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

3 YEAR (SW)
DIPLOMA IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

CURRICULUM -2020
(C-20)

3 YEAR (SANDWICH)
DIPLOMA IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING
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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,Dr.Pola Bhaskar I.A.SCommissioner of Technical Education and Sri. G. Anantha Ramu, 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 curriculam.

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 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 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

<u>For IVC & ITI Lateral Entry Students:</u>

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 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 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.

<u>For IVC & ITI Lateral Entry students</u>:

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 fulfill 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:

SUGAR TECHNOLOGY

Changes in theory subjects in C-20 D CH ST

1. **CHST-105 General mechanical engineering**
   Introduced the topics on parson turbines with latest technological developments
2. **CHST-106 Sugar production technology**
   Introduced the topics SRT clarifiers to make the students handy with day to day developments in sugar manufacturing
3. **CHST-302 Physical and Organic chemistry**
   In C-16 DCHST curriculum the name of the subject CHST-302 Chemistry-II is renamed as **CHST-302 Physical and Organic chemistry** as per the objectives of the course
4. **CHST-303 General Chemicaltechnology**
   A topic on Sugar industry related objectives which were already covered in CHST-106 removed
5. **CHST-401 Electrical technology**
   New objectives introduced related to Sugar/chemical industry.
6. **CHST-405 SCA&SC**
   New objectives introduced to update the students on latest cultivation methods in SCA and also topic on digital polarimeter in sugar chemistry
7. **CHST-504 Sugar equipment capacity calculation**
   In C-16 DCHST curriculum the name of the subject **CHST-504 Sugar equipment design and calculation** is renamed as **CHST-504 Sugar equipment capacity calculation** as per the objectives of the course

Changes in Practical subjects in C-20 DCHST

1) **CHST-306 Physical and Organic chemistry lab.**
   In C-16 DCHST curriculum the name of the subject CHST-302 Chemistry-II Lab is renamed as **CHST-302 Physical and Organic chemistry lab.** As per the Objectives of the course
2) **CHST-307 FM&HT lab**
   Experiments on latest technology on heat transfer introduced
3) **CHST-407 E.Tech lab**
   Experiments on latest technology on earthing and safety introduced
4) **STCC-409 Sugar technology chemical control lab**
   New practical topic estimation of Sucrose/Ash ratio in final molasses
5) **STCC-508 Sugar technology lab**

New practical topic estimation of ICUMSA of white sugar by Spectrophotometer

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

Develop chemical engineering with specialization in sugar technology professionals competent to face the global challenges in a progressive environment conducive to learn technical knowledge, skills blended with ethics and values, to serve the society and to better it for an innovative and comfortable living.

MISSION

M1	To provide a competitive learning environment, through a need based curriculum designed in collaboration with sugar/chemical industry, conducive for high quality education emphasizing on exchange of knowledge and skill development essential for the industry/ profession and the society as well.
M2	To nurture higher order leadership qualities and ethics and values in students to enable them to be leaders in their chosen professions while maintaining the highest level of ethics.
M3	To encourage the spirit of inquisition to promote innovation and entrepreneurship strengthened with life skills to sustain the stress.
M4	To foster effective interactions and networking with all the stake holders so as to work towards the growth and sustainability of the society and environment.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY) programme is steadfast to transform students in to competent professionals with qualities of good human values and responsible citizens. On completion of the Diploma programme, the students should have acquired the following characteristics

PEO1	To apply technical knowledge and management principles in analyzing and planning problems in the field of chemical / sugar while ensuring maximization of economic benefits to industry / society and minimization of damage to ecology and environment
PEO2	To be life-long learners with sprit of enquiry and zeal to acquire new knowledge and skills so as to remain contemporary and posses required professional skills.
PEO3	To enhance entrepreneurial, communication and other soft skills, which will enable them to work globally as leaders, team members and contribute to nation building for the betterment of the society.
PEO4	To make them strongly committed to the highest levels of professional ethics and focus on ensuring quality, adherence to public policy and law, safety, reliability and environmental sustainability in all their professional activities

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 basics in chemical engineering / sugar technology and to apply them to various areas in industry like extraction, evaporation, distillation, crystallization. Clarification, panboiling, certrifugation, drying etc....

2. An ability to solve complex chemical engineering / sugar technology industrial problems, using latest hardware and software tools, along with innovative analytical skills to arrive cost effective and appropriate solutions.

3. Wisdom of social and environmental awareness along with ethical responsibility to have a successful career in the Engineering / technological fields and to sustain passion and zeal for real-world applications in the learned fields as an Entrepreneur.

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING(SUGAR TECHNOLOGY)
FIRST YEAR
SCHEME OF INSTRUCTIONS AND EXAMINATION

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examinations			
		Theory	Practical's		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
CH-ST-101	English	3	-	90	3	20	80	100
CH-ST-102	Engineering Mathematics-I	5	-	150	3	20	80	100
CH-ST-103	Engineering Physics	4	-	120	3	20	80	100
CH-ST-104	Engineering Chemistry and Environmental Studies	4	-	120	3	20	80	100
CH-ST-105	General Mechanical Engineering	4	-	120	3	20	80	100
CH-ST-106	Sugar production Technology	4	-	120	3	20	80	100
PRACTICAL SUBJECTS								
CH-ST-107	Engineering Drawing	-	6	180	3	40	60	100
CH-ST-108	Workshop Practice	-	6	180	3	40	60	100
CH-ST-109	A)Physics Laboratory	-	3*	90	3	20	30	50
	B)Chemistry Laboratory	-			3	20	30	50
CH-ST-110	Computer fundamentals lab practice	-	3	90	3	40	60	100
	Total	**24**	**18**	**1260**	**-**	**280**	**720**	**1000**

Note: CH-ST-101, 102, 103, 104, 107, 109, 110 common to ALL BRANCHES

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
III SEMESTER
SCHEME OF INSTRUCTIONS AND EXAMINATION

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practical's		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
CH-ST-301	Engineering Mathematics-II	4	-	60	3	20	80	100
CH-ST-302	Physical and Organic chemistry	5	-	75	3	20	80	100
CH-ST-303	General Chemical Technology	6	-	90	3	20	80	100
CH-ST-304	Mass and Energy Balances	6	-	90	3	20	80	100
CH-ST-305	Fluid Mechanics and Heat Transfer	6	-	90	3	20	80	100
PRACTICAL SUBJECTS								
CH-ST-306	Physical and Organic chemistryLaboratory	-	3	45	3	40	60	100
CH-ST-307	Fluid MechanicsLaboratory	-	6	90	3	40	60	100
CH-ST-308	Heat Transfer Laboratory	-	3	45	3	40	60	100
CH-ST-309	General Chemical Technology Laboratory	-	3	45	3	40	60	100
	Total	**27**	**15**	**630**	**-**	**260**	**640**	**900**

Note: CH-ST-301, common to ALL BRANCHES

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
IV SEMESTER
SCHEME OF INSTRUCTIONS AND EXAMINATION

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practical		Duration (hrs)	Sectional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
CH-ST-401	Engineering Mathematics-III	3	-	45	3	20	80	100
CH-ST-402	Electrical Technology	5	-	75	3	20	80	100
CH-ST-403	Mechanical Unit Operations	6	-	90	3	20	80	100
CH-ST-404	Mass TransferOperations -I	5	-	75	3	20	80	100
CH-ST-405	Sugar Cane Agriculture and Sugar chemistry	4	-	60	3	20	80	100
CH-ST-406	Sugar Technology Chemical Control	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
CH-ST-407	Electrical Technology Laboratory	-	3	45	3	40	60	100
CH-ST-408	Communication skills	-	3	45	3	40	60	100
CH-ST-409	Sugar Technology Chemical ControlLaboratory	-	6	90	3	40	60	100
CH-ST-410	Mechanical Unit Operations Laboratory	-	3	45	3	40	60	100
	Total	**27**	**15**	**630**	**-**	**280**	**720**	**1000**

Note: CH-ST- 401 & 408 common to ALL BRANCHES

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
V SEMESTER
SCHEME OF INSTRUCTIONS AND EXAMINATION

Sub code	Name of the subject	Instruction Periods/Week		Total periods / year	Scheme of examination			
		Theory	Practicals		Duration	Sessional marks	End exam marks	Total marks
THEORY SUBJECTS								
CH-ST-501	Industrial management and entrepreneurship	5	-	75	3	20	80	100
CH-ST-502	Thermo dynamics and reaction engineering	6	-	90	3	20	80	100
CH-ST-503	Mass transferOperations-II	4	-	60	3	20	80	100
CH-ST-504	Sugar equipment capacity calculationS	5	-	75	3	20	80	100
CH-ST-505	By products and pollution control	4	-	60	3	20	80	100
PRACTICALS								
CH-ST-506	Sugar equipment drawing and plant lay out	-	6	90	3	40	60	100
CH-ST-507	Mass transferOperation sLaboratory	-	3	45	3	40	60	100
CH-ST-508	Life Skills	-	3	45	3	40	60	100
CH-ST-509	Sugar technology Laboratory	-	3	45	3	40	60	100
CH-ST-510	Project work		3	45	3	40	60	100
	Total	**24**	**18**	**630**		**300**	**700**	**1000**

***NOTE:CH-ST-508 Common to All branches**

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
VI SEMESTER - INDUSTRIAL TRAINING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CH-ST- 601DURATION: 6 MONTHS

NOTE:

For Diploma In Chemical Engg.(Sugar Technology) Students,The Industrial Training (Vi Semester) Has Been Mostly Arranged In Sugar Industries That Works In A Particular/ Specified Period Only I.E., September To March. Hence The Period Of Training Will Be Chosen Convenient To The Season/ Period Only As Per The Need Of Sugar Industry.So The Duration Of Training For A Period Of Six Months Will Be Arranged From 1st September To 28th February Only Of That Academic Year (Third Year)

Hence,The V **Sem**. Class Work In 3 RdYear Will Commence
From 15th May Of That Academic Year To 31st August & 5th March To 31st March Of The Same Academic Year In Two Spells / Sessions In Third Year And V Semester End Exams Will Be Conducted In March / April Of That Academic Year

C-20 3 YEAR SANDWICH DIPLOMA IN CHEMICAL ENGG
(SUGAR TECHNOLOGY)
VI SEMESTER
CH-ST-601
SCHEME OF INSTRUCTION AND EXAMINATION FOR
VI SEMESTER INDUSTRIAL TRAINING

S.No.	Subject	Duration	Scheme of examination			Remarks
			Nature item		Max. marks	
1.	Practical training in a sugar / Chemical or Allied Industry	6 months (One spell) From 1st sep. To 28th feb. of that academic year	Viva-Voce	1. First Assessment (at the end of 3rd month)	120	At the Industry
				2. Second Assessment (at the end of 6th month)	120	At the Industry
				3. Training Report(typed) / Maintenance ofLog Book (Writing}	30	At the institution
				4. Demonstration of any one of the skill listed in learning out comes in seminar conducted at institution	20	At the institution
				5.viva voce	10	At the institution
Total					**300**	

Note:-

1. The Industrial training shall carry 300 marks and pass marks is 50%
2. A Candidate failing to secure the minimum marks should complete it at his own. Expenses in the next academic year. No apprenticeship stipend is payable in such case.
3. During Industrial training the candidate shall put in a minimum of 90% attendance

I YEAR

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
I YEAR
SCHEME OF INSTRUCTIONS AND EXAMINATION

Sub Code	Name of the Subject	Instruction Periods/Week (NON- MODULAR)		Total Periods Per Year	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
CH-ST-101	English	3	-	90	3	20	80	100
CH-ST-102	Engineering Mathematics-I	5	-	150	3	20	80	100
CH-ST-103	Engineering Physics	4	-	120	3	20	80	100
CH-ST-104	Engineering Chemistry and Environmental Studies	4	-	120	3	20	80	100
CH-ST-105	General Mechanical Engineering	4	-	120	3	20	80	100
CH-ST-106	Sugar production Technology	4	-	120	3	20	80	100
PRACTICAL SUBJECTS								
CH-ST-107	Engineering Drawing	-	6	180	3	40	60	100
CH-ST-108	Workshop Practice	-	6	180	3	40	60	100
CH-ST-109	A)Physics Laboratory	-	3*	90	3	20	30	50
	B)Chemistry Laboratory	-			3	20	30	50
CH-ST-110	Computer fundamentals lab practice	-	3	90	3	40	60	100
	Total	**24**	**18**	**1260**	**-**	**280**	**720**	**1000**

Note: CH-ST-101, 102, 103, 104, 107, 109, 110 common to ALL BRANCHES

CHST-101 ENGLISH

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHST -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 CHST -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	10*			1		CO1, CO2, CO3, CO4
8	New Challenges - Newer Ideas	8	35		8*	8*+ 3+3+ 3			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. Analyze 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- CHST-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)**

6. 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)**

7. 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- CHST -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- CHST -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 mis behavior.
   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- CHST -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 meaningfulsentence.) **(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'

PART- 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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CHST-102 ENGINEERING MATHEMATICS-I

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
CHST-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

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

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

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 two trigonometric 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 appropriate 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 withexamples.

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 anddifference 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 fractions in to their partial fractions covering the types mentioned below.

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

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

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 of elementary 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.

Engineering Mathematics – I
Blue print

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	**CO 1**
2	Partial Fractions	3	2	3	0	3	0	0	0	1	0	0	**CO 1**
3	Matrices and Determinants	10	10	11	3	0	8	0	1	0	1	0	**CO 1**
	Unit - II : Trignometry												
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

Unit Test I

C –20, CHST -102

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-I**

Sub Code: **CHST -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 $Sin^2 45^0 - Sin^2 15^0 = \dfrac{\sqrt{3}}{4}$ **(CO2)**

5. Prove that $\dfrac{\sin 2A}{1-\cos 2A}=\cot A$ **(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 $\dfrac{2x}{(x-1)(x-3)}$ into partial fractions. **(CO1)**

   or

   B) Resolve $\dfrac{x+4}{x^2-3x+2}$ 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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Unit Test II

C –20, CHST -102

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-I**

Sub Code: **CHST - 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. Each question carries eight marks
(2) 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 and also 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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C –20, CHST -102

Unit Test III

State Board of Technical Education and Training, A. P

First Year

Subject Name: **Engineering Mathematics-I**

Sub Code: **CHST-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 χ 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. χ **(CO4)**

5. Find the derivative of $\frac{2x+3}{3x+4}$ **(CO4)**

Part-B **3×8=24**

Instructions: **(1) Answer all questions. Each question carries eight marks**
(2) 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 $u(x, y) = \frac{x^4 + y^4}{x - y}$ **(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 CHST- 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 CHST – 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 ΔABC, 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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CHST-103 ENGINEERING PHYSICS

Course code	Course Title	No. of Periods per week	Total No. of Periods	Marks for FA	Marks for SA
CHST-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 mapped1= 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 Explain the concept 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 ofVectors
2.5 Define Dot product of two vectors with examples (Workdone, 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 toGravity.
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 ofa 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 freely falling body.

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 DefineIdeal 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.

10.0Concepts 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 ofMagnetism.
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 line and 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's laws, 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 (CHST-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 obliqueProjection. **(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)**

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UNIT TEST –II
MODEL QUESTION PAPER (C-20)
ENGINEERING PHYSICS (CHST–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)**

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UNIT TEST –III

Model Question Paper (C-20)

ENGINEERING PHYSICS (CHST–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 unknown resistance **(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)**

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

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

PART—A **3×10=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. 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)**

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CHST-104 ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

Course code	Course title	No. of periods/week	Total No.of periods	Marks for FA	Marks for SA
CHST -104	Engineering Chemistry and Environmental studies	4	120	20	80

S.No.	Chapter/unit title	No. of periods	CO's Mapped
1.	Classification of Elements	12	**CO1**
2.	"s" Block Elements	18	**CO1,CO2,CO3**
3.	"p" Block Elements	34	**CO1,CO2,CO3**
4.	"d" Block Elements	10	**CO1,CO2,CO3**
5.	Solutions	13	**CO1,CO4**
6.	Acids – bases	13	**CO1,CO4**
7.	Oxidation – Reduction	11	**CO1,CO4**
8.	Principles of Metallurgy	09	**CO1,CO2**
Total periods		**120**	

Course objectives

Course objectives	(i)	To know the classification of elements and properties of s, p, d and f block elements
	(ii)	To understand solutions, acids and bases
	(iii)	To know about oxidation and reduction and balancing of chemical reactions and principles of metallurgy

Course Outcomes

CO1	PHST **-1O4.1**	Definitions, Classification, laws, tables, Concepts,
CO2	PHST **-1O4.2**	Physical and chemical properties of elements, Uses , applications
CO3	PHST **-1O4.3**	Preparations, manufacturing processes, chemical reactions
CO4	PHST **-1O4.4**	solved problems

LEARNING OUTCOME

1.0 Classification of Elements

1.1 Need for classification of Elements
1.2 State the modern periodic law
1.3 Periodicity and periodic properties
1.4 Main features of modern periodic table
1.5 Classification of Elements into s,p,d,f blocks

2.0 "s" Block Elements

2.1.1 Elements of GroupIA – General Properties
a) Electronic configuration
b) Metallic – Non Metallic character
c) Ionization potential

d) Electron affinity
e) Electro positive nature

2.1.2 Physical Properties
a) Physical State
b) Metallic Character
c) Density
d) Melting Point and Boiling Point
e) Bonding

2.1.3 Chemical Properties
a) Oxides
b) Hydrides
c) Halides

2.1.4 Compounds of 1^{st} Group elements
a) Preparation of NaOH (by Castner – Kelner process)
b) Physical properties Chemical Properties
c) Chemical properties and uses of Na_2CO_3

2.2 Elements of II A Group Elements – General Properties
a) Electronic configuration
b) Metallic – Non Metallic character
c) Ionization Potential
d) Electron affinity
e) Electropositive nature

