
	Part-C(10 marks)			
16	*Explain the Importance of surface energy as a energy component in chemical industry.*	*Analyse*	10	CO1,CO2

Course code	Course title	No. of periods/week	Totalno.of periods	Marks for FA	Marks for SA
CHPP – 705	Plastic Technology	05	75	20	80

S.No.	Chapter/unit title	No. of periods	CO's Mapped
1	Polymer Rheology	6	**CO1**
2	Rubbers	14	**CO2 to CO**3
3	Fiber Reinforced plastics (F.R.P)	15	**CO2 to CO**3
4	Plastic Processing techniques-II	15	**CO3**
5	Polymer degradation	10	**CO4**
6	Plastic waste management and Recycling	15	**CO5**
	TotalPeriods	**75**	

Course objectives

Course objectives	(i) To familiarize with flow properties of polymers. (ii) To know the manufacturing process of rubbers, FRP articles and processing techniques of plastics. (iii) To understand the degradation of polymers and recycling of plastics

Course Outcomes

Course Outcomes	CHPP -705.1	**CO1**	Interpret the Flow properties of polymers
	CHPP -705.2	**CO2**	Describe the Manufacturing process , Properties and applications of rubbers and FRP
	CHPP -705.3	**CO3**	Illustrate the Processing techniques of polymers.
	CHPP -705.4	**CO4**	Classify the degradation of polymers
	CHPP -705.5	**CO5**	Summarize the recycling and Plastic waste management

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHPP -705.1	**2**	**1**	**3**	**1**	**2**			**3**	**2**	
CHPP -705.2	**3**	**2**	**2**	**2**	**2**			**3**	**2**	**2**
CHPP -705.3	**2**	**2**	**3**	**2**	**2**			**2**	**3**	
CHPP -705.4	**3**	**1**	**2**	**2**	**3**			**2**	**2**	**1**
CHPP -705.5	**2**	**3**	**2**	**1**	**2**			**3**	**2**	**3**
Average	**2.2**	**1.8**	**2.2**	**1.8**	**2.2**	**0.0**	**0.0**	**2.2**	**1.8**	**1.0**

Learning Outcome

Upon the completion of this subject, the student should be able to know,

Unit-1: Polymer Rheology

1.1 Viscosity rheological properties of fluids
1.2 Shear stresses in polymer systems
1.3 Non-Newtonian flows
1.4 Simple shear flows
1.5 The Elastic and Viscoelastic state of polymers – Viscoelasticity
1.6 Hooke's equation
1.7 Newton's equation
1.8 Maxwell and Voigt models for Viscoelasticity

Unit-2: Rubbers

2.1 Introduction to rubbers.
2.2 Properties, application and manufacture process of the following rubbers.
a) Natural rubber
b) Poly-butadiene rubber.
c) Styrene Butadiene Rubber
2.3 Phenomena of vulcanization, mechanism of sulphur vulcanization, properties of vulcanized rubber.
2.4 Additives used in the rubber,
2.5 Manufacturing process of tyres

Unit-3: Fiber reinforced plastic (F.R.P)

3.1 Introduction to FRP
3.2 Properties of FRP materials
3.3 Know the different kinds of reinforcing materials and their properties.
3.4 Classification of fibers
3.5 Natural fibers – Vegetable fibers, animal fibers, mineral fibers-properties.
3.6 Man made and synthetic fibers – properties
3.7 Manufacturing process of synthetic fibers
3.8 Manufacturing process of Glass fibers
3.9 Know the different kinds of plastic composites.
3.10 Fabrication Processes of FRP
(a) Hand-layup process
(b) Spray-up technique
(c) Pultrusion process
(d) Filament winding process.
3.11 Know the different fields (areas) of applications of plastic composites.

Unit-4: Plastics processing techniques

4.1 Describe the general features and working of the following process equipment.
4.2 a) Calendering
b) Impregnation.
c) Lamination.
d) Encapsulation.
e) Potting.
f) Coating.
i. Wire or cable coating.
ii. Knife coating.
iii. Dip coating.

iv. Electrostatic coating.