2.2.1 Physical Properties
a) Melting Point and Boiling Point
b) Density
c) Bonding

2.2.3 Chemical Properties
a) Oxides
b) Hydrides
c) Halides

2.2.4 Chemical Properties and uses of
a) CaO b) $Ca(OH)_2$ c) $CaCl_2$

3.0 "p" Block Elements

3.1.1 Elements of III A group – General properties
a) Electronic configurations
b) Ionization Energy
c) Electronegative nature
d) Metallic and Non Metallic character
e) Electropositive nature

3.1.2 Physical Properties
a) M.P b) B.P c) Bonding

3.1.3 Extraction of aluminum (Hall herald process)

3.1.4 Chemical Properties
a) Oxides
b) Halides

3.1.5 Chemical Properties and uses of
a) Boric Acid b) Potash Alum

3.2 Elements of IV A group – general properties

3.2.1 Describe the properties and uses of carbon & silicon

3.2.2 State the allotropy of carbon and silicon

3.2.3 Describe the properties and uses of oxides of carbon

3.2.4 Describe the allotropic forms of carbon and their uses

3.3. Elements of V group – General Properties

a) Electronic Configuration
b) Ionization potential
c) Electro negativity
d) Electropositive nature

3.3.1 Physical and Chemical Properties
a) M.P. and B.P
b) Bonding
c) Oxides and Oxy-acids
d) Hydroxides
e) Halides

3.3.2 Preparation of NH_3 by Haber process

3.3.3 Physical properties and chemical properties of NH_3
a) $NH_3 + CO_2$
b) $NH_3 + Na$
c) Basic Nature
d) Action with halogens
e) Actions with $CaOCl_2$

3.3.4 Uses of Ammonia

3.3.5 Preparation of HNO_3 (Berkland-Eyde Process)

3.3.6 Physical and Chemical Properties of HNO_3
a) M.P and B.P
b) Oxidizing Properties
c) Action of Metals
d) Action of Organic compounds
e) Formation of Aquaregia
f)Decomposition

3.3.7 Allotropic forms of phosphorus

3.4 VI Group elements – General properties
a) Electronic configuration
b) Ionization Potential
c) Electro negativity
d) Electro positivity

3.4.1 Physical properties of VI group elements
a) M.P and B.P b)Bonding.

3.4.2 Chemical properties
a) Oxides and Oxyacids
b) Halides
c) Hydrides

3.4.3 a) Preparation of ozone (Siemen's and Halske's method)
b) Physical and chemical properties of ozone
c) Uses of ozone

3.4.4 a) Allotropic forms of "S"
b) Physical and chemical properties of "S"

3.4.5. Heavy water properties and uses.

3.5 VII A group elements
a) General properties of VII group elements
b) Preparation of fluorine (Whyt law – gray's method)
c) Preparation of chlorine (Nelson Method)
d) Preparation of HCl
e) Physical and Chemical properties and uses of HCl
f) Preparations, properties and uses of bleaching powder (Bachman's Plant)

4.0 "d" Block Elements

4.1 General Properties of transition elements
4.2 General characteristics
4.3 Werner's theory of complex compounds
4.4 Effective atomic numbers

5.0 Solutions

5.1 Definitions of solutions, solute, solvent.
5.2 Aqueous solutions, alcoholic solutions
5.3 Define Molarity, Normality and Mole fractions
5.4 Simple problems based on concentration method
5.5 Buffer solutions, different types of buffer solutions application of buffer solutions
5.6 Define dilute solutions and Raoult's Law
5.7 Define Vapour pressure and determination by Ostwald's method
5.8 Solubility of a solid in liquid

6.0 Acids – bases

6.1 Arrhenius concept of acids and bases with examples
6.2 Lowry Bronsted concept with examples
6.3 Lewis concept with examples
6.4 Definition of pH – pH Scale
6.5 Simple problems based on pH
6.6 Theories of Indicators
6.7 Ostwald's theory of acid and base indicator.
6.8 Postulates of Ostwald's theory.
6.9 Action of phenolphthalein and methyl orange indicators.

7.0 Oxidation – Reduction

7.1 Oxidation – Reduction based on electronic concept
7.2 Definition of oxidation number
7.3 Rules determining oxidation numbers
7.4 Calculate the oxidation numbers
7.5 Rules determining the balancing of equations by ion electron method
7.6 Balance the following Ionic Equations

$a) Cr_2 0_7^{2-} + No_2^- \rightarrow Cr^{3+} + No_3^-$ (in Acidic Medium)

$b) P_4 + OH^- \rightarrow PH_3 + H_2 Po_2$ (in Alkaline medium)

$c) M_n o_4^- + Fe^{2+} \rightarrow M_n^{2+} + Fe^{+3}$ (in Acidic medium)

8.0 Principles of Metallurgy

8.1 Introduction
8.2 Occurrence of Metals
8.3 Characteristics of metals
8.4 Metallurgy – Metallurgical operations

COURSE CONTENTS

1. Periodic classification of elements

Classification – periodic law – periodicity and periodic properties classification of elements into s, p, d, f blocks.

2. S – Block elements (Alkali metals and Alkaline earth metals)

Elements of group IA – General properties, physical and chemical properties of compounds of I group i.e. NaOH, Na_2CO_3 – preparations, properties and uses.

3 P – Block Elements (III, IV, V, VI, VII group elements)

A. III Group: General Properties – Physical properties, chemical properties – compounds of III Group – Boric acid, Potash Alum properties – uses.

B. IV Group: Describe the properties of carbon, sulphur – state the allotropes of carbon, silicon – properties, uses of oxides.

C. V Group: General properties, physical and chemical properties, preparation of NH_3, HNO_3 - chemical, physical properties and uses – allotropic forms of "P"

D. VI Group: General properties – physical and chemical properties preparation of ozone and heavy water – their properties and uses – allotropic form of "S"

E. VII Group: General properties – preparation and properties of fluorine, chlorine, HCl – preparation of Bleaching powder (by Bachmann's plant) – uses.

4 D – BLOCK ELEMENTS (Transition Elements)

General properties of transition elements – some general characterstics – werner's theory of complex compounds – effective atomic number

5 Solutions – Concentration methods, problems – buffer solutions – colligative

properties - solubility

6 Acids and bases – Arrhenius acid base theory – Lowry Bronsted concept – Lewis concept – pH Problems- theory of indicators.

7 Oxidation – Reduction – definition - rules determining – calculation of oxidation numbers – balancing the equations by Ion electron method.

8 Metallurgy – General Principles

Introductions – occurrence of metals – characteristics of metals – metallurgy – various metallurgical operations

REFERENCE BOOKS

1. Intermediate 1st Year Chemistry by Telugu Akademi (2002 Editor)
2. Intermediate 2nd Year Chemistry by Telugu Akademi (2002 Editor)
3. Unified Chemistry for B.Sc. Students, JPNP, Meerut
4. Inorganic Chemistry by P.L. Soni
5. Engineering Chemistry by B.K. Sharma
6. Engineering Chemistry by O.P. Agarwal
7. Engineering Chemistry by Jain & Jain

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	Classification of Elements	12	**8**			**8**				**1**		**CO1**
2	"s" Block Elements	18	**11**		**3**	**8**			**1**	**1**		**CO1,CO2,CO3**
3	"p" Block Elements	34	**24**	**3**	**3**	**8**	**10**	**1**	**1**	**1**	**1**	**CO1,CO2,CO3**
4	"d" Block Elements	10	**9**	**3**	**3**	**3**		**1**	**1**	**1**		**CO1,CO2,CO3**
5	Solutions	13	**8**			**8**				**1**		**CO1,CO4**
6	Acids – bases	13	**8**			**8**				**1**		**CO1,CO4**
7	Oxidation – Reduction	11	**6**	**3**	**3**			**1**	**1**			**CO1,CO4**
8	Principles of Metallurgy	09	**6**	**3**	**3**			**1**	**1**			**CO1,CO2**
Total		**120**	**80**	**12**	**15**	**43**	**10**	**4**	**5**	**6**	**1**	

Unit test NO	**Learning out comes to be covered**
Unit test-I	Objectives from 1.1 to 3.3.1(e)
Unit test-II	Objective from 3.3.2 to 5.8
Unit test-III	Objective from 6.1 to 8.4

MODEL PAPER 1
State Board of Technical Education and Training, A.P
Diploma in Chemical Engineering
I Year
Subject Name: Inorganic Chemistry
Subject Code: CHST-104
Unit Test-1

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

PART-A **16marks**

Instructions: (1) Answer all questions.
(2) First question carries 4 marks and rest of the questions carries Three marks

1. (a) State Modern Periodic law. (CO1)
   (b) What is the trend of Ionization potential and atomic size in IA group elements. (CO1)
   (c)Define Allotropy. (CO1)
   (d)Write the formulae of Boric acid and potash alum. (CO1)
2. What is Periodicity? Mention the periodic properties. (CO1)
3. Write the chemical properties of sodium hydroxide. (CO2)
4. Write 2 uses of Boric acid and Potash Alum. (CO2)

PART-B

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

5. Describe the main features of modern periodic table. (CO1)
   Or
   Describe the classification of elements into s,p,d and f-blocks. (CO1)
6. Describe the preparation of sodium hydroxide by Castner-Kelner process with a neat labeled diagram. (CO3)
   Or
   Describe the chemical properties and uses of (CO2)
   (a) $Ca(OH)_2$ (b) CaO (c) $CaCl_2$
7. Describe the extraction of Aluminium by Hall-Herald process with a neat labeled diagram. (CO3)
   Or
   Describe the allotropic forms of carbon and their uses. (CO1)

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BOARD DIPLOMA EXAMINATIONS
C-20,CHST -104, INORGANIC CHEMISTRY
I YEAR
MODEL PAPER- END EXAMINATION

TIME :3 HOURS **MAX.MARKS:80**

Part –A **10x3=30**

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

1. What is the Ionization potential? Explain its variation in a group and along period. (CO1)
2. Write the electronic configurations of III A and V group elements . (CO1)
3. Write physical properties of HCl. (CO1)
4. Write the general properties of transition elements. (CO1)
5. Define effective atomic number and give the formula for the calculation of EAN. (CO1)
6. Write any three important postulates of Werner's theory of metal complex. (CO1)
7. Define oxidation number and calculate the oxidation number of 'S' in H_2SO_4. (CO1)
8. What is oxidation and reduction based on electronic concept? (CO1)
9. Write the characteristics of metals. (CO2)
10. Define a) Flux and b) Slag. (CO1)

Part-B

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

11. State the modern periodic law, periodicity and periodic properties . (CO1)

    or

    Discuss the salient features of different blocks of elements in the periodic table. (CO1)

12. Explain the preparation of NaOH by Castner-Kelner process. (CO3)

    Or

    Write the chemical properties and uses of $Ca(OH)_2$ (CO2)

13. Explain the preparation of NH_3 by Haber's process (CO3)

    Or

    Write the chemical and physical properties of Sulphur. (CO2)

14. Define Vapor pressure and determine vapor pressure by Ostwald's method. (CO1)

    Or

    Define Molarity, normality and Mole fraction and buffer solutions. (CO1)

15. Describe the Bronsted – Lowry theory concept of acids and bases with an example . (CO1)

    Or

    Write a note on the theory of indicators and define P^H. (CO1)

Part –C

Instructions: 1) Answer the question below. It carries 10 marks
2) Answer should be comprehensive and the criterion for valuation isthe content but not the length of the answer.

16. Write the chemical properties and uses of the following (CO2)

    a)HCl b) CO_2 c) Carbon

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CH ST-105 GENERAL MECHANICAL ENGINEERING

Course code	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
CH-ST-105	GENERAL MECHANICAL ENGINEERING	04	120	20	80

TIME SCHEDULE

S.No.	Chapter/Unit title	No.of periods	CO's Mapped
1	Measuring Instruments	15	C01,
2	Fitting and welding operations	30	C02
3	Friction and lubrications	15	C03
4	Properties of Steam &Steam Boilers	40	C04
5	Steam Nozzles and Turbines	20	C05
Total periods:		**120**	

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 &steam Boilers, Turbines.

CO NOS		**Course outcomes**
C01	CHST-105.1	Introduction/concepts related to measuring instruments
C02	CHST-105.2	Explain the construction & working of mechanical process of fitting and welding operations
C03	CHST-105.3	Observe, list and illustrate various types of friction and need for lubrication
C04	CHST-105.4	Differentiate the working of different properties of steam and different types of boilers and to produce steam and also problems on using steam tables.
C05	CHST-105.5	Summarise the uses of steam,by application of nozzles and turbines to generation of power.

LEARNING OUTCOMES:

1.0Measuring Instruments

1.1 Define Measurement, types of measurement
1.2 Explain the use of checking and measuring Instruments.
1.3 Draw Line diagrams of different measuring tools.
1.4 Explain the uses of each Instrument
1.5 Explain Least count of different measuring tools. Differentiate measuring and checking Instruments.

2.0 Fitting and welding operations

2.1 State different hand tools
2.2 List and explain different marking tools, cutting tools, striking tools, holding devices and miscellaneous tools
2.3 List different fitting operations
2.4 Differentiate&Explain Tapping and dieing, drilling and Reaming. cutting, filing, scraping
2.5 Identify the different types of hammers and their specifications
2.6 Define welding & advantages and limitations of welding
2.7 State the classification of welding processes.
2.8 State the working principles of Arc welding(sequential operations) &equipment and tools of arc welding
2.9 State the working principle of gas welding (Oxy-acetylene).
2.10 List different Gas welding equipment and explain each.
2.11 Explain Gas welding procedure (sequential operations)
2.12 Differentiate bare electrode and coated electrode
2.13 State the uses of flux in welding
2.14 Differentiate soldering and brazing
2.15 Explain various flame-cutting processes.& advantages and limitations of flame cutting.

3.0Friction and Lubrication

3.1 Explain the existence of friction in elements of power transmission
3.2 Explain the concept of friction
3.3 Explain the necessity of lubrication
3.4 State the classification of lubricants
3.5 Explain the properties of good lubricant
3.6 State different methods of lubrication

4.0 properties of Steam , Boilers

4.1 Define the various properties of steam
4.2 Compute the enthalpy, Internal energy and entropy of given pressure
4.3 Solve problems by Use of the steam tables.
4.4 Interpret the data in steam tables to calculate enthalpy.
4.5 Compute the above values using Mollier chart
4.6 Define Boiler
4.7 State the classification of Boiler
4.8 Differentiate fire tube and water tube boiler
4.9 Name different types of Boilers
4.10 Explain the construction and working of a simple Vertical Boiler with a line diagram
4.11 Explain Lancashire Boiler with a line diagram.
4.12 Explain the construction and working of a Babcock and Wilcox Boiler with a line diagram.
4.13 List the different Boiler mountings
4.14 State the specific use of each mounting.
4.15 List the different Boiler accessories.
4.16 State the functions of the boiler accessories.
4.17 Explain the Hydraulic testing of boiler tubes.

5.0 Steam Turbines & Nozzles

5.1 State the function of steam nozzle in a turbine.
5.2 Name different types of nozzles.
5.3 Define steam turbine
5.4 Explain the working of impulse turbine with a line diagram
5.5 Explain the working of a Reaction turbine with a line diagram
5.6 Explain the working of a Parason's Reaction Turbine with a line diagram

COURSE CONTENTS:

1. Measuring Instruments

Dividers:- Sizes and uses, Combination square, Bevel protractor, Universal level protractor, Sinebar, Universal surface guage, Engineers parallels, Slip gauges, Screw pitch guage, Vernier caliper, Vernier height guage – least count of the measuring tools – comparison between measuring and checking instruments.

2. Fitting and Welding

Fitting Operations Cutting, Filing, Scraping, thread cutting (Trapping and dieing) drilling and reaming (hand) – marking tools cutting tools, striking tools, holding devices and miscellaneous tools.

Welding Introduction and classification of welding processes (IS:8.12)- Advantages and limitations of welding principles of Arc welding-Equipments choice of Principles of gas welding (Oxyacetylene)-Equipment. Welding procedures (Arc & Gas) –soldering–various flame cutting processes. Advantages and limitations of flame cutting.

3. 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

4. Properties of steam & Boilers

Formation of steam under constant pressure, dryness fraction and degree of super heat, specific volume.Determination of enthalpy, Internal energy, Internal latent heat.Simple direct problems on the above using tables and charts. or rejected during the above processes.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. 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.

Steam Nozzles – function(Types-convergent, divergent and convergent and divergent) Steam turbines:a) Classification with examples:i) Impulse- Construction, working, comparison ii) Reaction-advantages – disadvantagesiii) Impulse – Reaction c) Governing of turbines:i) Throttle governing ii) Nozzle governing.

REFERENCE BOOKS :

1. Workshop Technology, Volume 1 by Raghu Vamsi.
2. Workshop Technology by Hazra Chowdary.
3. Thermal Engineering by R.S.Kurmi.
4. Heat Engines – Volume I&II by R.C.Patel.
5. Thermal Engineering I & II by Pakirappa

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-105.1	3	3	2					1		
CHST-105.2	3	2	3		2			2		2
CHST-105.3	2	2	1	2				1		
CHST-105.4	3	3	2					2	1	1
CHST-105.5	2									
Average	2.6	2.5	2	2	2			1.5	1	1.5

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media

Blue print with weight ages for Blooms category and questions for each chapter and COS mapped:

S.No.	Major Topics	No.Of Periods	Weightage Allocated	Marks Distribution of Weightage				Question wise Distribution of Weightage				Cos mapped
				R	U	AP	AN	R	U	AP	AN	
1	Measuring Instruments	15	11	3	-	8		1	-	1		C01
2	Fitting and Welding Operations	30	14	3	3	8		1	1	1	* **01**	C02
3	Friction and Lubrication	15	11	3	-	8		1	-	1	QUESTION	C03
4	Properties of Steam &Steam Boilers	40	20	3	6	8	*	1	2	1		C04
5	Steam Nozzles&Turbines	20	14	3	6	8	10 MARKS	1	2	1		C05
PART-C	One QUESTION 10 MARKS FROM 1 to 5 CHAPTERS										*	
	TOTAL	120	80	15	15	40	*	5	5	5	**1**	

Table specifying the scope of syllabus to be covered for unit tests:

Unit test	Learning outcomes to be covered
Unit test-I	From1.1to2.10
Unit test-II	From2.11 to 4.4
Unit test-III	From4.5 to5.5

C –20, CHST -105

UNIT TEST I

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A. P

DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

1ST YEAR

SUBJECT NAME: GENERAL MECHANICAL ENGINEERING

SUB CODE: CHST**– 105**

IME: 90 MINUTES **UNIT TEST I** **MAX.MARKS:40**

PART-A **16 MARKS**

Instructions: (1) Answer **all** questions.
(2) First question carries **four** marks of each one mark and remaining each question Carries **three** marks.

1. Answer the following:
   a) Bevel protractor is used for _____
   b) Hammers are made from forged steel (T/F).
   c) ---------- is used to check the holes.
   d) Oxy- Acetylene flame can be obtained in three various flames. (T/F)
2. Define welding and write its advantages and disadvantages.
3. List out the uses of fitting operations.
4. List out various measuring Instruments.
5. Write various types of Hammers.

PART-B **3×8=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) Draw and Explain Vernier calipers.
   or
   (b) Draw and explain the measurement of Sine bar.
   or
7. (a) Explain the working principle of Arc welding with a neat sketch.
   Or
   (b)Draw and explain any four fitting operations.

8. (a) Explain any five holding devices with a neat sketch.
   or
   (b) Draw and explain combination set.

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C –20, CHST -105

UNIT TEST II

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A. P

DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

IST YEAR

SUBJECT NAME: GENERAL MECHANICAL ENGINEERING

SUB CODE: CHST**– 105**

TIME: 90 MINUTES **UNIT TEST II** MAX.MARKS:40

PART-A **16 MARKS**

Instructions: (1) Answer **all** questions.
(2) First question carries **four** marks of each one mark and remaining each question Carries**three** marks.

1. Answer the following:
   a) Most of the Oxy-Acetylene welding is done with _____
   b) Dryness fraction is related with wet steam (T/F).
   c) Flux welding is used
   d) Good lubricant should have high boiling point and low freezing point. (T/F).
2. Define Arc welding.
3. Write the uses of flux in welding.
4. Define various properties of steam.
5. Write the necessity of lubrication.

PART-B **3×8=24MARKS**

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

6. (a) Explain the principle of Gas welding with a neat sketch.

   Or

   (b) Differentiate between Fire tube and Water tube boiler.
7. (a) Explain the properties of good lubricant.

   Or

   (b) List out the classification of lubricants and explain various methods of lubrication.
8. (a) Steam has quality of 0.8 dry and 25 bar determine enthalpy/kg entropy/kg internal energy/kg Specific volume.

   Or

   (b) Find the specific enthalpy and internal energy of wet steam at 18 bar and dryness fraction is 0.9.

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CHST -105
MODEL QUESTION PAPERS FOR UNIT TESTS
UNIT TEST III
STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A. P
DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
SUB CODE: CHST**– 105IST YEAR**
SUBJECT NAME: GENERAL MECHANICAL ENGINEERING

TIME: 90 MINUTES **UNIT TEST III** MAX.MARKS:40

PART-A **16 MARKS**

Instructions: (1) Answer **all** questions.
(2) First question carries **four** marks of each one mark and remaining each question Carries**three** marks.

1. Answer the following:
   a) The rate of flow of steam is in fired tube boiler _____
   b) La-Mont boiler is a high-pressure water tube type forced circulation boiler (T/F).
   c) Feed pump is used for pumping
   d) Nozzle Governing is more efficient than throttle Governing (T/F)
2. Define Boiler.
3. Write the uses of Boiler Mountings.
4. Define steam turbine and write its uses.
5. Write the functions of Boiler accessories.

PART-B **3×8=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 construction and working of a simple vertical Boiler with a line diagram.

   Or

   (b) Differentiate between Fire tube and Water tube boiler.

7. (a) List out different boiler mountings and Explain any four Boiler mountings with a neat sketch.

   Or

   (b) Explain the construction of a Babcock and Wilcox Boiler with a line diagram

8. (a) Explain the working of Impulse turbine with a neat sketch

   Or

   (b) Explain the working of a Reaction

***

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	Question	Bloom's category	Marks allocated	CO addressed
	PART – A (30 marks)			
1	Write the classification of Measuring Instruments	U	3	CO1
2	Define Fitting and write its uses	U	3	C02
3	State limitations and advantages of gas welding.	R	3	C02
4	Write about different types of Frictions .	U	3	C03
5	Define dryness fraction.	R	3	C04
6	Define Saturation Temperature	U	3	C03
7	How boiler mountings are different from boiler accessories?	R	3	C04
8	Write about Nozzle control.	U	3	C05
9	List out any three applications of steam nozzle.	U	3	C04
10	What do you understand by governing of steam turbines? State its importance.	Ap	3	C05
	PART–B (40 marks)			
11	Explain the principle of vernier calliper with a neat sketch (or) Write the constructional universal protractor with a neat sketch	Ap	8	CO1
12	Explain the process of Reaming with a neat sketch (or) Explain the principle of Arc welding with a neat sketch.	An	8	C02
13	Explain friction and write advantages and disadvantages (or) List out properties of lubricants and explain the functions of lubrication	Ap	8	C03
14	Find the specific volume enthalpy and internal energy of wet steam at 18bar and dryness fraction of 0.9. (or) Draw a neat sketch of Lancashire boiler and describe its working.	Ap	8	C04
15	List out different types of nozzles .write the condition for maximum discharge. (or) Explain the working principle of Impulse turbine with neat diagram.	An	8	C05
	PART –C (10 marks)			
16	Critically analyze different methods of welding with their areas of application.	Ap	10	C03

CH ST-106 SUGAR PRODUCTION TECHNOLOGY

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-106	Sugar production technology	4	120	20	80

S.NO.	Chapter/unit title	No. of periods	Cos mapped
1.	Definitions, White sugar manufacture process flow diagrams, milling	22	CO1
2.	Juice extraction and clarification	24	CO2
3	Evaporation, condensers	26	CO3
4.	Pan boiling, crystallization	26	CO4
5	Centrifugation, drying and grading	22	CO5
		120	

COURSE OBJECTIVES:	1. To familiarize the terms related to sugar industry and manufacture process flow diagrams for white sugar manufacture 2. To acquaintance of juice extraction from mills and clarification of the juice in the process 3. To familiarize the process of evaporation and condensation as per the norms 4. To familiarize pan boiling in pans and the process of crystallization **5.** To familiarize the centrifugation of massecuites, drying process of sugar and grading of sugar as per Indian standards

CO NOS		COURSE OUTCOMES
CO1	**CHST-106.1**	State definitions, analyse the flow diagram of white sugar manufacturing for sulphitation and carbonation plants
CO2	**CHST-106.2**	Illustrate extraction of juices, efficiency of mills, clarification of juice at various conditions
CO3	**CHST-106.3**	Explain the process of Evaporation under negative pressure, generating of vacuum by using different types condensers in the sugar industry.
CO4	**CHST-106.4**	Contrast various graining methods in the sugar pans and crystallization.
CO5	**CHST-106.5**	Explain the centrifugation process for separation of molasses, significance of drying of sugar, grading of sugar as per Indian standards.

LEARNING OUT COMES:

1.0 Definitions, White sugar manufacture process flow diagrams and milling

1.1 Define the terms :
1. Cane, 2.Primary juice, 3.Secondary juice, 4.Absolute juice, 5.Mixed juice, 6.Last mill juice, 7. Fiber, 8.Clear juice, 9.Sulphured juice, 10.Undiluted juice, 11.Muddy juice, 12. Syrup, 13. Massecuite, 14.Molasses, 15.Filter cake, 16.Press cake, 17.Imbibition, 18.Maceration, 19.Bagasse, 20.Light filtrate, 21.Heavy filtrate, 22.BIS Sugar

1.2 List out the chemicals used in the process of white sugar manufacture and explain their application at various stations in the plant.

1.3 Distinguish cane kicker, leveler and cutter

1.4 Write the advantages of using Shredder at mills

1.5 Distinguish between a crusher and mills.

1.6 List different types of mill grooving also state various factors contributing for good milling.

1.7 Draw 1. Simple imbibitions 2. compound imbibitions with a neat sketch.

1.8 List the factors influence the efficiency of evaporation.

1.9 Define diffusion process in sugar industry.

1.10 Draw flow diagram of double sulphitation process of sugar manufacturing.

1.11 Define the terms :1.A-Heavy molasses, 2. B-Heavy molasses, 3.Final molasses,4.Slurr

1.12 List various colouring matters present in the cane juices.

1.13 List various by- products in sugar industry.

1.14 State various types of fermentation.

2.0 Juice extraction and Clarification

2.1 Write the composition of various constituents present in the cane juice.

2.2 Write the physical and chemical properties of sucrose.

2.3 Explain the effect of organic acids and in-organic non sugars presence in clarification.

2.4 Write the objectives/general requirements of clarification.

2.5 Explain the bleaching action of sugar cane juice.

2.6 Explain the juice heating and its importance.

2.7 Explain auto PH Control of juices.

2.8 Write the role of P_2O_5/ SO_2in clarification.

2.9 Write a short note on defecation / sulphitation process.

2.10 State the merits and demerits of sulphitation over a carbonation process.

2.11 Describe the working and operation of a juice heater.

2.12 Describe the working and operation of a SO_2 burner, milk of lime slacker.

2.13 Describe the working and operation of a Dorr-444, Grever clarifier.

2.14 Distinguish between Dorr-444 and Grever clarifier.

2.15 Explain S.R.T (Short retention time clarifier)

3.0 Evaporation, Condensers

3.1 State Rillieux principles with its limitation.

3.2 Explain the advantages of multiple effect evaporation.

3.3 Draw a line sketch of a quadruple effect evaporator.

3.4 Write about thermo compression in evaporators.

3.5 Write various features of evaporator design as applied to the multiple effect evaporators.

3.6 Write the various factors which influence the efficiency of evaporation.

3.7 Generalize the intensity of incrustation/scale formation on heating surface of evaporator is reduced.

3.8 Explain the general methods of scales/incrustations removal over the heating surface of an evaporator.

3.9 Write the condensate removal.

3.10 Define Entrainment; Draw various types of entrainment catchers used in sugar industry.
3.11 Explain the working of vapour cell or pre evaporator.
3.12 Write various types of condensate removal system.
3.13 State condensation process and write the various types of condensers.
3.14 Explain the working of condensers in view of extracting air and water.
3.15 Illustrate the working of multijet and barometric condensers with a diagram.

4.0 Pan boiling and Crystallization

4.1 Explain the significance of (S/V) in pans.
4.2 Write the principles of pan boiling for three boiling scheme.
4.3 Write the essential requirements for good pan boiling.
4.4 Illustrate three massecuite boiling scheme for white sugar manufacture.
4.5 Illustrate four massecuite boiling scheme for white sugar manufacture.
4.6 Define coefficient of super saturation of sugar solutions.
4.7 Distinguish various graining methods.
4.8 Illustrate various graining methods.
4.9 Describe formation of false grain and conglomerates in pan boiling their effects and prevention.
4.10 Write the causes of false grain formation, their notification and prevention methods.
4.11 State the conditions influence the character of grain formation.
4.12 Explain the factors which influence rate of crystallization.
4.13 Describe molasses exhaustibility.
4.14 Write a short note on movement water and circulation in pans.
4.15 Describe the operation of different types of crystallizers.

5.0 Centrifugation, drying and grading

5.1 Write the centrifugal operation in sugar industry.
5.2 Describe the centrifugal liners.
5.3 Explaining washing and steaming in centrifugals.
5.4 Explain double curing operation at centrifugals.
5.5 Write the advantages and disadvantages of continuous centrifugal machines.
5.6 Write the advantages of using fully automatic centrifugal machines.
5.7 Explain the advantages of using high speed centrifugals.
5.8 Explain drying and grading operations at sugar drier hall.
5.9 Write the importance of drying sugar in keeping quality.
5.10 Explain the drying of sugar in centrifugals.
5.11 Write the different grades of sugar by sieving.
5.12 Write the types of graders and their function.
5.13 State safety factor for white sugar.
5.14 Write the specifications of sugar bagging gunnies as per statutory control.
5.15 Explain the importance of stacking of sugar bags in the Godown.
5.16 Explain the construction of sugar go-down.

COURSE CONTENTS :

1. Definitions, White sugar manufacture process flow diagrams and milling:

Define the terms : Cane, Primary juice, Secondary juice, Absolute juice, Mixed juice, Last mill juice, Fiber, Clear juice, Sulphured juice, Undiluted juice, Muddy juice, Syrup, Massecuite, Molasses, Filter cake, Press cake, Imbibition, Maceration, Bagasse, Light filtrate, Heavy filtrate, BIS Sugar,A-Heavy molasses, B-Heavy molasses, Final molasses, Slurry.

Chemicals used in the process of white sugar manufacture,Various units in sugar industry, Distinguish cane kicker, leveler and cutter, Advantages of using Shredder, Crusher and mills,

Different types of mill grooving ,factors contributing for good milling, Role of strainers, Simple imbibition, Compound imbibition, Advantages of hot imbibitions, Efficiency of evaporation.

Diffusion, Flow diagram of single and double Sulphitation process, Open chain and ring structure of sucrose, glucose and fructose, Colouring matters in juices, By- products in sugar industry,Fermentation.

2. Juice extraction and Clarification

Constituents present in the cane juice, Physical and chemical properties of sucrose,

Organic acids and in-organic non sugars role in clarification, Objectives of clarification,

General requirements of good clarification, Bleaching action of sugar cane juice, Juice heating and its importance, Influence of lime and heat on clarification, Effect of liming in cold and hot conditions, Role of P_2O_5, SO_2, in clarification, Defecation process,Sulphitation, carbonation process, Merits and demerits of sulphitation, carbonation process,Working and operation of a juice heater, SO_2 burner, milk of lime slacker, Dorr-444, Grever clarifier,

4. Evaporation, Condensers

Rillieux first,second,third principles with its limitation, Advantages of multiple effect evaporation,Line sketch of a quadruple effect evaporator. Thermo compression in evaporators,Various features of evaporator design applied to the multiple effect evaporators,Factors which influence the efficiency of evaporation,Scale constituents present in the different bodies of evaporators,Write the origin of different scale forming constituents in evaporator scale,Methods of scales/incrustations removal over the heating surface of an evaporator, Condensate removal, Entrainment, entrainment catchers used in sugar industry, Vapour cell or pre evaporator, Condensate removal system, Types of condensers, Construction and working of Multijet condenser, barometric condensers.

5. Pan boiling and Crystallization

Types of pans, Significance of (S/V) in pans, Principles of pan boiling for three boiling scheme,Essential requirements for good pan boiling, Advantages and disadvantages of two massecuite boiling scheme, Three, four massecuite boiling scheme for white sugar manufacture, Coefficient of super saturation, Various graining methods, Causes of false grain formation andconglomerates their preventive methods, Factors effecting crystallization, Conditions influence the character of grain formation, Rate of crystallization, Molasses exhaustibility, Movement water in pans, Advantage of mechanical circulators in pans, Different types of crystallizers.

6. Centrifugation, drying and grading

Centrifugal operation in sugar industry, Centrifugal liners, Washing and steaming in centrifugals, Single, double, Continuous curing/purging, Advantages and disadvantages of continuous centrifugal machines, Advantages of fully automatic centrifugal machines,

Advantages of using high speed centrifugals, Drying and grading operations at sugar drier hall, Significance of drying sugar in keeping quality, Rotary drier,Drying of sugar in centrifugals, Bucket type elevators, Grades of sugar by sieving, Types of graders and their function,Vibrating screen, State safety factor for white sugar, Specifications of sugar bagging gunnies as per statutory control, Stacking of sugar bags in the Go-down, Molasses pits.

REFERENCE BOOKS

S.No	Title of the book	Name of the author
1	Hand book of Cane sugar technology	R.B.L Mathur
2	Cane sugar manufacture in india	D.P.Kulakarni
3	Hand book of sugar cane Engineering	Emile.Hugot
4	Technology in sugar cane growing	M.Lakshmikantam
5	Principles of Sugar technology Clarification- Volume-1 (Clarification)	Pieter Honig
6	Principles of Sugar technology Clarification- Volume-2 (Crystallization)	Pieter Honig
7	Principles of Sugar technology Clarification- Volume-3 (Evaporation &Centrifugation)	Pieter Honig
8	Introduction to Sugar cane technology	Elsevier
9	Training manual for Sugar mills	Mangal Singh
10	Introduction to Cane Sugar Technology	G.H.Jenkings
11	Cane Sugar Hand book	Spencer Meade
12	Hand book for cane Sugar manufacturers	
13	Sugar cane cultivation	Lucky James
14	The Sugar hand book	David w Blymyer
15	Cane Sugar	Noel Deerr
16	Sugar House notes and tables	Noel Deerr
17	Sugar cane processing and By products of molasses	H.Panda
18	Chemical control in sugar factories	Nabu press
19	Production of lump Sugar-Gur	Ajith k Ghosh, Ashok K Srivatsava , V.P.Agnihotri
20	Cane Sugar (A text book on the Agriculture of the Sugar Cane)	Noel Deerr, Norman Rodger
21	Factors Determining the Keeping Quality of Cane Sugar	Kopeloff Nicholas
22	Methods Of Chemical Control In Cane Sugar Factories	H. C. Prinsen Geerligs
23	The Deterioration of Cane Sugar in Storage	William Ludwell Owen
25	Chinese Sugar	Nabu Press
26	Processing and Storage of Sugarcane Juice	Thakar Harsh

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-106.1	3	3	2					2		
CHST-106.2	3	2	3		3			2	3	2
CHST-106.3	2	2	1	2				3		
CHST-106.4	3	3	2					2	2	2
CHST-106.5	2							3		
Average	2.6	2.5	2	2	3			2.4	2.5	2

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

MODEL BLUE PRINT WITH WEIGHT AGES FOR BLOOMS CATEGORY AND QUESTIONS FOR CHAPTER AND Cos MAPPED EACH.