4.3 Manufacture of plywood

4.4 Manufacture of particle board

4.5 Foaming of polymers

Unit-5: Polymer degradation

5.1 Introduction to polymer degradation.

5.2 Various types of polymer degradation

(i) Thermal degradation
(ii) Oxidative degradation
(iii) Degradation by radiation
(iv) Mechanical degradation
(v) Chemical degradation
(vi) Biological degradation
(vii) Degradation of polymer by weathering

5.3 Degradation of specific polymers

(i) Polyolefins (PE and PP)
(ii) PVC
(iii) Natural Rubber
(iv) Polyamides
(v) PMMA
(vi) Cellulose
(vii) SBR
(viii) Poly acrylonitrile (PAN)
(ix) Polystyrene (PS)
(x) PET
(xi) PU

Unit-6: Plastic waste management and Recycling

6.1 Definition of plastic wastes and litter.

6.2 Basis for assessing plastic wastes.

6.3 Applications of plastics and their potential as sources of waste.

6.4 Separation techniques (density - float sink and froth floatation methods, optical, spectroscopic, sorting by melting temperature etc.).

6.5 Thermoplastic waste management: 4 R's approach (reduces, reuse, recycle (mechanical and chemical), recover).

6.6 Recycling classification- - primary - secondary - tertiary - quaternary recycling with examples.

6.7 Disposal processes and various waste treatment methods – controlled tipping, pulverization, compositing.

6.8 Energy from waste – (incinerators - pyrolysis, factors affecting incineration).

6.9 New developments in thermal disposal of refuse, on-site disposal methods, compacting and baling.

6.10 Recycling of Polyolefins, PVC, PET, Polystyrene, Polyamides (Nylon-6 and Nylon-6,6).

6.11 Recycling of Thermosets – reclaiming of rubber – pyrolysis, depolymerization of scrap rubber, tyre retreading, uses of recycled rubber.

Course code CHPP-705	Course title : Plastic Technology Number of course outcomes:06				No. of periods:90
POs	Mapped with CO No.	CO Periods addressing PO in Column 1		Level (1,2,3)	Remarks
		No	%		›40% Level 3 Highly addressed
PO1	CO3,CO4,	45	50	3	
PO2	CO2, CO5	35	38	2	
PO3	CO1	10	11	1	25% to 40% Level 2 Moderately addressed
PO4					
PO5					
PO6					
PO7					5 to 25% Level 1 Low addressed ‹5% Not addressed

Hyponated course contents with Reference books

Unit-1: Polymer Rheology

Viscosity rheological properties of fluids-shear stresses in polymer systems-non-Newtonian flows- simple shear flows- Viscoelasticity-Hooke's equation-Newton's equation- Maxwell and Voigt models for Viscoelasticity.

Unit-2: Rubbers

Introduction to rubbers - Properties, application and manufacture process of the following rubber - Natural rubber, Poly-butadiene-SBR - Vulcanization of rubbers - Additive of rubber-Manufacture of tyres.

Unit-3: Fiber reinforced plastic (F.R.P)

Introduction to FRP-Properties of FRP materials-different types of reinforcing materials and their properties-Classification of fibers-Manufacturing process of synthetic fibers-Manufacturing process of Glass fibers - different kinds of plastic composites. Fabrication Processes of FRP- Hand-layup process-Spray-up technique-Pultrusion process-Filament winding process- applications of plastic composites.

Unit-4: Plastics processing techniques

General features and working of the following process equipment- Calendering - Impregnation - Lamination-Encapsulation – Potting – Coating - Wire or cable coating Knife coating, Dip coating, Electrostatic coating.

Unit-5: Polymer degradation

Introduction to polymer degradation - Various types of polymer degradation - Thermal degradation - Oxidative degradation - Degradation by radiation - Mechanical degradation Chemical degradation - Biological degradation - degradation of polymer by weathering
Degradation of specific polymers - Polyolefins (PE and PP) - PVC- Natural Rubber - Polyamides – PMMA – Cellulose – SBR - Poly acrylonitrile (PAN) - Polystyrene (PS) - PET- PU.

Unit-6: Plastic waste management and Recycling

Definition of plastic wastes and litter - Applications of plastics and their potential as sources of waste - Separation techniques - density - float sink - froth floatation methods – optical – spectroscopic - sorting by melting temperature etc - Thermoplastic waste management: 4 R's approach (reduces, reuse, recycle (mechanical and chemical) recover) - Recycling classification - primary - secondary - tertiary - quaternary recycling with examples - Disposal processes and various waste treatment methods – controlled tipping, pulverization, compositing - Energy from waste – incinerators - pyrolysis, factors affecting incineration - New developments in thermal disposal of refuse, on-site disposal methods, compacting and baling - Recycling of Polyolefins, PVC, PET, Polystyrene, Polyamides (Nylon-6 and Nylon -6,6) - Recycling of Thermosets – reclaiming of rubber – pyrolysis, depolymerization of scrap rubber – tyre retreading - uses of recycled rubber.