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.	Definitions, White sugar manufacture process flow diagrams, milling	22	14	6	8			2	1			C01
2.	Juice extraction and clarification	24	14	6	8			2	1			C02
3.	Evaporation, condensers	26	14	6	8		10*	2	1		1*	C03
4.	Pan boiling, crystallization	26	14	6	8			2	1			C04
5.	Centrifugation, drying and grading	22	14	6	8			2	1			C05
One question from Part-C carries 10 Marks from 1 to 5 chapters			10									
Total		**120**	**80**	**30**	**40**		**10**	**10**	**5**		**1**	

Table specifying the scope of syllabus to be covered for unit tests:

Unit test	**Learning outcomes to be covered**
Unit test-I	From1.1to2.10
Unit test-II	From2.11 to 3.15
Unit test-III	From4.1 to5.16

MODEL QUESTION PAPERS FOR UNIT TESTS
UNIT TEST
C –20, CHST -106
State Board of Technical Education and Training, A. P
Diploma in Chemical Engineering (Sugar Technology)
First year
Subject Name: Sugar Production Technology
Sub Code:CHST - 106

ime : 90 minutes **UNIT TEST** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following

   a) write the principle clarificant used in sugar industry ---------

   b) Final molasses purity is 40 (T/F)

   c) purity of syrup is ----------

   d)$NH_3$is used in clarification (T/F)

2. State the role of P_2O_5 in clarification
3. Write the various by products from sugar industry
4. State the rotational speed of a clarifier
5. Define massecuite

Part-B **3×8=24**

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

6. (a) Explain the advantages of double sulphitation

   or

   (b) Draw the flow diagram of double sulphitation sugar with neat sketch

7. (a) Explain various objects of good clarification

   or

   (b) Explain significance of juice heating.

8. (a) Explain the advantages of using vertical type of juice heater

   or

   (b) Explain various chemicals used in sugar industry.

***

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	Question	Marks allocated	Blooms category	CO adressed
		PART-A		
1.	List various By-products in sugar industry	3	remembering	CO1
2.	Write the role of P_2O_5 in clarification	3	Remembering	CO2
3.	Define Entrainment	3	Remembering	CO3
4.	State the objectives of clarification	3	Remembering	CO2
5.	State Rillieux first principle with limitation	3	Remembering	CO3
6.	Write S/V in pans	3	Remembering	CO4
7.	State Coefficient of super saturation	3	understanding	C04
8.	Define safety factor for sugar	3	Remembering	CO5
9.	Write the importance of steaming in centrifugal	3	Understanding	CO5
10.	Define 'massecuite'	3	Remembering	CO1
		PART-B		
11	Explain compound imbibition with a neat sketch OR Differentiate between Kicker and leveller	8	understanding	C01
12	Explain chemical properties of sucrose OR Explain general requirements of good clarification.	8	understanding	C02
13	Explain Thermo compression in evaporators OR Explain the working of Multijet condenser	8	understanding	C03
14	Draw three massecuite boiling scheme for white sugar manufacture OR Describe the Molasses exhaustibility	8	applying	C04
15	Explain the merits and demerits of using continuous centrifugal machines OR Explain the working of vibratory screens	8	understanding	C05
		Part - C		
16	Draw the flow diagram of sugar manufacturing process for double sulphitation method	10	Analyzing	CO1

CH-ST-107 ENGINEERING DRAWING

(COMMON WITH ALL BRANCHES)

Course code	Course title	No. of periods/week	Total no. of periods	Marks for FA	Marks for SA
CH-ST-107	**ENGINEERING DRAWING**	06	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 Engineering Drawing	--	01	-	-	-
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**	CHST-107.1	Practice the use of engineering drawing instruments
	CO2	CHST-107.2	Familiarise with the conventions to be followed in engineering drawing as per BIS
	CO3	CHST-107.3	Construct the i) basic geometrical constructions ii) engineering curves
	CO4	CHST-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	CHST-107.5	Visualise and draw the isometric views of machine components
	CO6	CHST-107.6	Draw the developments of surfaces of regular solids and use them to make the components used in daily life

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.

PO-CO Mapping

Course Code : CHST107	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

C-20-CHST-107
BOARD DIPLOMA EXAMINATIONS
MODEL QUESTION PAPER
DCHST – I-YEAR

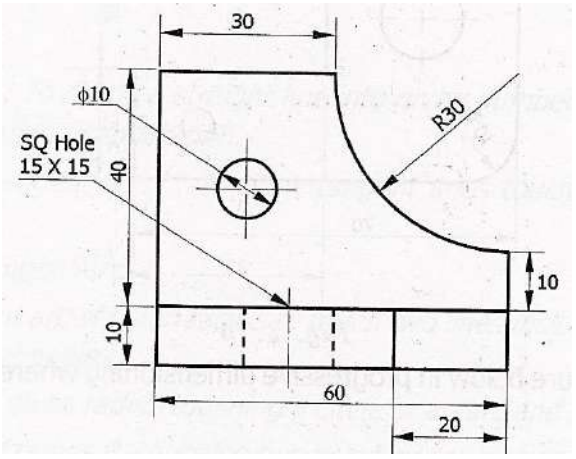
CHST-107 **ENGINEERING DRAWING**

Instructions: **1. All the dimensions are in mm**
2. Use first angle projections only
3. Due weitage 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

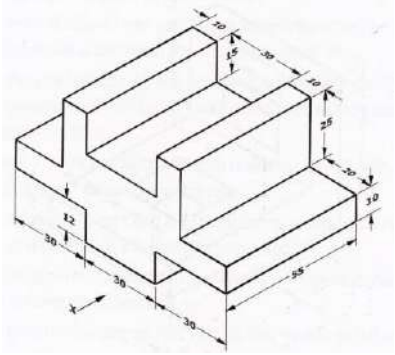
PART – B **10 X 04 = 40**

Instructions:1. Answer any FOUR of the following questions
2. Each question carries TEN marks

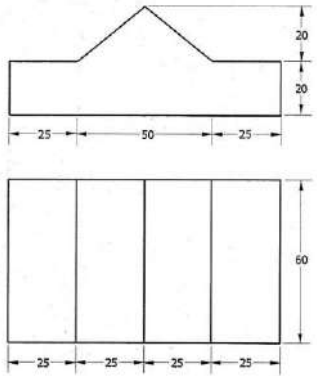
05. Draw the involute of a circle of diameter 30 mm and also draw a tangent to the curve at a distance of 60 mm from the centre of the circle.
06. A right circular cone of height 80 mm and base radius 60 mm is resting in the H.P. on one of its generators and its axis is parallel to V.P. Draw the projections 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



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CH ST-108 WORKSHOP PRACTICE

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CH-ST-108	Workshop practice	6	180	40	60

S.No.	Major Topics	No. of periods
1.	Carpentry	48
2.	Fitting and welding	72
3.	Basic machine operations	44
4.	Plumbing	16
TOTAL		**180**

Course title :CHST-108 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/excercises	
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 recomendations
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

Following list of experiments are to be made by every student in the workshop

1. CARPENTRY

1.1 Exercises on planning, sawing and chiseling
1.2 Prepare a half lap joint
1.3 Prepare a Dovetail joint.
1.4 Prepare a Mortise joint.
1.5 Prepare a 20 cm X 15 cm Teakwood switch board with hinges and bottom hook.
1.6 Fix the laminate sheet to the above box and cut suitable holes to mount tone flush type switch, socket.

2. FITTING and WELDING

2.1 Exercises to cut a metal conduit, G.I. Pipe and solid rod using hack saw.
2.2 3 & 4 Thread cutting of G.I.pipe, metal conduit and solid rod using Die set.
2.3 5. & 6. Internal thread cutting using Tap set and cleaning the threads using reamers and make a hexagonal nut from a round rod.
2.4 Prepare a job and to make a lap joint and finish it using grinder.
2.5 Prepare a job and make a butt joint and finish it with grinder.
2.6 Prepare the job and make ***'T'*** joint.

3. MACHINE SHOP

3.1 Exercise on turn the given rod to get three different diameters using lathe.
3.2 Make a bolt and cut threads using lathe.
3.3 Cut the threads to G.I. Pipe using lathe.
3.4 Prepare a centre punch and knurl its head.
3.5 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
4.1. Types of pipe joints .
4.2. Symbols
4.3. Materials used for pipes
4.4. Assembling, Threading , Joining of pipes.
4.5. Different fittings such as cross, L, T etc.,

COURSE CONTENT

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.

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 calipers, 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

PHYSICS LAB PRACTICE

(C-20 CURRIUCULUM COMMON TO ALL BRANCHES)

Subject Code	Subject Title	Periods per week	Total periods per year
CHST-109 A	Physics Laboratory	03	45

TIMESCHEDULE

S.No	Name of the Experiment	No.of Periods
1.	Hands on practice on Vernier Calipers	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 calipers 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 wirel 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 (No of Periods)	Competencies	Key competencies
1. Hands on practice on Vernier Calipers(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 • Compare the ratios	• 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-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-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 resonanting lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonanting 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 axial lines

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 :

D.	Writing Aim, Apparatus, Formula, Graph, Precautions carries	10 (Ten) Marks
E.	For Drawing the table, taking Readings, Calculation work, Drawing the graph, finding result carries	15 (Fifteen) Marks
F.	Viva Voice	05 (Five) Marks
	Total	**30 (Thirty) Marks**

➢ **Course outcomes**

Course Outcomes	CO1	Experiments with Vernier calipers, 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
(C-20 curriculum common to all Branches)

Subject Code	Subject Title	Periods per week	Total periods per year
CHST -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 CHST-109B	Chemistry Laboratory No of Cos;5				No Of periods 45
POs	Mapped with CO No	CO periods addressing PO in Col 1 NO	%	Level 1,2,3	remarks
PO1	CO1,CO2,CO3, CO4,CO5	12	26.66	2	>40% level 3 (highly addressed) 25% to 40% level2(moderately addressed 5% to 25% level1 (Low addressed < 5%(not addressed)
PO2	CO1,CO2,CO3, CO4,CO5	9	20	1	
PO3					
PO4	CO1,CO2,CO3, CO4,CO5	12	26.66	2	
PO5	CO2,CO3, CO4,CO5	12	26.66	2	
PO6					
PO7					

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 .of Periods	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 ▪ 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 standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations
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)		
Determination of pH using pH meter (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
Determination of conductivity of water and adjusting ionic strength to required level (03)		
Determination of turbidity of water (03)		
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**

CHST-110- Computer fundamentals Lab practice

Course code	Course Title	No. of Periods/Weeks	Total No. of periods	Marks for FA	Marks for SA
CHST-110	Computer Fundamentals Lab practice	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	CHST -110.1	Identify hardware and software components
	CO2	CHST -110.2	Prepare documents with given specifications using word processing software
	CO3	CHST -110.3	Use Spread sheet software to make calculation and to draw various graphs / charts.
	CO4	CHST -110.4	Use Power point software to develop effective presentation for a given theme or topic.
	CO5	CHST -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
CHST -110.1	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CHST -110.2	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CHST -110.3	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CHST -110.4	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**
CHST -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

1. 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 colors 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	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon

		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	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 spread sheet and familiarize with MS Excel 2007 layout like MS office Button-	a. Familiarize with excel layout and use b. Use various

		b. Use Quick Access Toolbar-Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar	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	Create 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	Insert Text and Objects Use 3d features

		d. Format pictures e. Insert shapes and word art f. Use 3d features g. Arrange objects	
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	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

		g. Saving h. Printing presentation (a) Slides (b) Hand-out	
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	*Able to prepare cover page for the*

		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	*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: CHST-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:CHST -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 totaling 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 spread sheet to calculate Cumulative monthly attendance for a period of Three months.

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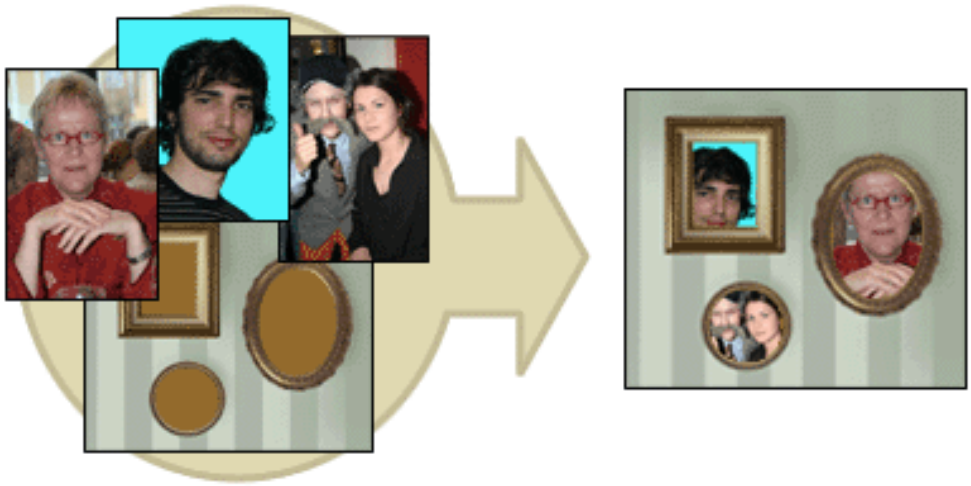
I YEAR INTERNAL LAB EXAMINATION
UNIT TEST - III
MODEL QUESTION PAPER
COMPUTER FUNDAMENTALS LAB

SCHEME: C-20 **SUBJ CODE: CHST -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 **SUB CODE:CHST-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

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
III SEMESTER
SCHEME OF INSTRUCTIONS AND EXAMINATION

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practical's		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
CH-ST-301	Engineering Mathematics-II	4	-	60	3	20	80	100
CH-ST-302	Physical and Organic chemistry	5	-	75	3	20	80	100
CH-ST-303	General Chemical Technology	6	-	90	3	20	80	100
CH-ST-304	Mass and Energy Balances	6	-	90	3	20	80	100
CH-ST-305	Fluid Mechanics and Heat Transfer	6	-	90	3	20	80	100
PRACTICAL SUBJECTS								
CH-ST-306	Physical and Organic chemistryLaboratory	-	3	45	3	40	60	100
CH-ST-307	Fluid MechanicsLaboratory	-	6	90	3	40	60	100
CH-ST-308	Heat Transfer Laboratory	-	3	45	3	40	60	100
CH-ST-309	General Chemical Technology Laboratory	-	3	45	3	40	60	100
	Total	**27**	**15**	**630**	**-**	**260**	**640**	**900**

Note: CH-ST-301, common to ALL BRANCHES

C-20

ENGINEERING MATHEMATICS-II

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
CHST -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 $\int kudx$ 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.

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:

2. 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.

3.

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	Weight age allotted	Marks wise distribution of weight age				Question wise distribution of weight age				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

C –20, CHST-301

Unit Test I

State Board of Technical Education and Training, A. P

First Year

Subject Name: Engineering Mathematics-II

Sub Code: CHST-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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C –20, CHST-301
Unit Test II
State Board of Technical Education and Training, A. P
First Year
Subject Name: Engineering Mathematics-II
Sub Code: CHST-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 CHST-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 CHST- 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 $\int_{0}^{1}\frac{\sec^{2}x}{\left(1+\tan x\right)^{2}}dx.$ **CO2**

Or

B) Evaluate $\int_{0}^{\frac{\pi}{2}}\log\left(1+\tan\theta\right)d\theta.$ **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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CH ST-302 PHYSICAL AND ORGANIC CHEMISTRY

Course code	Course title	No.of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-302	PHYSICAL AND ORGANIC CHEMISTRY	5	75	20	80

S.NO.	Chapter/unit title	No. of periods	Cos mapped
1.	Thermodynamics	10	CO1
2.	Chemical equilibrium and Kinetics	15	CO2
3	Solutions, Colloids and emulsions	18	CO3
4.	Chemistry of Aliphatic compounds	18	CO4
5	Chemistry of Aromatic compounds	14	CO5
I		**75**	

COURSE OBJECTIVES:	1. To familiarize with the knowledge of thermo chemistry, chemical equilibrium, Kinetics,solutions, colloids and emulsions. 2. To familiarize with the knowledge of classification, nomenclature, isomerism, preparation and properties of organic compounds. **3.** To understand andreinforce the concept in various chemical processes for better production results.

Co nos		COURSE OUTCOMES
CO1	CHST-302.1	**Explain Basic concepts of thermochemistry, Solve problems in thermochemistry.**
CO2	CHST-302.2	**Explain the principles of Chemical equilibrium and Kinetics**
CO3	CHST-302.3	**Explain the various concentration methods and preparation and properties of colloids and emulsions**
CO4	CHST-302.4	**Explain the preparation methods of aliphatic and aromatic hydrocarbons**
CO5	CHST-302.5	**List the properties of aliphatic and aromatic hydrocarbons**

LEARNING OUTCOMES

1.0 Thermodynamics.

1.1 Explain Introduction to thermo chemistry.
1.2 Define 1st law of thermo dynamics and know the equations for "E", "Q", "W" and "H".
1.3 Define Internal energy and Enthalpy.
1.4 Explain exothermic and Endothermic reactions with examples.
1.5 Types of heats of reactions.
i) Heat of formation ii) Heat of combustion
iii) Heat of neutralization iv) Heat of solution.

2.0 Understand chemical equilibrium and Kinetics

2.1 Define chemical Equilibrium:
2.2 Explain Reversible and irreversible reactions – examples. Homogeneous and heterogeneous Equilibrium – examples.
2.3 Explain chemical equilibrium and its characteristics.
2.4 Explain law of Mass Action
2.5 Explain law of mass action to a general reaction i.e. $mA + nB \leftrightarrow pC + qD$
2.6 Explain the effect of (i) concentration (ii) pressure (iii) temperature and (iv) catalyst on chemical equilibrium.
2.7 Explain Lechatelier's principle –
2.8 Explain Lechatlier's principle to
(i) manufacture of NH_3 by Haber's process (ii) FormationSO_3in contact process.

3**.0 Define a solution, Colloid and emulsion.**

3.1 Explain the various methods of expressing concentrations.
3.2 Define dilute solution and Raoults law.
3.3 Define vapour pressure and determine by Stwards method.
3.4 Explain the elevation of boiling point by Control's method.
3.5 Explain the depression of freezing point.
3.6 Explain the nature and types of colloids and their preparation and properties.
3.7 Explain the nature and types of emulsions and their preparation and properties.
3.8 Explain the properties and applications of emulsifier.

4.0 Chemistry of Aliphatic Compounds-I.

4.1 Explain Introduction to organic chemistry. Unique characteristics of carbon, hybridization of carbon in organic compounds i.e. sp^3, sp^2 and sp. Classification of organic compounds, IUPAC nomenclature of organic compounds, homologous series and characteristics. Explain isomerism,Structural isomerism and Stereo isomerism (Geometrical and optical) with examples.
4.2 Explain the preparation of Alkanes: Preparation of Methane and Ethane by
(i) Decarboxylation (ii) Wurtz reaction (Ethane only) (iii) by reduction of Alkyl Halides.
Explain Properties of alkanes: (i) Halogenation (ii) Nitration (iii) Combustion of methane and ethane.
4.3. 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.Explain the Properties of Ethylene: Reaction with (i) H_2, (ii) Br_2/CCl_4 (iii) Ozone (iv)Oxidation by $KMnO_4$.
4.4 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. 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% $HgSO_4$. List the uses of ethane, methane, ethylene and acetylene.

Chemistry of Aliphatic Compounds-II.

4.5 Explain ethyl chloride preparation from (i) Grove's process (ii) PCl_3 (iii) Ethylene and properties of EthylChloride - Reactionwith (i) KOH (ii) KCN (iii) AgCN (iv) Wurtz Reaction

4.6 Explain Chloroforme préparation from (i) Ethylalcohol (ii) Methane (iii) CCl_4 and Properties of Chloroform (i) Carbyl amine or isocyanide test (iii) oxidation (iv) HNO_3

4.7. Alcohols:

Explain the 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

4.8 Explain the synthesis and properties of aliphatic compounds, alkanes, alkenes, alkynes, Alcohols

5.0 Describe the chemistry of Aromatic compounds.

5.1 Explain aromaticity and Huckle's rule.

5.2 Explain the nomenclature of aromatic compounds.

5.3 Explain the preparation, properties and uses of Benzene.

5.4 Explain the preparation, properties and uses of Phenol

5.5 Explain the preparation, properties and uses of Toulene

COURSE CONTENTS :

1. **Thermodynamics:**
   Introduction – Statement of 1st law – Equation for E, Q, W and H, simple problems – Statement of second law – Sample problems on the equation E = Q – W; H = E + PV; A = E – TS.
   Thermo chemistry exothermic and endothermic reactions – Heat of formation, combustion and neutralization, Hess law – Calorific value of fuel gases.
2. **Chemical equilibrium and Kinetics:**
   Law of mass action – Equilibrium constant – Influence of concentration pressure, temperature and catalyst – Lechatitiers and Borium principles – Application to synthesis ammonia and sulphur dioxide.
   Order of a reaction – Reaction rate molecular reaction acid hydrolysis and ester inversion of cane sugar.
3. **Solutions, Colloids and emulsion:**
   Methods of expressing concentrations – Dilute solutions – Raoults raw – Vapor pressure – Determination by ostwald method – Elevation of boiling point (Control's method) – Depression of freezing point – Acid – Base – Salt, modern concepts – pH value – Buffer's solution and its applications.
   Nature and types of colloids – Preparations and properties of colloids – Emulsions and emulsifiers – Their properties and preparation.
4. **Chemistry of aliphatic compounds :**
   a) Alkanes, b) Alkenes, c) Alkynes, d) Halo alkanes, e) Alcohols
5. **Chemistry of aromatic compounds:**
   a) Benzene, b) Phenol, c) Toluene.

REFERENCE BOOKS:

S.No.	Book Title	Author	Publications
1	Essentials of Physical Chemistry	Bahl&Tuli	S. Chand &CoNewDelhi
2	Intermediate Chemistry	Vol, 1&2	Telugu Academy(or) Vikram Series
3	Text Book of Organic Chemistry	Arun Bahl& B.S. Bahl,	S. Chand & Co,NewDelhi.

CO-PO/PSO MATRIX

CO No	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-302.1	3	3	2					1		
CHST-302.2	3	2	3		3			2	2	2
CHST-302.3	2	2	1	2				3		
CHST-302.4	3	3	2		2			2	2	1
CHST-302.5	3			1				2		
Average	**2.8**	**2.5**	**2**	**1.5**	**2.5**			**2**	**2**	**1.5**

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

MODEL BLUE PRINT WITH WEIGHT AGES 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.	Thermo Chemistry	10	11	3		8			1		1			**CO1**
2.	Chemical Equilibrium	15	14	3	3	8			1	1	1			**CO2**
3.	Solutions colloids and Emulsions	18	14	3	3	8			1	1	1			**CO3**
4.	Chemistry of Aliphatic compounds	18	17	6	3	8	10*		2	1	1			**CO4**
5.	Chemistry of Aromatic compounds	14	14	3	3	8			1	1	1			**CO5**
***ONE QUESTION IN PART C OF 10 MARKS FROM CHAPTERS 1 TO 5**			10									1*		
Total		**75**	**80**	**24**	**16**	**40**	**10***		**10**		**5**	**1***		

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning out comes to be covered
Unit Test-I	**From 1.1 – 3.5**
Unit Test-II	**From 3.6—5.5**

C –20, CHST -302

MODEL QUESTION PAPERS FOR UNIT TESTS

UNIT TEST I

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

III Semester

Subject Name: **PHYSICAL AND ORGANIC CHEMISTRY**

Sub Code: CHST**–302**

Time : 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

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

(2) First question carries **four** marks of each one mark and remaining each question carries **three** marks

1. (a) Entropy depends on _____

   (b)In an exothermic reversible reaction increases in temperature shifts the equilibrium to

   (c) Reactant side (d) Product side (e) Remains unchanged (f) none

   (g) When heat is applied to a system in equilibrium, the reaction absorbs heat is favoured. **T/F**

   (h) Write the units of Molarity.

2. Define heat of neutralization**.**
3. What are homogeneous and heterogeneous equilibrium .Give examples to each?
4. Write any three differences between reversible and irreversible reaction.
5. Define Normality with formula.

Part-B **Marks 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. State first law of thermodynamics.Derive its mathematical notation.

   (or)

   State and explain Hess's law constant heat summation.

7. State Lechatlier's principle. Discuss the application of Lechatlier's principle for the industrial synthesis of Ammonia.

   (or)

   Define first order reaction. Derive rate equation for first order reaction.

8. Define and derive raoult's law. Give its Limitations.

   (or)

   Elevation of boiling point of non volatile solution.its relation to molar mass of the solute.

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UNIT TEST II

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

III Semester

Subject Name: **PHYSICAL AND ORGANIC CHEMISTRY**

Sub Code: CHST**–302**

Time : 90 minutes **Unit Test II** **Max.Marks:40**

Part-A **16Marks**

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

1. **Answer the following**
   a) What is the best description of Blood
   b) The Scattering of light by coarse and colloidal dispersed system is known as
   c) Alkenes have low boiling point and insoluble in water.
   d) What is the solubility of Benzene.
2. Write any two preparation methods of Alkanes.
3. Write any two chemical properties of Alcohols.
4. Give any three uses of Benzene.
5. Write any three physical properties of phenols.

Part-B **3×8=24**

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

6. Explain the Properties of colliods
   (or)
   Write the preparation methods of colloids.
7. Write any four preparation methods of Alkenes
   (or)
   Write any four chemical properties of of Alkynes
8. Write any four preparation methods of Phenols
   (or)
   Write any four preparation methods ofToulene.

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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)

Model Question paper

Q.No	Question	Blooms category	Marks allocated	CO adressed
Part-A(30 marks)				
1.	Define (a)heat of formation (b) heat of combustion.	remembering	3	CO1
2.	Explain first law of thermodynamics.	understanding	3	CO2
3.	Explain law of mass action	understanding	3	CO1
4.	Explain reversible and irreversible reactions withexamples	Understanding	3	CO3
5.	Define Gold number .	Remembering	3	CO3
6.	Define emulsification and emulsifier.	understanding	3	CO4
7.	Explain the reaction of acetylene with H_2/Ni, andBr_2/CCl_4	understanding	3	CO4
8.	Explain the classification of alcohols, give an example to each	remembering	3	CO5
9.	Explain the unique character of carbon.	Remembering	3	CO3
10.	Write any three uses of Benzene	Remembering	3	CO5
Part-B(40 marks)				
11	State first law of thermodynamics Derive its mathematical notation. (OR) (a)Define Endothermic and Exothermic reactions with examples (b)State and explain Hess law of constant heat summation.	remembering	8	**CO1**
12	Explain Lechatlier's principle for Haber's process (or) Explain the effect of temperature, pressure and concentration on equilibrium	understanding	8	**CO2**
13	Explain the methods to express Concentration of	understanding	8	**CO3**

	solutions (OR) Write the preparation methods of colloids			
14	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.	understanding	8	**CO4**
15	Explain two preparation methods and two chemical properties of benzene (or) Explain two preparation methods and two chemical properties of nitro benzene	understanding	8	**CO5**
Part-C (10 marks)				
16	(a)Explain Sabatier Sanderson reaction (b) ANALYES the alkanes reactions with Grignard reagent and give chemical reactions	analyzing	10	CO4

CHST-303 GENERAL CHEMICAL TECHNOLOGY

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-303	GENERAL CHEMICAL TECHNOLOGY	6	90	20	80

TIME SCHEDULE

S.No.	Chapter/unit title	No of Periods	CO's mapped
1.	Basic industrial chemicals	16	CO1
2.	Water and Fertilizer industry	18	CO2
3.	Industrial gases and Inorganic products	16	CO3
4.	Coal chemicals, Petroleum refining and Petrochemical industry	22	CO4
5.	Oils, fats, soap, Pulp, Paper, Polymers, Plastics and Rubbers	18	CO5
Total		90	

COURSE OBJECTIVES:	1. Illustrate the different chemical products manufacturing and its uses 2. Explain the use of unit operations in the manufacturing processes. 3. To know the importance and uses of non-renewable sources like coal and petrol. 4. To understand and reinforce the unit operations concepts in various chemical processes for better production results.

CO NOS		COURSE OUTCOMES
CO1	CHST-303.1	Illustrate the various basic industrial chemicals
CO2	CHST-303.2	Explain the various methods of water purification and manufacturing process of fertilizers
CO3	CHST-303.3	Describe the physical and chemical properties of various inorganic products
CO4	CHST-303.4	Explain the importance and uses of non-renewable sources
CO5	CHST-303.5	Identify the production methods for various products practiced in the industry

LEARNING OUT COMES:

After completion of the course, the student will be able to

1.0 Basic industrial chemicals.

1.1 State different industrial manufacturing methods HCl and its uses
1.2 State industrial manufacturing methods of sodium carbonate
1.3 Explain the manufacturing of sodium carbonate by Solvay process.
1.4 List out the uses of soda ash
1.5 State industrial manufacturing methods ofsodium hydroxide
1.6 Explain the manufacturing of sodium hydroxide through electrolytic process
1.7 List out the properties and usesof sodium hydroxide.
1.8 State industrial manufacturing methods ofammonia
1.9 Explain the manufacturing of ammonia through steam reforming of naphtha or natural gas
1.10 List out theproperties and uses of ammonia

1.11 State industrial manufacturing methods ofnitric acid
1.12 State and explain the manufacture of nitric acid, properties and uses of HNO_3
1.13 State and explain the manufacturing process of sulfuric acid by double absorption and double contact process , properties and uses of H_2SO_4
1.14 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 out the different 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 the 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 about the precautions to be taken during coal storage
4.6 Explain the recovery of chemicals when coal is subjected to coking.
4.7 Explain about proximate analysis and ultimate Analysis of coal
4.8 Explain coal tar distillation
4.9 Explain the origin of crude petroleum.
4.10 Explain the atmospheric distillation and vacuum distillation of crude petroleum in a refinery to obtain different cuts.
4.11 Explain the principles of cracking and process of catalytic cracking.

4.12 Explain the principles of catalytic reforming and process of catalytic reforming.
4.13 State the petrochemicals obtained from methane, ethylene, propylene and butylene
4.14 Explain the manufacturing process of chloro methanes from methane.
4.15 State the uses of methane, ethylene, propylene and butylene..

5.0 Oils, Fats, soaps, Pulp, Paper ,Polymers, Plastics and Rubbers.

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 glycerin from soap industry.
5.6 Explain the sulphate or Kraft process to manufacture pulp.
5.7 Explain the industrial method of manufacturing paper from sulphate pulp.
5.8 Explain the process to which the black liquor should be subjected to recover its chemical constituents for reuse in the manufacture of pulp.
5.9 State the different varieties of polymers and plastics.
5.10 Distinguish between thermoset and thermo plastic.
5.11 Explain the manufacturing method of LDPE, HDPE.
5.12 Understand the classification of rubbers.
5.13 Explain the manufacturing process of ethyl benzene, styrene and butadiene.
5.14 Explain the manufacturing process of styrene- butadiene rubber

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 chloro methanes from methane

5. Oils, fats, soaps, Pulp, Paper Polymers, Plastics and Rubbers.

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.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 and butadiene and SBR.

REFERENCE BOOKS

S.NO	BOOK TITLE	AUTHOR	PUBLICATIONS
1.	ShrevesChemical Process Industries	George T Austin.	
2.	Chemtech IIT – Vol. II, III and IV		
3.	Outlines of Chemical Technology	GopalaRao (Dryden).	21 st century
4.	Chemical Technology Vol – I and Vol – II	Sukla and Pandey.	

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-303.1	3	3	2					2		
CHST-303.2	3	2	3		2			2	2	2
CHST-303.3	2	1	1	2				3		
CHST-303.4	2	3	2		2			3	2	2
CHST-303.5	3			2				2	1	
Average	2.6	2.2	2	2	2			2.4	1.6	2

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

MODEL BLUE PRINT WITH WEIGHT AGES 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	16	14	6	8			2	1			CO1
2.	Water and Fertilizer industry	18	14	6	8			2	1			CO2
3.	Industrial gases and Inorganic products	16	14	6	8			2	1			CO3
4.	Coal chemicals, Petroleum refining and Petrochemical industry	22	14	6	8		10	2	1		*1	CO4
5.	Oils, fats, soap, Pulp, Paper ,Polymers, Plastics and Rubbers.	18	14	6	8			2	1			CO5
One question from Part-C, it carries 10 Marks. from CO2,CO4 &CO5			10									
Total		**90**	**80**	**30**	**40**	**10**		**10**	**5**	**01**		

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning out comes to be covered
Unit Test-I	**From 1.1 – 3.9**
Unit Test-II	**From 4.0-5.14**

MODEL QUESTION PAPERS FOR UNIT TEST
C-20,CHST-303
UNIT TEST-I
STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A.P
DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
III SEMESTER
Subeject Name: GENERAL CHEMICAL TECHNOLOGY
Sub Code: CHST-303

Time: 90 minutes **UNIT TEST-I** **Max.Marks:40**

Part-A **16 Marks**

Instructions: (1) Answer all questions
(2)First question carries **four** marks of each one mark and remaining each question carries **three** marks

1. Answer the following

(a) Water gas is also called as _____

(b) Purification of water by zeolite method (True / False)

(c) Double contact process is used to Manufacturing of _____

(d) Lime stone + clay+ Heat=_____

2. Write the manufacturing methods of hydrochloric acid
3. List out the sources of water
4. Define Portland cement
5. Write the industrial applications of urea

Part-B **3X8=24**

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

6. With a neat sketch explain the manufacturing of sodium carbonate by Solvay process

(or)

With a neat sketch explain the manufacturing of Ammonia

7. Explain the purification of water by municipal water treatment

(or)

Explain the process of making ammonium sulphate

8. Explain the concept of conventional linde cycle

(or)

List out the industrial applications of carbon dioxide

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UNIT TEST-II

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A.P

DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

III SEMESTER

Subeject Name: GENERAL CHEMICAL TECHNOLOGY

Sub Code: CHST-303

Time: 90 minutes **UNIT TEST-II** **Max.Marks:40**

Part-A **16 Marks**

Instructions: (1) Answer all questions
(2)First question carries **four** marks of each one mark and remaining each question carries **three** marks

1. Answer the following

(a) Peat is the third stage of coal formation (True / False)

(b) Splitting up of larger molecular weight compounds into smaller ones is called as _____

(c) If soap is made of pure olive oil it may be called as _____

(d) Thermo plastics that soften when heated and become firm again when cooled (True/ False)

2. Write any four petrochemical obtained from ethylene
3. Define cracking
4. Differentiate oil and fat
5. Classify rubbers

Part-B **3X8=24M**

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

6. Explain about high temperature carbonization

(Or)

With a neat sketch explain the coal tar distillation

7. With a neat sketch explain the solvent extraction method of oil extraction

(Or)

Explain the recovery of glycerin from soap manufacturing

8. Explain the manufacturing of paper from kraft process

(or)

Explain the manufacturing of butadiene

***

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)

S.No	Question	Blooms category	Marks allocated	CO adressed
	Part-A(30 marks)			
1.	Write the manufacturing methods of sodium carbonate	remembering	3	CO1
2.	List out the uses of HCL	Remembering	3	CO1
3.	Draw a neat sketch of hydrological cycle	remembering	3	CO2
4.	List out the manufacturing methods of urea	Remembering	3	CO3
5.	Write the physical and chemical properties of oxygen	remembering	3	CO4
6.	Write the properties of glass	Remembering	3	CO1
7.	Define carbonization and classify it	remembering	3	CO2
8.	List any six petrochemical obtained from ethylene	remembering	3	CO1
9.	Define Saponification	remembering	3	CO1
10.	Differentiate between oils and fats	remembering	3	CO5
	Part-B(40 marks)			
11.	With a neat sketch explain the manufacturing of sodium Hydroxide by electrolytic process. (or) With a neat sketch explain the manufacturing of ammonia.	understanding	8	CO1
12	With a neat sketch explain the purification of water by ion-exchange method. (or) With a neat sketch explain the manufacturing of triple super phosphate.	understanding	8	CO2
13	With a neat sketch explain the manufacturing of Carbon dioxide by fermentation method. (or) With a neat sketch explain the manufacturing of calcium carbide.	understanding	8	CO3

14	Explain the formation of coal and list out various grades of coal. (or) With a neat sketch explain the fluidized bed cracking	understanding	8	CO4
15	With a neat sketch explain the recovery of glycerine from soap industry. (or) With a neat sketch explain the manufacturing of butadiene.	understanding	8	CO5
Part-C(10 marks)				
16	Why high purity of water is maintained prior to entry in to boiler	analyzing	10	CO2

CHST-304 MASS AND ENERGY BALANCE

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-304	Mass and Energy Balance	6	90	20	80

S.NO.	Chapter/unit title	No. of periods	Cos mapped
1.	Units and Dimensions	12	CO1
2.	Basic Calculations	24	CO2
3	Material balance without Chemical Reactions	16	CO3
4.	Material balance with Chemical Reactions	14	CO4
5	Energy balance	14	CO5
6	Combustion	10	CO5
TOTAL		**90**	

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.