REFERENCE BOOKS:

1. Outlines of Polymer Technology – R. Sinha.
2. Plastic Materials – Brydson.
3. Polymer Science – Billmeyer.
4. Polymer Chemistry – B.K. Sharma.
5. Processing of Polymers – R. Sinha.
6. Plasic waste recycling technology by EIRI
7. Plastic materials and processing technology by EIRI
8. Plastic Technology by MIDHATLUQMAN(CBS publications)

Model blue print with weightages for blooms category and questions for each chapter and COs mapped

S.No.	Major Topics	No of Periods	Weightage allocated	Marks wise distribution of weightage				Question wise distribution of weightage				Cos mapped
				R	U	Ap	An	R	U	Ap	An	
1.	Polymer Rheology	6	6	3	3	-	-	1	1			**CO1**
2.	Rubbers	14	14	3	11			1	2			**CO2 to CO3**
3.	Fiber Reinforced plastics (F.R.P)	15	13	3		10	-	1		1		**CO2 to CO3**
4.	Plastic Processing techniques-II	15	19	8	11			2	1			**CO3**
5.	Polymer degradation	10	14	3	11			2	1			**CO4**
6.	Plastic waste management and Recycling	15	14	6	8			2	1			**CO5**
Total		**75**	**80**	**26**	**44**	**10**		**9**	**6**	**1**		

C-20, CHPP-705
Subject Name: Polymer Technology
Syllabus split up for Unit Test

Unit test No.	Learning out comes to be covered
Unit test-I	Objective from 1.1 to 3.11
Unit test-II	Objective from 4.1 to 6.11

	No of periods	Name of Topic
Unit Test 1	6	Polymer Rheology
	14	Rubbers
	15	Fiber Reinforced plastics (F.R.P)
Unit Test 2	15	Plastic Processing techniques-II
	10	Polymer degradation
	15	Plastic waste management and Recycling

Model paper 1
State Board of Technical Education and Training, A.P
Diploma in Chemical Engineering (PP)
Subject Name: Polymer Technology
SUBJECT CODE: CHPP-705
Unit Test-1

Time : 90minutes **Max Marks: 40**

PART-A **16** Marks

Instructions: (1)Answer all questions **2X3=6 Marks**
(2) First question carries 4marks and rest of the questionscarries 3marks

1. (a) Give the classification of rubbers **CO1**
   (b) Name two synthetic rubbers **CO1**
   (c) What is the role of carbon in rubber manufacture **CO2**
   (d) Write two properties of vulcanized rubber **CO2**
2. Explain about polymer rheology. **CO1**
3. List the additives used in rubber industry. **CO1**
4. Write the properties of FRP materials **CO1**
5. Give the classification of fibres **CO1**

PART-B **8X3=24 Marks**

Instructions: (1) Answer all questions (2) Each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6. (a) Explain the elastic and visco elastic state of polymers **CO2**

   or

   (b) Explain about the shear stresses in polymer systems. **CO2**
7. (a) Explain the process of manufacture of styrene butadiene rubber with a flow sheet. **CO2**

   Or

   (b) Explain the process of manufacture of poly butadiene rubber with a flow sheet **CO2**
8. (a) Explain the process of manufacture of glass fibers. **CO2**

   or

   (b) Explain the process of pultrusion with a simple sketch. **CO1**

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Model paper 1
State Board of Technical Education and Training, A.P
Diploma in Chemical Engineering (P&P)
Subject Name: Plastic Technology
SUBJECT CODE: CHPP-705
Unit Test-1I

Time : 90minutes **Max Marks: 40**

PART-A **16** Marks

Instructions: **(1)Answer all questions** **2X3=6 Marks**
(2) First question carries 4marks and rest of the questionscarries 3marks

1) Resins used in encapsulation____ **CO1**

List the synthetic fibres____ **CO1**

Examples of foam polymers___ **CO1**

List 4 R's-_____ **CO1**

2) Explain about pulverization. **CO2**

3) What are the applications of plastic waste **CO1**

4) Explain about Thermal degradation. **CO1**

5) Explain the process of potting **CO1**

PART-B **8X3=24 Marks**

Instructions: (1) Answer all questions
(2) each question carries eight marks
(3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer

6) Describe the processes of lamination and Encapsulation. **CO2**

(or)

7) Describe the processes of Encapsulation and impregnation. **CO2**

8) What are the various types of polymer degradation? Explain about Oxidative degradation and Thermal degradation of polymers. **CO2**

(or)

9) What are the various types of polymer degradation? Explain about Biological degradation and Degradation of polymer by weathering. **CO2**

10) Describe about various separation techniques of plastic waste. **CO2**

(or)

11) Describe about various disposal processes of waste treatment methods. **CO2**

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Model question paper

Q.No	Question	Blooms category	Marks allocated	CO addressed
Part-A(30 marks)				
1.	State the properties of Styrene Butadiene Rubber.	remembering	3	CO1
2.	State the applications of natural rubber.	Remembering	3	CO2
3.	What are the properties of FRP materials?	understanding	3	CO2
4.	List the components used in the manufacture of particle board.	Remembering	3	CO3
5.	Explain the process of impregnation.	understanding	3	CO3
6.	Write the Newton's equationof Viscoelasticity.	Remembering	3	CO1
7.	Explain about polymer degradation.	understanding	3	CO3
8.	Explain about the degradation of PET.	remembering	3	CO4
9.	Explain about thermal disposal of plastic refuse.	remembering	3	CO4
10.	What is tertiary Recycling of polymers?	remembering	3	CO5
Part-B(40 marks)				
1	Explain about the Phenomena of vulcanization.	understanding	8	CO2
2	Explain about different kinds of reinforcing agents and their properties.	understanding	8	CO2
3	With a neat sketch explain the process of wire coating.	understanding	8	CO3
4	Explain about Maxwell and Voigt models for Viscoelasticity.	understanding	8	CO1
5	Explain the process of tyre retreading.	understanding	8	CO2
Part-C(10 marks)				
6	Suggest different fibre and resin combinations with their applications in FRP.	analyzing	10	CO5

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CHPP-706	Chemical plant equipment drawing	6	90	40	60

S.No.	Chapter/unit title	No. of periods	CO's Mapped
01.	Drawing of heat transfer equipment	25	CO1
02.	Drawing of mass transfer and mechanical unit operations	25	CO1
03.	Process flow diagrams using process description (flow sheeting)	20	CO2
04.	Process instrumentation diagrams, process equipment layouts and plant layouts	20	CO3,CO4,CO5
Totalperiods		**90**	

Course objectives

Course objectives	(i)	To draw various heat transfer, mass transfer and mechanical unit operations equipment
	(ii)	Todraw process block diagram/flow diagram using process description
	(iii)	To draw process instrumentation diagrams, process layouts and plant layouts

Course Outcomes

Course Outcomes	CO1	Demonstrate the skill of drawing and labelling heat transfer, mass transfer and mechanical unit operations equipments
	CO2	Practice the flow sheeting of process flow diagrams using process description for the production of various chemical compounds
	CO3	Sketch the instrumentation diagrams of the equipments for unit operations
	CO4	Follow the principles of process equipment layout in chemical process industries
	CO5	List the factors in identification of plant location for the proposed chemical process plant layout

Learning Outcome

Chapter-1

1.1 Draw a neat sketch of Shell & tube heat exchanger (1-1)
1.2 Draw a neat sketch of 2-4 Shell & tube heat exchanger
1.3 Draw a neat sketch of Short tube vertical evaporator
1.4 Draw a neat sketch of Long tube forced circulation evaporator

Chapter-2

2.1 Draw a neat sketch of Rotary drum vacuum filter
2.2 Draw a neat sketch of Bubble cap plate
2.3 Draw the neat sketch of Jaw crusher
2.4 Draw a neat sketch of Plate & Frame filter press
2.5 Draw a neat sketch of Basket centrifuge
2.6 Draw a neat sketch of Rotary drum driers
2.7 Draw a neat sketch of Crystallizer

Chapter-3

3.1 Draw the sketch for the production of glacial acetic acid using acetaldehyde
3.2 Draw the sketch for the production of para-nitroaniline from Para -nitrochlrobenzene
3.3 Draw the sketch for the production of acetone from Iso-propanol
3.4 Draw the sketch for the production of Diethyl oxalate from oxalic acid and ethanol
3.5 Draw the sketch for the conversion of ethanol to alcohol by azeotropic distillation
3.6 Draw the sketch for the manufacture of any fertilizer /any petrochemical product.