CO NOS		COURSE OUTCOMES
CO1	**CHST-304.1**	Explain basic concepts of Physico-Chemical relations
CO2	**CHST-304.2**	Solve problems related to Physico-Chemical relations and mass balances.
CO3	**CHST-304.3**	Solve problems related to Energy balances in chemical engineering, apply MEB in design aspects.
CO4	**CHST-304.4**	Explain the procedures adopted for Material balance withChemical Reactions calculations
CO5	**CHST-304.5**	Analyse and Solve the Problems on basic calculations ,mass and energy balances and combustion.

LEARNING OUTCOMES

After completion of the course, the student will be able to

1.0 Units and Dimensions:

1.1 State Physical Quantities
1.2 Explain Fundamental and Derived quantities
1.3 State unit and System of units
1.4 Explain units in SI system and Dimensional formula of different derivedquantities.
1.5 Distinguish the conversion factors for various fundamental quantities (Mass, Length, Time and Temperature) from one system of unit to another system of units.
1.6 Explain 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 Write the conversion factors for the following derived quantities
a) Work done b) Heat c) Power from one system of unit to another system of units.
1.8 Explain 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 State 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 Explain different dimensionless groups
1.11 Explain the conversion of a equation from one system of units into another system of units.
1.12 Solve 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,Define Molarity, Normality, Molality, PPM, Weight percent, Volume percent, Mole percent, Analysis on dry basis and wet basis, Define Density and Specific gravity, different gravity scales , and relation between
gravity scale and Specific gravity ,Explain the Variation of density and specific gravity with temperature,Solve Numerous problems on all the above topics

(b) Behavior of ideal gases

2.2 Kinetic theory of gases,Explain Gas laws: Boyle's law, Charles law, Gay-Lussac's law, Avogadro's law ,derive Ideal gas equation, Write about Vander Waal's equation of state, Critical properties of substances
2.3 Explain Ideal gas constant–Derive the value of ideal gas constant in different system of Units. Sate and explain Dalton's law of partial pressures, Amagat's law of partial volumes forgaseous mixtures, Explain the characteristics of an Ideal gas, Differences between Ideal gas and Real gas
2.4 (i) Derive the equation volume % = mole % = pressure % for an ideal gas mixture
(ii) Explain average molecular weight of a gas mixture and the evaluation procedure
2.5 Differentiate the evaluation procedures for the density of a gaseous mixture,Solve Numerous problems on all the above topics

(c) Vapour Pressures:

2.6 Define vapour pressure, understand the relation between vapor pressure and boiling point, Explain the effect of temperature on vapor pressure, Explain the methods of evaluation of vapor pressure
(a) Antoine equation

(b) Clausius – Clapeyron equation.
(c) Vapor pressure reference substance
plot - Cox chart, Duhring's lines

2.7 Define Ideal solutions and Non-Ideal solutions. Differences between Ideal and Non-Ideal solutions

2.8 Define (a) Raoult's Law (b) Henry's Law for solutions,Solve Numerous problems on all the above topics

(d) Humidity and Saturation:

2.9 Explain the following.
1. Un-saturation, 2.Saturation 3. Humidity 4.Absolute 5.humidity
6.Relative Humidity7. Molal absolute humidity 8. %Saturation
9.Dew Point

2.10 Explain dry and wet bulb temperature

2.11 Solve numerous problems on all the above topics

3.0 Material balance without chemical reactions:

3.1 Define Unit operation and Unit Process. Give Examples

3.2 Explain representation of unit operations/unit processes by a process flow chart or ablock diagram

3.3 Explain the basis for material balances, Explain the terms in the general material balance equation

3.4 Define and explain tie substance, key component and inert substance, solve material balance problems,

3.5 State Degrees of Freedom, Explain about steady and un-steady state mass balance

3.6 Solve material balance problems related to
1. Evaporation,
2. Drying,
3. Distillation
4. Extraction
5. Crystallization

3.7 Explain Bypass in continuous chemical processes with examples

3.8 Explain Recycle in continuous chemical processes with examples

3.9 Explain Purge streams in continuous chemical processes with examples

3.10 Write Blow-down streams in continuous chemical processes with examples

3.11 Solve Numerous problems on all the above topics

4.0 Material balance with chemical reactions:

4.1 Explain 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 State % conversion in a chemical reaction

4.4 State % yield in a chemical reaction

4.5 Explain Degree of completion in a chemical reaction

4.6 State theoretical quantity of reactant

4.7 Define 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 Explain 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 Solve the problems on heat requirement calculations, using Q = mcp ΔT and Q = ncp ΔT
5.9 Explain exothermic, endothermic, adiabatic and isothermal reaction systems
5.10 Define and explain Heat of Formation , Heat of combustion and Heat of Reaction,
5.11 Explain 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 Explain net hydrogen
6.5 Solve combustion problems related to refuse analysis
6.6 Explain the proximate and ultimate analysis of coal
6.7 Explain 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 Explain 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 andincomplete combustion
6.11 Solve problems related to combustion

COURSE CONTENT :

1.0 Units and Dimensions:

Physical Quantities-Fundamental and Derived quantities-Unit and System of units-Formula, Units in SIsystem 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-Reynolds number, Prandtl number, Nusselt number, Grashof number, Peclet number, Mach number, Schmidtnumber, Graetz number, Lewis number, Sherwood number, Stanton number-Conversion of one system of 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, Analyze 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) Behavior 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 gaseousmixture-Numerous problems on all the above topics.

(c) Vapor Pressures:

Vapor pressure, Relation between vapor pressure and boiling point-Effect of temperature on vapour pressure-Methods of vapor pressure determination-Antoine equations, Clausius–Clapeyron equation-Vapor pressure reference substance plots-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 in
continuous 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 of Solution, 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 fuel gases, 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

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-304.1	2	3	2					2		
CHST-304.2	3	2	3		2			2	2	2
CHST-304.3	2	1	1	1				3		
CHST-304.4	2	2	2		2			3	2	
CHST-304.5	3			2				2		
Average	2.4	2	2	1.5	2			2.4	2	2

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NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

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				R	U	Ap	An	R	U	Ap	An	
1.	Units and Dimensions	12	11	3		8		1		1		**CO1**
2.	Basic Calculations	24	17	9	8			3		1		**CO2**
3.	Material balance without Chemical Reactions	16	14	6	8		10*	2		1		**CO3**
4.	Material balance with Chemical Reactions	14	11	3	8		10*	1	1		1*	**CO4**
5.	Energy balance	14	11	6	8		10*	2	1			**CO5**
6.	Combustion	10	6	3	3		10*	1	1			**CO5**
***ONE QUESTION IN PART C OF 10 MARKS FROM CO3,CO4 & CO5**			10									
Total		90	80	30	35	8	10	10	5	1	1	

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning out comes to be covered
Unit Test-I	**From 1.1 – 3.11**
Unit Test-II	**From 4.1-6.11**

MODEL QUESTION PAPERS FOR UNIT TEST
C-20,CHST-304
UNIT TEST-I
STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A.P
DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
III SEMESTER
Subeject Name: MASS AND ENERGY BALANCES
Sub Code: CHST-304

Time: 90 minutes **UNIT TEST-I** **Max.Marks:40**

Part-A **16 Marks**

Instructions: **(1)** Answer **all** questions
(2) First question carries **four** marks of each one mark and remaining each question carries **three** marks

1. Answer the following
(a)Write the example of dimension base group
(b) No. Of moles of solute present in 1 lit. Solution =_____
(c) Units of universal gas constant _____
(d**)** Phase rule F= C-P+2 (T/F)

2. Convert a volumetric flow rate of 3.5 m^3/sec to l/s.

3. Explain the terms `Gram atom `&`Gram mole`.

4. In a multiple effect evaporator system, the second effect is maintained under vacuum of 475torr (mm Hg).find the absolute pressure in kPa.

5. State Raoult's law

Part-B **3X8=24**

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

6. A solution of caustic soda contains 30% NaOH by weight. Taking density of the solution as 2.19 kg/l find the normality, molarity and molality of the solution.

(or)

Explain fundamental and derived qualities

7. Find the equivalent weights of (1) HCL (2) NaOH (3) Na_2CO_3 (4) H_2SO_4

(or)

Explain the characteristics' of an ideal gas & write the difference between ideal gas and real gas

8. An aqueous solution of soda ash (Na_2CO_3) contains 20% soda ash (on weight basis).Express the composition as weight % Na_2O .

(or)

Write the material balance equation for evaporation

***

C-20,CHST-304

UNIT TEST-II

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A.P

DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

III SEMESTER

Subject Name: MASS AND ENERGY BALANCES

Sub Code: CHST-304

Time: 90 minutes **UNIT TEST-II** **Max.Marks:40**

Part-A **16 Marks**

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

(2) First question carries **four** marks of each one mark and remaining each question carries **three** marks

1. Answer the following

(a) What is % yield

(b) Amount of heat required to raise the 1^oC=_____

(c) Calorific value of the coal is > coke (True/False)

(d)Units of latent heat =_____

2. What is Limiting Reactant
3. What is % Conversion
4. What is calorific value of fuels and types of calorific values
5. Define heat of reaction

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 feed to a continuous fractionating column analyses 28 percent benzene and 72 percent toluene by weight. The analysis of the distillate shows 52 weight percent benzene and 5 weight percent benzene was found in the bottom product. Calculate the amount of distillate and bottom product per 1000 kg of feed per hour. Also calculate the percent recovery of benzene.

(or)

Explain about degree of completion in a chemical reaction system

7. In the manufacture of acetic acid by oxidation of acetaldehyde, 100 kml of acetaldehtde is fed to a reactor per hour. The product leaving the reactor contains 14.81% acetaldehyde, 59.26% acetic acid and the rest oxygen (on mole basis).Find the percentage conversion of acetaldehyde.

(or)

Derive the general energy balance equation for a steady flow process

8. Pure ethylene is heated from 303 K (30^0C) to 523 K(250^0C) at atmospheric pressure. Calculate the heat added per kmol ethylene using the heat capacity data given below:
$Cp^0 = 4.1261+155.0213x10^{-3}T-81.5455x10^{-6}T^2+16.9755x10^{-9}T^3$.

(or)

Explain the ultimate analysis of coal

***

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	Question	Marks allocated	Blooms category	CO adressed
	PART-A			
1.	Convert the following in to SI units? (a) 212 o F (b) 2 Btu/lb-mole	3	remembering	CO1
2.	Define the following terms: (a) Vapour pressure and (b) humidity	3	Remembering	CO1
3.	Write the standard state condition in SI System?	3	Remembering	CO2
4.	State : (a) Ideal solution (b) ideal gas	3	Remembering	CO2
5.	Define the following : (a) Recycle (b) purge	3	Remembering	CO3
6.	Define the following items? (a) % conversion (b) % excess	3	Remembering	CO4
7.	An alcohol whose molecular weight is 74 analyzes as C =64.87 %, H= 13.51 %, O=21.62 % State its chemical formula?	3	understanding	CO5
8.	Explain partial combustion and complete combustion?	3	Remembering	CO5
9.	Define the following terms : (a) Std.heat of reaction (b) Std. Heat of solution	3	Understanding	CO4
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)	3	Remembering	CO5
	PART-B			
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	8	understanding	CO1

	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. ?			
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 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?	8	understanding	CO2
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.	8	understanding	CO3
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	8	applying	CO4
15	In the Deacon process for the manufacture of chlorine, hydrochloric acid gas is Oxidised with air. The reaction taking place is:	8	understanding	CO5

	$4HCl + O_2 \rightarrow 2Cl_2 + 2H_2O$ 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 gases leaving the reaction chamber (Or) In the Deacon process for the manufacture of chlorine, hydrochloric acid gas is Oxidised with air. The reaction taking place is: $4HCl + O_2 \rightarrow 2Cl_2 + 2H_2O$ 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?			
PART-C				
16	Why the process of coal analysis is significant in combustion	10	Analyzing	CO5

CHST-305 FLUID MECHANICS AND HEAT TRANSFER

Course code	Course title	No. of periods/week	Total no of periods	Marks of FA	Marks for SA
CHST - 305	FLUID MECHANICS AND HEAT TRANSFER	6	90	20	80

S.No	Chapter / unit title	No. of periods	CO's Mapped
	FLUID MECHANICS		
1.	Introduction to fluid flow phenomena and basic equations of fluid flow	14	CO1
2.	Flow of incompressible fluids in pipes and flow past immersed bodies	12	CO2
3.	Transportation and metering of fluids	20	CO3
	HEAT TRANSFER		
4.	Heat transfer by conduction	12	CO4
5.	Principles of heat flow in fluids(Convection) Radiation heat transfer	18	CO5
6.	Heat exchange equipment and evaporation	14	CO5
	TOTAL	**90**	

COURSE OBJECTIVES

COURSE OBJECTIVES	i. To understand basic concept of fluid flow and its application to chemical process industries including pipe flow, fluid machinery and transportation of fluid and problems based on above topics ii. Modes of heat transfer, heat transfer to fluids with and without phase change, radiation heat transfer and problems based on above topics. iii. Types of heat exchanges and types of evaporators, evaporator accessories, performance of evaporation, multiple effect evaporation

CO NOS		COURSE OUTCOMES
CO1	**CHST-305.1**	Explain about fluid mechanics
CO2	**CHST-305.2**	Explain the nature of flow and flow equations
CO3	**CHST-305.3**	Analyze the Principles of various flow equipments
CO4	**CHST-305.4**	Illustrate the heat transfer operation and equipment
CO5	**CHST-305.5**	Examine thePrinciples of evaporation operation and equipments

LEARNING OUTCOMES:

CHAPTER – 1 :

1. Fluid flow phenomena & Basic equations of fluid flow

1.1 Define a fluid.
1.2 Explain classification of fluids
1.3 State the important physical properties of fluid and give their units.
1.4 Explain the concepts of pressure and its measurement.
1.5 State Newton's Law of Viscosity
1.6 Importance of Reynolds's number.
1.7 Explain the Reynolds experiment
1.8 Distinguish laminar and turbulent flow
1.9 Explain mass balance and continuity equation
1.10 Derive Bernoulli's and modified Bernoulli's equations. Solve related problems
1.11 Explain boundary layer formation in fluids
1.12 Simple problems onReynolds number and pressure drop

CHAPTER – 2:

2. Flow of incompressible fluids in conduits & flow past immersed bodies

2.1 Explain flow of incompressible fluids in pipes, shear stress distribution in pipes, average velocity,
2.2 Hagen-Poiseuille equation for pressure drop calculations.
2.3 Explain the effect of roughness.
2.4 State the equations of friction factor.
2.5 Explain the friction factor chart.
2.6 Explain the energy losses due to sudden expansion, contraction and fittings.
2.7 Explain stokes law, free settling and hindered settling.
2.8 Define Drag and Drag coefficient
2.9 Explain the process of fluidization and applications of fluidization.
2.10 Problems on energy losses in fluid flows through the pipes

CHAPTER – 3:

3. **Flow measurement & Transportation of fluids**:

3.1 State classification of flow meters, Explain the principle construction and working of flow meters.
3.2 Differentiate between pipes and tubes, explain the function of various pipe fittings and valves
3.3 Explain the functions of pump in fluid handling, and explain the principle, construction and working of centrifugal pump
i) Explain principle, construction and working of reciprocating positive displacement pumpi) Piston pump ii) Plunger pump iii) Diaphragm pump.
3.4 Explain the principle, construction and working of rotary positive displacement pumps.
i) Gear pump ii) Screw pump
3.5 Define the terms related to a pump
i) Suction head
ii) Discharge head
iii) Total head
iv) NPSH
v) Cavitations
vi) Priming
vii) Mechanical efficiency
viii) Power required

3.6 Explain the equipment for gas flow i) fan ii) blower iii) vacuum pump and differentiate between the fan and a blower.