Chapter-4

Part-A

4.1 Draw the Instrumentation diagram for Reactor temperature control
4.2 Draw the Instrumentation diagram for Hot fluid temperature control in heat exchanger
4.3 Draw the Instrumentation diagram for Spray drier temperature control
4.4 Draw the Instrumentation diagram for Control of mechanically agitated vessel used for gas absorption
4.5 Draw the Instrumentation diagram for Distillation column tower pressure control

Part-B

4.6 Understand the important Equipment layout in Ammonia plant
4.7 Understand the important Equipment layout in water treatment plant
4.8 Understand the important Equipment layout in sugar manufacturing unit
4.9 Understand the important Equipment layout in paper industry
4.10 Understand the important Equipment layout in cement plant

Part-C

4.11 Know the diagram of project layout for phosphoric acid, urea plant, ammonia plant and utilities of DAP plant in fertilizer Industry
4.12 Know the diagram of a project layout consisting various units of pulp and paper Industry
4.13 Know the diagram of project layout of CDU, FCCU, utilities etc in petroleum refinery
4.14 Understand the diagrams of a project layout of Glycerin, vanaspathi, soap of vegetable oil industry.

Course code CHPP-706	Course title : Chemical plant equipment drawing Number of course outcomes:05				No. of periods
POs	Mapped with CO No.	CO Periods addressing PO in Column 1		Level (1,2,3)	Remarks
		No	%		›40% Level 3 Highly addressed 25% to 40% Level 2 Moderately addressed 5 to 25% Level 1 Low addressed ‹5% Not addressed
PO1	CO4	7	8		
PO2	CO2,CO3	27	30		
PO3	CO1	50	56		
PO4					
PO5	CO5	6	6		
PO6					
PO7					

COURSE CONTENTS:

Unit-1: Drawings of Chemical Engineering equipment

Draw the neat sketches of Shell & tube heat exchanger (1-1)- 2-4 Shell & tube heat exchanger - Short tube vertical evaporator - Long tube forced circulation evaporator .

Unit-2: Draw the neat sketches of Rotary drum vacuum filter - Bubble cap plate - Jaw crusher- Plate & Frame filter press- Basket centrifuge- Rotary drum driers- Crystallizer.

Unit-3Process flow diagrams using process description (Flow sheeting)

Production of glacial acetic acid using acetaldehyde solution- Para-nitro aniline from Para-nitrochlrobenzene.- acetylene from Isopropanol- Diethyl oxalate from oxalic acid and ethanol - Conversion of ethanol to alcohol by Azeotropic distillation – fertilizer / a petrochemical product.

Unit-4: Process instrumentation diagrams of equipments

Reactor temperature control-Hot fluid temperature control in heat exchanger - Spray drier temperature control--Control of mechanically agitated vessel used for gas absorption-Distillation column tower pressure control.

Process equipment layout

Equipment layout in Ammonia plant - water treatment plant - sugar manufacturing unit- paper industry - cement plant

Plant layouts and location identification

Plant layout for phosphoric acid - urea plant in fertilizer industry - D.A.P plant- pulp and paper industry - petroleum refinery - Vegetable oil industry for vanaspathi.

REFERENCE BOOKS:

1. Chemical Engineering drawing by KA Ghavane, Nirali publications
2. Chemical Engineering drawing by R.S.Hiremath. Nirali Publications.
3. Introduction to Chemical Engineering by Badger &Benchero, Mc Graw Hill Publications
4. Unit operation of Chemical Engineering by Mc Cabe and smith –Mc Graw Hill publications
5. Plant design drawing by vibrant & Dryden, Mc Graw Hill publications

Model Blue print with weightages for Blooms category and questions for each chapter and COs mapped

S.No	Chapter/unit title	No. of periods	Weightage allocated	Marks wise Distribution of weightage				Question wise Distribution of weightage				CO's Mapped
				R	U	Ap	An	R	U	Ap	An	
1	Drawing of heat transfer equipment	25	**15**			**15**				**1**		CO1
2	Drawing of mass transfer and mechanical unit operations	25	**15**			**15**				**1**		CO1
3	Process flow diagrams using process description (flow sheeting)	20	**15**			**15**				**1**		CO2