3.7 Solve the problems based on flow meters, and centrifugal pump

CHAPTER – 4:

4. Heat transfer and its applications-Heat transfer by conduction

4.1 Explain the mechanism of heat flow, modes of heat transfer with examples

4.2 Define steady state and unsteady state heat flow

4.3 Explain heat transfer by conduction and the Fourier's law of conduction

4.4 Explain thermal conducting of a substance, significance of lagging

4.5 Derive an equation for heat flow through a single plane walls, cylindrical wall and composite wall.

4.6 Solve problems on Fourier's law, heat flow through a flat wall, cylindrical wall and composite wall.

CHAPTER – 5:

5. Principles of heat flow in fluids

5.1 Define convection, natural and forced convection, Rate and flux of heat transfer

5.2 Differentiate the co- current, counter current and parallel current heat flows in a heat exchanger

5.3 Explain logarithmic mean temperature difference (LMTD)

5.4 Explain the film concept in heat transfer by convection.

5.5 Derive an equation for calculation of overall coefficients from individual coefficient

5.6 Practice the various empirical equations used to calculate 'h' such as i) Dittus – bolter equation ii) Seeder – Tate equation iii) Colburn equation and explain fouling factor

5.7 Explain the heat transfer mechanism to boiling liquids.

5.8 Distinguish the drop wise and film wise condensation.

5.9 Define radiation, absorptivity, reflectivity and transitivity, emission power, black body emissivity

5.10 State Laws of radiation, back body radiation

5.11 Solve problems based on LMTD, and overall heat transfer coefficients, and laws of radiation

CHAPTER – 6:

6. Heat Exchange equipment &Evaporation:

6.1 State classification and evaporators and heat exchangers

6.2 Explain principle and operation of double pipe heat exchanger, shell and tube heat exchanger (single pass and multi pass) and surface heat exchangers

6.3 Explain the function of a condenser.

6.4 Explain the liquid characteristics and properties in evaporation.

6.5 Explain the different types of evaporators- standard vertical tube evaporates, falling film and climbing film evaporators and forced circulation evaporates

6.6 Explain the working of evaporator accessories with a neat sketch

6.7 Explain the working principle of the multiple effect evaporator system with a sketch

6.8 Explain the performance of an evaporator, boiling point elevation

COURSE CONTENTS:

1. **Introduction to fluid flow phenomena and basic equations for fluid flow:**

   Fluid statics and fluid dynamics; types of fluids-Compressible and in compressible fluids, Newtonian and Non-Newtonian fluids, State Newton's law of viscosity, Physical properties of fluids– Density, Viscosity, velocity head, pressure head and static head., Pressure concept, Manometers U–Tube Manometer, Inverted U tube manometer, inclined tube manometer, - Importance of Reynold's number, Laminar flow – Turbulent flow, - Reynold's experiment, Solve problems on Reynolds number and Pressure drop in manometers, Mass balance and Momentum balance, Bernoulli's equation– Modified Bernoulli's equation for frictional flow and pump work, Solve problems on various heads using Bernoulli's equation.

2. **Flow of incompressible fluids in pipes &Flow past immersed bodies:**
   Friction-Skin friction and wall shear- Equation for friction factor- Laminar flow in pipes- Average velocity- boundary layer formation- Hagen poiseuille equation, Maximum velocity and average velocity Roughness- Friction factor chart- Energy loss for fluids during flow – Understand the energy loss due to flow, pipe fittings, sudden expansion and contraction - equivalent length concept – solve simple problems on friction factor in Laminar & turbulent flow, Drag- Different types of drags, Drag coefficient– Stokes law- Drag coefficient Vs Particle Reynolds number curveTerminal velocities-– Fluidization velocities and pressure drops-Applications of fluidization, Solve problems on drag coefficient, terminal velocity of a spherical particle.

3. **Metering and transportation of fluids:**
   Flow meters- Orifice meter, Venturi meter, Pitot tube ,Rota meter, Pipes and tubes – Pipe fitting and joints, Valves – Gate valve, Globe valve, Check valve, Diaphragm valve, Butterfly valve, Ball valve, Safety valve or relief valve Pumps-functions of a pump- Positive displacement pumps – Piston, Plunger pumps, Diaphragm pumps, reciprocating pumps- Rotary pumps-Gear pump, screw pump, Centrifugal pumps – single and multi stage centrifugal pumps, different types of casings, Suction head, Discharge head, Total developed head- NPSH, Priming, Cavitation, Equipment for gas flow-fans, blowers, compressors, Vacuum producing equipment– ejectors, vacuum pump, barometric leg condenser, solve simple problems on volumetric flow rates using flow meters, NPSH

4. **Heat transfer and its applications-Heat transfer by conduction**
   Conduction- Mechanisms of heat flow, modes of heat transfer, Fourier's law, thermal conductivity of a substance and state its units, Steady state conduction- Derive and equation for conduction through a single plane wall, a cylindrical wall and composite wall, explain the significance of lagging and economic lagging thickness Solve simple problems on calculation of rate of heat flow in case of flat wall, cylindrical wall and composite walls

5. **Principles of heat flow in fluids & Radiation Heat transfer:**
   Convection- natural and forced convections, Newton's law of cooling, co-current, counter current and parallel current flows in a heat exchanger, Understand temperature variations along the length of the exchange in both cases, Rate of heat transfer – Explain heat flux, Average temperature of fluid stream and logarithmic mean temperature difference (LMTD), Calculation of Overall heat transfer coefficients from Individual coefficients, Nussult number and Prandtl number, Resistance form of overall coefficient. Fouling factors, Know the heat transfer mechanism to boiling liquids- pool boiling of a saturated liquid, film boiling and nucleate boiling Simple problems on logarithmic mean temperature difference (LMTD).
   Radiation - Absorptivity, Reflectivity and Transmitivity, Laws of Black body radiation Explain Stefan Boltzmann Law, Planck's law and Wiens displacement law, Emission of Radiation wave length of radiation Emissive power, Black body radiation, Emissivity of solids, Absorption of radiation by opaque solids , Kirchhoff's law – Radiation between surfaces, Simple problems on Stefan's law.

6. **Heat Exchange equipment &Evaporation:**
   Types of heat exchangers principles and operation of Double pipe heat exchangers, shell and tube – single, multipass, floating head heat exchangers Temperature patterns in multipass exchangers, extended surface heat exchangers, condensers Fin type and plate type condensers, liquid characteristics- some important properties, types of evaporators - standard vertical tube, basket

type, long tube, falling film – forced circulation evaporators – agitated film evaporators, evaporator accessories – steam traps condensers, Entrainment separators, Barometric leg Ejectors. Performance of tubular evaporators – Evaporator capacity – boiling point elevation Evaporator Economy, multiple effect evaporators- methods of feeding the multiple effect evaporator system with relative advantages and disadvantages, Principle of vapor recompression

REFERENCE BOOKS :

1. Unit Operations in Chemical Engineering by Mc. Cabe and Smith.

2. Introduction to Chemical Engineering by W.L. Badger and T.T. Benchero.

3. Introduction to Chemical Engineering by Ghosal, Sanyal and Dutta

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-305.1	2	3	2					2		
CHST-305.2	3	2			2			1	2	1
CHST-305.3	2	1	1	2				3		
CHST-305.4	1	2	2		2			3	2	
CHST-305.5	3			2				2		
Average	2.2	2	1.6	2	2			2.2	2	1

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

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.	14	14	3	3	8	**10***	1	1	1		CO1
2	Flow of incompressible fluids in pipe and flow past immersed bodies	12	06	3	3			1	1			CO2
3	Know about flow measurement & transportation of fluids	20	14	3	3	8	**10***	1	1	1		CO3
4	Heat transfer by conduction	12	11	3	-	8		1	-	1	**1***	CO4
5	Principles of heat flow in fluids(Convection) & Radiation heat transfer	18	14	3	3	8		1	1	1		CO4
6	Heat exchange equipment and Evaporation	14	11	3	-	8	**10***	1	-	1		CO5
***ONE QUESTION IN PART C OF 10 MARKS FROM CO1,CO3 & CO5**			10^{*}									
TOTAL		**90**	**80**	**18**	**12**	**40**	**10**	**6**	**4**	**5**	**1**	

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

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.8
Unit Test-II	From 4.1 to 6.8

MODEL QUESTION PAPERS FOR UNIT TESTS

UNIT TEST I

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

III Semester

Subject name: FLUID MECHANICS AND HEAT TRANSFER

Sub Code: CHST – 305

Time : 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following
   a) Write an example for incompressible fluid
   b) Hagen- Poiseuille equation is useful for determination of _____
   c) Which one of the following is a variable area meter
      1) Venturi meter 2) Rota meter 3) current meter
   d) valves are used to control the flow (T/F)
2. State physical properties of a fluid
3. Define boundary layer formation in fluids
4. Draw and label the parts of Rota meter
5. Differentiate between pipes and tubes

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. Explain the construction and working of a U-tube manometer with neat sketch.

(OR)

Explain the Reynolds experiment with a neat diagram

7. Explain the energy losses due to sudden expansion and sudden contraction

(OR)

Explain the principle involved in the fluidization process with a neat diagram

8. Explain construction and working of a reciprocating pump with a neat sketch

(OR)

Explain the construction and working of venturi meter with neat sketch

***

UNIT TEST II **C –20, CHST -305**

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

III Semester

Subject Name: FLUID MECHANICS AND HEAT TRANSFER

Sub Code:CHST – 305

Time : 90 minutes **Unit Test II** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following
   a) State the units of thermal conductivity
   b) Forced convection heat transfer rates are higher than natural convection (T/F)
   c) The condenser and cooler function is same (T/F)
   d) Weak solution is concentrating by vaporizing a portion of solvent is _____
2. Define heat transfer and state modes of heat transfer
3. Differentiate co current and counter current heat flow
4. Define black body radiation
5. Write the classification of heat exchangers

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. Derive an equation for heat transfer through a plane wall.

(OR)

Explain lagging and significance of lagging

7. Explain logarithmic mean temperature difference

(OR)

Explain the heat transfer mechanism to boiling liquids

8. Explain construction and working of a shell and tube heat exchanger with a neat sketch

(OR)

Explain the construction and working of vertical tube evaporator with neat sketch

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BOARD DIPLOMA EXAMINATION (C-20)
D.CH.ST. – III SEMESTER EXAMINATION
CH.ST-305: FLUID MECHANICS AND HEAT TRANSFER

Time: Three Hours **Max.: 80 Marks**

Part A Marks: 10 x 3= 30

Note: - (1) Answer all questions and each question carries 3 marks.
(2) Answers should be brief and straight to the point and shall not exceed five Simple sentences

1.	List the important physical properties of fluids	R/CO1
2.	Differentiate between laminar flow and turbulent flow	U/CO1
3.	Define fluidization	R/CO2
4.	Define roughness of pipe	U/CO2
5.	Classify flow meters	R/CO3
6.	Differentiate between priming and cavitation	U/CO3
7.	Define thermal conductivity and write its units	R/CO4
8.	Define convection with an example	R/CO4
9.	Define black body radiation	U/CO4
10.	Define boiling point elevation	U/CO5

Part B 5 x 8 = 40

Note: - (1) Answer all 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 the answer.

11. Derive Bernoulli's equation without friction. U/APP/CO1

(or)

Explain the construction and working of a U-tube manometer with neat sketch.

12. Explain construction and working of a centrifugal pump with a neat sketch. U/APP/CO2

(or)

Explain the construction and working of orifice meter with neat sketch.

13. Derive an equation for heat transfer through a plane wall. U/APP/CO3

(or)

Derive an expression for heat transfer through a composite wall made up of three materials having different thermal conductivities.

14. Derive the relation between individual and overall heat transfer co-efficient through film concept

(or) U/APP/CO4

Explain the heat transfer mechanism to the boiling liquids

15. Explain shell and tube heat exchanger with a neat diagram U/APP/CO5

(or)

Explain the multiple effect evaporation system with a neat sketch

Part-c

Note: - (1) Answer question carries 10 marks. 1x10=10

(2) The answer should be comprehensive and the criteria for valuation is the content but not the length of the answer.

16. Compare merits and demerits of heat exchanger equipments ANY/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)

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CH ST -306 PHYSICAL AND ORGANIC CHEMISTRY LAB

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CHST-306	PHYSICAL ANDORGANIC CHEMISTRY LABORATORY	3	45	40	60

TIME SCHEDULE

S. No.	Major Topics	No. of periods
1.	Determination of Melting point of Solid Organic compounds. Determination of Boiling points of liquid organic compounds	03
2.	Detection of Elements present in organic compounds	06
3.	Reactions of Functional groups present in organic compounds	06
4.	Systematic identification of functional groups in an Organic Compound	12
5.	Preparation of Organic Compounds.	12
6.	Test & Review	6
	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 Physical and Organic 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 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 Detection of 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

REFERENCE BOOKS:

S.No.	Book Title	Author	Publications
1	Vogel's Textbook of Practical for physical & Organic Chemistry	A I Vogel	S. Chand &CoNewDelhi

CHST-307 FLUID MECHANICS LABORATORY

Coursecode	Coursetitle	No. of periods/week	Totalno.of periods	MarksforFA	MarksforSA
CHST-307	FluidMechanics Laboratory	6	90	40	60

CourseObjectives	(i) To reinforce theoretical concepts by conducting relevant experiments / exercises (ii) To Apply process principles learnt in other chemical engineering courses to practical situations (iii) To Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems (iv) To broaden their professional foundation (v) To reinforce theoretical concepts by conducting relevantexperiments/exercisesinfluidflow.	
CourseOutcomes	**C01**	Demonstratetheskillofplanningandorganizingexperimentalsetup foradesiredpurpose
	C02	Performpreciseoperations/taskswithEngineeringequipmentor instrumentforinvestigationofEngineeringproblems
	C03	Observevariousparameters,theirvariationsandgraphically represent thesame
	C04	Analyzetheexperimentalresultstodrawinferencestomake recommendations
	C05	Practice ethics & etiquette while working in a group and displayprofessionalism whilecommunicatingasamemberandleader ina group

TIME SCHEDULE

S.No.	Major Topics	Periods
1.	Flow meters	18
2.	Flow through pipes and fittings	12
3.	Bernoulli‘s apparatus	12
4.	Reynolds experiment	12
5.	Centrifugal pump	12
6.	Reciprocating pump	12
7.	Packed bed	12
Total		**90**

LEARNING OUTCOMES:

List of experiments:

1. **Flow meters**
   - 1.1 To determine the venturi meter coefficient and to plot a graph between coefficient of venturi and velocity head.
   - 1.2 To determine the orifice meter coefficient and to plot a graph between coefficient of orifice and velocity head.
   - 1.3 To determine thecalibration of given Rotameter and to draw calibration curve
2. **Flow through pipes and fittings**
   - 2.1 To determine the pipe function and to show the variation in friction factor along the Reynolds number along with a plot friction factor Vs Reynolds number
   - 2.2 Determination of frictional losses in various pipes and fittings
3. **Bernoulli's experiment**
   - 3.1 To determine the total energy of a fluid flowing through a passage of various cross sections with the help of Bernoulli's equation
4. **Reynolds experiment**
   - 4.1 To identify the laminar and turbulent flow regions using Reynolds experiment
5. **Centrifugal pump**
   - **5.1** Perform an experiment to determine the characteristics of a centrifugal pump and draw the Characteristic curves.
6. **Reciprocating pump**
   - **6.1** Determinationsofcharacteristicsof aReciprocatingpumptodrawthecurves.
7. **Packed bed**
   - 7.1 DeterminationofPressuredropsinapackedbedfordifferentfluidvelocities.

REFERENCE BOOKS:

1. Unit Operations in Chemical Engineering by Mc. Cabe and Smith.
2. Introduction to Chemical Engineering by W.L. Badger and T.T. Benchero.
3. Introduction to Chemical Engineering by Ghosal, Sanyal and Dutta

CHST-308 HEAT TRANSFER LABORATORY

Coursecode	Coursetitle	No. of periods/week	Totalno. of periods	MarksforFA	MarksforSA
CHST-308	**Heattransfer Laboratory**	**3**	**45**	**40**	**60**

CourseObjectives	(i) To familiarize with the knowledge different materials tools used ingeneralEngineeringprocesses (ii) Tousevariousbasicimplementsusedin generalEngineeringprocesses (iii) To knowtheetiquetteofworkingwiththe fellowworkforce (iv) Toreinforcetheoreticalconceptsbyconductingrelevant experiments/exercises	
CourseOutcomes	**C01**	Demonstratetheskillof planningandorganizingexperimentalsetup foradesiredpurpose
	C02	PerformpreciseoperationsswithEngineeringequipmentor instrumentforinvestigationofEngineeringproblems
	C03	Observevariousparameters,theirvariationsandgraphicallyrepresent thesame
	C04	Analyzetheexperimentalresultstodrawinferencestomake recommendations
	C05	Practice ethics & etiquette while working in a group and displayprofessionalism whilecommunicatingasamemberandleader ina group

ListofExperiments:

1. VerificationofFourier'slawofheatconductionthroughcompositewalls.
2. VerificationofFourier'slawofheatconductionanddeterminationofthermalconductivity of ametal bar.
3. Determination of overall heat transfer co-efficient in a double pipe heat exchanger forcounterflow.
4. Determination of overall heat transfer co-efficient in a double pipe heat exchanger forparallelflow.
5. Determination of overall heat transfer co-efficient in a shell and tube heat exchanger forcounterflow.
6. Determination of overall heat transfer co-efficient in a shell and tube heat exchanger forparallelflow.
7. Determinationof heattransfer co-efficient for forcedconvectionof air.
8. Determinationof heattransfer co-efficient for naturalconvectionofair.