Model question paper

PART- A **Marks: 5 X 4 = 20**

Note: Answer *all* questions .Each question carries *four* marks

1. Draw the process equipment layout in cement plant **CO2**
2. Draw the process equipment layout in Sugar manufacturing plant. **CO1**
3. Draw the process equipment layout in pulp industry. **CO1**
4. Draw the neat diagram of project layout for petroleum refinery **CO1**
5. Draw the neat diagram of project layout for urea plant **CO1**

PART-B **Marks: 2X 20= 40**

Note:*1) Answer any two questions. Each Question carries twenty marks*
2) Draw the figures with dimensions mentioned and assume anySuitable dimension where ever required.

6. Draw the equipment diagram of 2-4 heat exchanger with the suitable dimensions and indicate the parts **CO2**
7. Draw the process block diagrams for the production of Diethyl oxalate from oxalic acid and ethanol. **CO2**
8. Draw the Instrumentation diagram for Steam flow rate and level control of re- boiler. **CO2**

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Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-707	**IPC and RE Lab**	3	45	40	60

Course title :IPC and RE Lab(CHPP-707)		
Course Objectives	(i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant experiments/exercises	
Course Outcomes	C01	Demonstrate the skill of planning and organizing experimental set up for a desired purpose.
	C02	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems.
	C03	Observe various parameters, their variations and graphically represent the same.
	C04	Analyse the experimental results to draw inferences to make recommendations.
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group.

List of experiments for Instrumentation, Process Control:

1. Determine the response of a bare thermometer and plot the response curve.
2. Determine the response of a thermometer with thermal well and plot the response curve.
3. Calibrate a give thermocouple and plot a graph between the experimentally obtained thermal EMF and temperature data against the theoretical thermal EMF and temperature data.
4. Obtain the resistance and temperature data for a given resistance thermometer.
5. Calibrate a given pressure gauge by using a Dead weight piston gauge.
6. Determine the response of a single tank liquid level system for a given step input and determine the time constant. Plot the response by using a complete response method and incomplete response method.
7. Determine the response of a second tank of a two tank interacting liquid level system for a given step input and determine the time constants. plot the response by using an incomplete response method.
8. Determine the response of a second tank of a two tank non-interacting liquid level system for a given step input and determine the time constants. plotthe response by using an incomplete response method.

9. Determine the response of an air oven incorporated with ON-OFF control system and determine the offset for the system.
10. Determine the valve coefficient CV for a linear type control valve and plot the control valve characteristics.
11. Determine the valve coefficient CV for an Equal percentage type control valve and plot the control valve characteristics.
12. Determine the damping coefficient for critical, over and under damped condition of a second order U-tube manometer.

List of experiments for Reaction Engineering Lab:

13. Perform an experiment to calculate the volume required for constant volume batch reactor.
14. Perform an experiment to calculate the volume required for constant volume steady state mixed flow reactor.
15. Perform an experiment to calculate the volume required for constant volume steady stateplug flow reactor.

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-708	Life Skills	3	45	40	60

S. No.	Unit Title	No of Periods	COs Mapped
1	Attitude	**4**	CO1
2	Adaptability	**4**	CO1, CO2
3	Goal Setting	**4**	CO1, CO2, CO3
4	Motivation	**4**	CO1, CO2, CO3
5	Time Management	**4**	CO2
6	Critical thinking	**4**	CO3
7	Creativity	**4**	CO3
8	Problem Solving	**5**	CO3
9	Team Work	**4**	CO4
10	Leadership	**4**	CO4
11	Stress Management	**4**	CO4
Total Periods		**45**	

Course Objectives	To understand the importance of Life skills for acceptable, sustainable and ethical behaviour in academic, professional and social settings
	To exhibit language competence appropriate to acceptable social and professional behaviour.
	To demonstrate time management, stress management, team skills, problem solving ability to manage oneself in academic, professional and social settings.

CO No.	Course Outcomes
CO1	Demonstrates positive attitude and be able to adapt to people and events
CO2	Fixes personal and professional goals and manages time to meet targets
CO3	Exhibits critical and lateral thinking skills for problem solving.
CO4	Shows aptitude for working in teams in a stress free manner and sometimes/ very often/ mostly display leadership traits.

CO-PO Matrix

Course Code CHPP-708	**Course Title: Life skills Number of Course Outcomes: 4**				**No. of Periods: 45**
POs	Mapped with CO No.	CO Periods Addressing PO in Column 1		Level of Mapping (1,2,3)	Remarks
		Number	Percentage %		
PO1		Not directly applicable for Life Skills Course. However activities that use content and situations from academic, professional and social settings relevant to the Programme shall be exploited for triggering thought and interaction in the Course.			
PO2					
PO3					
PO4					
PO5	CO1, CO2, CO3, CO 4	11	25%		>60%: Level 3
PO6	CO1, CO2, CO3, CO4	27	45%		16 -59%: Level 2
PO7	CO1, CO2, CO3, CO4	7	30%		Up to 15%: Level 1

Level 3 – Strongly Mapped
Level 2- Moderately Mapped
Level 1- Slightly Mapped

Mapping Course Outcomes with Program Outcomes:

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**
CO 1					✓	✓	✓
CO 2					✓	✓	✓
CO3					✓	✓	✓
CO4					✓	✓	✓

Blue Print for evaluation based on Course Outcomes for SA:

Note: Every Activity based Question that focuses on COs and responses as exhibited through communication has to be given marks for the following parameters

- Clarity of Thinking as Exhibited through Content
- Features of Etiquette

***Rubric Descriptors 'Outstanding/ Very Good/ Good/ Satisfactory/ Poor' levels of Competence**

Level of Competence	Parameters of Assessment	
	Clarity of thinking as exhibited through content	**Features of etiquette**
Outstanding 10	**Thinking** is **extremely logical** and suggested course of action is **feasible** Shows **creativity and uniqueness** Exhibits **expert use of expression** (organizational devices and discourse markers) that denote clarity in thought.	Exhibits **courtesy to all most appropriately** with **confidence**
Very Good 8/9	**Thinking** is **clear and logical** Suggested **course of action is feasible** Shows **traces of creativity** Exhibits **good expression** (organizational devices and discourse markers) that denote clarity in thought.	Exhibits **courtesy to all to a considerable level.**
Good 6/7	**Thinking is clear and logical most of the time**. Lacks creativity or out of the box thinking as expressed through content.	Exhibits **courtesy / politeness to an acceptable level.**
Satisfactory 4/5	**Thinking is logical**; However **expressing content is disjointed and disorganized.**	Has courtesy but often fumbles with language.
Poor 3 or less than 3	**Thoughts** as expressed through content are **incoherent. Language skills are very limited.**	Fails to show courtesy to others.

Blue Print for evaluation based on Course Outcomes for SA of each student:

Note: Marks are awarded for each student as per the Rubric descriptors.

S No.	Questions based on Course Outcomes	Periods Allocated for practical work	Max Marks	Poor >3	Satisfactory 4 /5	Good 6/7	Very Good 8/9	Outstanding 10
1	Short presentation on GOALS with Timeline and Action Plan	12	10					
2	State what you will do in the given situation (Assesses adaptability and critical thinking skills, leadership, team skills)	12	10					
3	In how many different and creative way can you use _____ (Object) other than its primary use	8	10					
4	What solutions can you think of for _____ problem.	13	10					
	Total	**45**	**60**					

Note: The marks that are awarded for the student for 40 to be increased proportionally for 60.

Learning Outcomes

1. Attitude Matters :

1.1 Understand the importance of positive attitude and the consequences of negative attitude.

1.2 Demonstrate positive attitude in dealing with work-related issues and in personal life.

2. Adaptability….makes life easy :

2.1 Understand the significance of adaptability.

2.1 Show adaptability whenever needed, both at place of work and on personal front.

3. Goal Setting … life without a Goal is a rudderless boat!

3.1 Understand the SMART features of goal-setting.

3.2 State one's short-term and long-term goals and spell out plans to achieve them.

4. Motivation … triggers success!

4.1 Comprehend the need for motivation in order to achieve success in life.

4.2 State how one is motivated in life.

4.3 Show the impact of motivation on one's life.

5. Time Management… the need of the Hour!

5.1 Understand the value of time management and prioritizing in life

5.2 Demonstrate the effect of time management on one's professional work.

6. Critical Thinking … logic is the key!

6.1 Distinguish between facts and assumptions

6.2 Use logical thinking in dealing with professional matters

7. Creativity … the essential you!

7.1 Understand the importance of thinking out of the box in dealing with critical issues

7.2 Solve problems using creativity / imagination

8. Problem Solving … there is always a way out!

8.1 Understand the need for and importance of problem solving.

8.2 Use logic or creativity to solve a problem at workplace or home.

9. Team Work… together we are better!

9.1 Understand the need for team skills / team building

9.2 Demonstrate one's skills as a team player

10. Leadership… the meaning of a leading!

10.1 Understand the need for team skills / team building

10.2 Demonstrate one's skills as a team player

11. Stress Management… live life to the full!

11.1 Understand what causes stress and how to cope with stress at workplace.

11.2 Demonstrate how stress can be overcome in a healthy way.

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-709	Project Work/Plastic technology Lab	3	45	40	60

Course Objectives	(i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant Experiments/exercises.	
Course Outcomes	C01	Demonstrate the skill of planning and organizing experimental set up for a desired purpose.
	C02	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems.
	C03	Observe various parameters, their variations and graphically represent the same.
	C04	Analyse the experimental results to draw inferences to make recommendations.
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group.

A list of topics suggested for project work:

1. Basic design and cost estimating of the following equipment based on the problems suggested by teachers on topics;
   a) Heat exchangers and condensers
   b) Distillation units
   c) Pumping installation
   d) Absorber
   e) Extractor
   f) Water purification system
   g) Crystallizer
   h) Evaporator
   i) Dryer
   j) Project works related to pollution control of solid, liquid and gaseous pollutants
2. Prepare a detailed project report on the production of a chemical.
3. Design and fabricate small prototype Chemical Engineering equipment's useful for doing experiments inthe laboratory.
4. To conduct a survey of a Petroleum refinery/ Petrochemical / Chemical Industry and produce areport on
   a) Various safety methods being followed
   b) Various pollution control methods being carried out.
   c) Production, planning and control systems
   d) Process instrumentation of the plan

e) Maintenance schedule of Chemical Engineering Equipment
f) Material transportation and storage of chemicals

List of Experiments to be conducted in Plastic Technology Lab

1. Preparation of plywood with phenol formaldehyde resin.
2. Preparation of Urea formaldehyde resin.
3. Preparation of nylon 6.
4. Determination of moisture content of plastics.
5. Determination of resin content of polymer solution.
6. Preparation of alkyl resin for coating.
7. Preparation of polystyrene.
8. Determination of pH of a resin solution.
9. Determination of intrinsic viscosity of polymer solutions.
10. Determination of acid number of alky resin.
11. Preparation of articles by FRP.
12. Determination of non-volatile percentage of alky resin.
13. Prepare Vulcanized rubber with sulphur.
14. Separate different plastic waste materials with sink and float method.

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHPP-710	**Unit operations-III Lab**	3	45	40	60

Course title: Unit operations-III Lab(CHPP-710)		
Course Objectives	(i) To familiarize with the knowledge different materials tools used in general Engineering processes (ii) To use various basic implements used in general Engineering processes (iii) To know the etiquette of working with the fellow workforce (iv) To reinforce theoretical concepts by conducting relevant experiments/exercises	
Course Outcomes	C01	Demonstrate the skill of planning and organizing experimental set up for a desired purpose
	C02	Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems
	C03	Observe various parameters, their variations and graphically represent the same
	C04	Analyse the experimental results to draw inferences to make recommendations
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

List of Experiments:

1. Verification of the various laws of crushing by using Jaw crusher.
2. Verification of various crushing laws using roll crusher.
3. Determination of angle of nip in roll crusher.
4. Determination of critical speed & energy consumed in size reduction using ball mill / rod mill.
5. Perform screen analysis for determination of average size, Specific surface area, Particle population for the given sample.
6. Determination of effectiveness of screening in separating the given material by use of vibrating screens.
7. Perform froth flotation experiment to separate a mixture of coal into two fractions.
8. Verification of Stoke‘s law by settling a particle in a liquid column
9. Perform batch Sedimentation experiment to calculate the thickener area required using Kynchformula.
10. Determination of the resistance offered by filter cake & filter medium under constant pressure& constant rate of filtration in filtration operation by plate & frame type of filter press.

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