CHST-309 GENERAL CHEMICAL TECHNOLOGY LABORATORY

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-309	GENERAL CHEMICAL TECHNOLOGY LABORATORY	03	45	40	60

TIME SCHEDULE

S.No.	Major Topics	Periods
1.	Analysis of water	06
2.	Determination of hardness present in Water by using different methods	12
3.	Analysis of oil	06
4.	Analysis of flue by using different apparatus	09
5.	Analysis of Coal	03
6.	Analysis of common salt	06
7.	Test and Review	03
TOTAL		**45**

COURSE OBJECTIVES	1. To familiarize with the knowledge of different chemicals, tools and instruments used in the laboratory
	2. To know the etiquette of working with the fellow workforce
	3.To reinforce theoretical concepts by conducting relevant experiments

Course outcomes	**CO1**	Demonstrate the skill of planning and organising experimental set up for a desired purpose
	CO2	Analyse the experimental results to draw inferences
	CO3	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,

1.0 Analysis of water

1.1Determination of total solids present in Tap Water in PPM

1.2 Determination of total solids present in Seawater in PPM

1.3Estimation of dissolved solids present in tap water in PPM

1.4 Estimation of dissolved solids present in seawater in PPM

2.0 **Determination of hardness present in Water by using different methods**

2.1 Determination of the total hardness in water by E.D.T.A method

2.2 Determination of the permanent hardness in water by E.D.T.A method

2.3 Determination of the total hardness in water by soap solution method

2.4 Determination of the permanent hardness in water by soap solution method

2.5 Determination of chlorides present in water

2.6 Estimation of sulphates present in water.

3.0 **Analysis of oil**

3.1 Determination of acid value of coconut oil / vegetable oil.

3.2 Estimation of Saponification value of the given sample.

3.3 Determination of iodine value of given vegetable oil.

4.0 **Analysis of flue by using different apparatus**

4.1 Calculate the flash and fire point of oil sample using Abel'sapparatus

4.2 Calculate the flash and fire point of oil sample using Pensky Martin'sapparatus

4.3 Find the percentage of CO.CO_2 and O_2 of a sample of flue gas by Orsatapparatus

5.0 **Analysis of Coal**

5.1 Find the percentage composition of moisture content, volatile matter, ash content and fixed carbon content of coal using proximate analysis ofcoal

6.0 Analysis of common salt

6.1 Estimating of chlorides content present in common salt.

6.2 Determination of sulphates content in a given sample.

7.0 Test and Review

7.1 Review of all the experiments done

7.2 Conducting a pre final examination

IV SEMESTER

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
IV SEMESTER
SCHEME OF INSTRUCTIONS AND EXAMINATION

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practical		Duration (hrs)	Sectional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
CH-ST-401	Engineering Mathematics-III	3	-	45	3	20	80	100
CH-ST-402	Electrical Technology	5	-	75	3	20	80	100
CH-ST-403	Mechanical Unit Operations	6	-	90	3	20	80	100
CH-ST-404	Mass TransferOperations -I	5	-	75	3	20	80	100
CH-ST-405	Sugar Cane Agriculture and Sugar chemistry	4	-	60	3	20	80	100
CH-ST-406	Sugar Technology Chemical Control	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
CH-ST-407	Electrical Technology Laboratory	-	3	45	3	40	60	100
CH-ST-408	Communication skills	-	3	45	3	40	60	100
CH-ST-409	Sugar Technology Chemical ControlLaboratory	-	6	90	3	40	60	100
CH-ST-410	Mechanical Unit Operations Laboratory	-	3	45	3	40	60	100
	Total	**27**	**15**	**630**	**-**	**280**	**720**	**1000**

Note: CH-ST- 401 & 408 common to ALL BRANCHES

Course Code	Course Title	No. of Periods/week	Total No. of periods	Marks for FA	Marks for SA
CHST-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 (withoutproof) 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 Transformsand 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.

C-20
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

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

Unit Test I **C –20, CHST-401**

State Board of Technical Education and Training, A. P

First Year

Subject Name: Engineering Mathematics-II

Sub Code: CHST -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. Each question carries **eight** marks
(2) 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-II

Sub Code: CHST-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 $L\left\{te^t\right\}$. **(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 $L\left\{te^{-t}\cos t\right\}$. **(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 –CHST- 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 – CHST-401

TIME : 3 HOURS **MODEL PAPER- 2** **MAX.MARKS : 80M**

PART-A

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

1. Solve $\left(D^2+4D+4\right)y=0.$ **CO1**
2. Solve $\left(D^2+9\right)y=0.$ **CO1**
3. Find the particular integral of differential equation $\left(D^2-4D+3\right)y=e^{4x}.$ **CO1**
4. Find the particular integral of differential equation $\left(D^2-4D-5\right)y=\cos 2x.$ **CO1**
5. Find $L\left\{2-e^{-2t}+\sinh 6t\right\}.$ **CO2**
6. Find $L\left\{e^{-2t}t^2\right\}.$ **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 $f(x)=x+x^2$ in the interval $(-1,1).$ **CO3**
9. Write Euler's formula of Fourier expansion of $f(x)$ in the interval $(c,c+2\pi).$ **CO3**
10. Find the value of a_1 in the half range cosine series of $f(x)=\pi$ in the interval $(0,\pi).$ **CO3**

PART-B

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

11. A) Solve $\left(D^3+1\right)y=0.$ **CO1**

Or

B) Solve $\left(D^2+D-6\right)y=e^{3x}+e^{-3x}.$ **CO1**

12. A) Solve $\left(D^2-3D+2\right)y=\cos 3x.$ **CO1**

Or

B) Solve $\left(D^2+2D+1\right)y=2x+x^2.$ **CO1**

13.A) Evaluate $L\left\{e^{3t}\cos^2 t\right\}.$ **CO2**

Or

B) Evaluate $L\left\{t^2\cos 2t\right\}.$ **CO2**

14.A) Evaluate $L\left\{\frac{e^{-at}-e^{-bt}}{t}\right\}.$ **CO2**

Or

B) Using Laplace transforms evaluate $\int_0^\infty \cos 3t dt.$ **CO2**

15.A) Find $L^{-1}\left\{\log\left(\frac{s^2+1}{(s-1)^2}\right)\right\}$. **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 $f(x)=(\pi-x)^2$ in the interval $0 \prec x \prec 2\pi$ and hence deduce that $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+---=\frac{\pi^2}{6}$. **CO3**

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CHST-402ELECTRICAL TECHNOLOGY

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-402	ELECTRICAL TECHNOLOGY	5	75	20	80

S.NO.	Chapter/unit title	No. of periods	Cos mapped
1.	D.C & A.C Circuits	15	**CO1**
2.	Electromagnetismand Electromagnetic Induction	15	**CO2**
3.	D.C & A.C Machines	25	**CO3**
4.	Electrical Measuring Instrument	10	**CO4**
5.	Electrical equipment's & safety procedures used in industry.	10	**CO5**
		75	

COURSE OBJECTIVES:	1. To familiarize DC and AC circuits, electromagnetism and electromagnetic induction 2. To understand classify, apply principles, construction and working of AC and DC machines 3.To understand different components, safety precautions in industries and working of electronic devices

CO NOS		COURSE OUTCOMES
CO1	**CHST-402.1**	**Define the various terminologies, concepts, importance and classifications of Dc and Ac circuits.**
CO2	**CHST-402.2**	**Analyse the various laws with equations, statements of Electromagnetic induction**
CO3	**CHST-402.3**	**Analyse principles of Ac and Dc machines, types, Derivations, solved problems, calculations, applications.**
CO4	**CHST-402.4**	**Explain uses and analysis of Electrical measuring instruments.**
CO5	**CHST-402.5**	**Analyse Equipment's & safety procedures used in Electrical industry**

LEARNING OUTCOME

Chapter-1

1.1 Define 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-induced emf
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) and solve the problems
3.6 Explain the necessity of starter and explain 3 point starter with neat diagram.
3.7 Explain speed control of D.C. Shunt motor by armature control and (b) Field control methods.
3.8 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 Explain step – up and step – down and auto transformers.

3.14 Classify the three phase induction motors and single phase Induction motors – state the application of Each motor.
3.15 Explain the construction and working principles of 1 & 3 – phase Induction Motors
3.16 Explain the necessity of starter in 3-phase induction motor
3.17 Explain i) DOL starter ii) Star Delta Starter with neat diagrams.
3.18 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 equipment's or live wires. In sugar / chemical industries
5.9 State procedures for first aid to a person came into contact with electric shock In sugar / chemical industries

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 – Kirchhoff'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 – electromagneticinduction– 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. Electrical equipment's & 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 centers- safety precautions to prevent shock – safety procedures for first aid against electric shock.

REFERENCE BOOKS:

S.No.	Book Title	Author	Publications
1	Electrical Technology (Vol – I and Vol – II)	4. B.L. Theraja 5. A.K. Theraja	S.CHAND Publishing House
2	Fundamentals of Electrical Engineering and Electronics	B.L. Theraja	S.CHAND Publishing House
3	The Art and Science of utilization of electrical energy	1. Siva Nagaraju. 2. D.Srilatha	PEARSON Publishing House
4	Electrical Technology	V.K. Mehta	S.CHAND Publishing House
5	Electrical Technology	Huges	PEARSON Publishing House

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-402.1	2	2	2					1		
CHST-402.2	3	2			2			2	2	2
CHST-402.3	2	1	1	2				3		
CHST-402.4	3	3	2		2			2	3	1
CHST-402.5	2			1				2		
Average	2.4	2	1.6	1.5	2			2	2.5	1.5

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

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'sMapped
				R	U	Ap	An	R	U	Ap	An	
1	D.C & A.C Circuits	15	**14**	**3**	**3**	**8**		**1**	**1**	**1**		**CO1**
2.	Electromagnetism and Electromagnetic Induction	15	**11**		**3**	**8**	**10**		**1**	**1**		**CO2**
3.	D.C & A.C Machines	25	**17**	**6**	**3**	**8**	**10**	**2**	**1**	**1**		**CO3**
4	Electrical Measuring Instrument	10	**14**	**3**	**3**	**8**		**1**	**1**	**1**		CO4
5	Understand the different equipment's & safety procedures used in industry.	10	**14**	**3**	**3**	**8**	**10**	**1**	**1**	**1**		CO5
***ONE QUESTION IN PART C OF 10 MARKS FROM CHAPTERS CO2,CO3,CO5**			10*									
Total		**75**	**80**	**15**	**15**	**40**	**10***	**5**	**5**	**5**	**1***	

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

Unit Test	Learning outcomes to be covered
Unit Test - I	From 1.1 to 3.9
Unit Test - II	From 3.10 to 5.9

MODEL QUESTION PAPERS FOR UNIT TESTS

C –20, CHST -402

UNIT TEST I

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

IV Semester

Subject Name: ELECTRICAL TECHNOLOGY

Sub Code: CHST - 402

Time: 90 minutes UNIT TEST I Max.Marks:40

Part-A 16Marks

Instructions: (1) Answer all questions.
(2) First question carries four marks of each one mark and remaining each question Carries three marks

1. Answer the following

   a) What is the unit of Resistance_____

   b) Fleming's left hand rule finds application in Motors. (T/F)

   c) The function of commutator in a DC Machine is _____

   d) frequency is reciprocal of time period (T/F)

2. State ohms law.
3. Define self-inductance.
4. Explain phase and phase difference.
5. Classify the DC Generators.

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) State Kirchhoff's laws with neat diagram.

   Or

   (b) State phase relationship between voltage and current In RLC series circuit.

7. (a) State faraday's laws of electromagnetic induction.

   Or

   (b) Explain self- inductance, mutual-inductance and coefficient of coupling.

8. (a) Explain 3-point starter with neat diagram.

   Or

   (b) Explain the working principle of DC Motors.

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MODEL QUESTION PAPERS FOR UNIT TESTS

C –20, CHST -402

UNIT TEST II

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

IV Semester

Subject Name: ELECTRICAL TECHNOLOGY

Sub Code: CHST **- 402**

Time: 90 minutes **Unit Test II** **Max.Marks:40**

Part-A **16Marks**

Instructions: (1) Answer **all** questions.
(2) First question carries **four** marks of each one mark and remaining each question Carries **three** marks

1. Answer the following
   a) A transformer transforms _____
   b) Megger is used to measuring the insulation resistance. (T/F)
   c) Fuse can protect the circuit from _____.
   d) The frequency of DC supply is Zero. (T/F)
2. State the applications of three phase induction motor.
3. State the uses of Energy meter and multimeter.
4. Classify the methods of electric welding.
5. State the function of switch and fuse.

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) Explain the construction and working of Three phase induction motors.

   Or

   (b) Explain DOL starter with neat diagram.

7. (a) Explain the construction and working of MI Type instruments.

   Or

   (b) Explain the construction and working of thermocouple instruments.

8. (a) Explain the working of DC Welding Generator with a neat sketch.

   Or

   (b) Explain the procedure for first aid to a person came into contact with live wires.

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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	Question	Marks allocated	Blooms category	CO addressed
	PART-A			
1.	Define (i) Current (ii) Electric Potential.	3	Remembering	CO1
2.	State Ohm's law.	3	Remembering	CO1
3.	Define phase and phase difference.	3	Remembering	CO2
4.	State Lenz's law.	3	Remembering	CO2
5.	Define the following : (a) flux (b) flux density	3	Remembering	CO3
6.	Classify the D.C.Motors.	3	Remembering	CO3
7.	State EMF equation of a Transformer.	3	understanding	C04
8.	State the uses of : (a) Megger (b) Multimeter	3	Remembering	CO4
9.	Explain basis principal of electric welding.	3	Understanding	CO5
10.	State the functions of (i) Fuse (ii) Relay	3	Remembering	CO5
	PART-B			
11	State and explain Kirchhoff's laws(or) A series circuit having a resistance of 40Ω, capacitance of 20μF, and inductance of 0.2H is connected across 110V, 50Hz supply. Calculate (i) Impedance (ii) Current (iii) Power factor	8	understanding	CO1
12	Express the field strength due to straight current carrying conductor.(or) Explain self-inductance and mutual inductance.	8	Analyzing	CO2
13	Explain speed control of D.C. shunt motor by armature and field Control methods.(or) Explain 3-point starter with neat diagram.	8	Analyzing	CO3
14	Explain construction and working of Moving Coil instrument.(or) Explain thermocouple instrument for measuring temperature.	8	applying	CO4
15	Explain the working of DC welding Transformer with neat diagram.(Or) Explain the procedure for first aid to a person came into contact with live wires.	8	Analyzing	CO5
	PART-C			
16	Analyze the working of 3-phase induction motor with a neat diagram.	10	Analyzing	CO2

CHST-403 : MECHANICAL UNIT OPERATIONS

Course code	Course title	No. of periods/week	Total no of periods	Marks for FA	Marks for SA
CHST-403	MECHANICAL UNIT OPERATIONS	6	90	20	80

TIME SCHEDULE

S.No.	Chapter / unit title	No of periods	Co's Mapped
1.	Introduction and Properties of particulate Solids, Storage and conveyance	18	CO1
2.	Mixing	16	CO2
3.	Size Reduction	20	CO3
4.	Mechanical Separations	20	CO4
5.	Filtration	16	CO5
	Total Periods	**90**	

Course Objectives	(i).Toget the knowledge for solids and its flow properties. And to understand the basic concepts of mechanical operations such as Size analysis, Size reduction, solid handling, solid separations and mixing etc. (ii) To Familiarize with mechanical separation method such as filtration, sedimentation, transportation and storage of solids etc. and associated equipment used for achieving these methods. (iii) The students are able to understand basic principles of various mechanical operations, construction and working of the equipment's in various solid handling operations.

COURSE OUTCOMES		
CHST-403.1	C01	Describe Mechanical Unit Operations principles , conveyance and storage methods of solids
CHST-403.2	C02	Explain the various size reduction equipments
CHST-403.3	C03	Identify the various size reduction operations
CHST-403.4	C04	Analyze the principlesand operation of variousmechanical separation equipment.
CHST-403.5	C05	Explain mechanical separation in chemical industries.

LEARNING OUTCOMES:

1. 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 Define volume –surface mean diameter. Explain the mixed particle sizes and size analysis.
1.4 Describe the specific surface, average particle size and particle population.
1.5 Specify various standard screening sieves viz. Taylor standard series & Indian standard series.
1.6 Demonstrate differential & cumulative screen analysis.
1.7 Compare actual& ideal screens. Distinguish between screen effectiveness and screen capacity.
1.8 Derive the equation for screen effectiveness. Solve problems on screen analysis and

screen effectiveness

1.9 Generalize storage of solids.Understand the bulk storage of solids

1.10 Explain bin storage-Flat bottomed bins, sloped bottomed bins. Explain silos and hoppers.

1.11 List out various conveyors.Demonstrate the working principles of
- (a) conveyors-belt conveyors
- (b) screw conveyors
- (c) Bucket Elevators
- (d) pneumatic conveyors

2. **Understand the objective of mixing.**

2.1 State the various mixing equipments.

2.2 Explain the mixing of various systems like liquid-liquid, solid-liquid, gas-liquid, solid-solids

2.3 Explain the working principle of mixing equipment's used for liquid-liquid mixing-propellers, Paddles and turbines

2.4 Describe the working principle of mixing equipment's used for solid mixing-Ribbon blenders,Tumbling mixers, pug mill

2.5 Describe the working principle of mixing equipment's used for viscous masses-kneading machines, and Banbury mixer

2.6 Differentiate between mixing, agitation and blending

2.7 Explain vortex formation and its significance

3. **Understand the size reduction operation**.

3.1 Explain the principle involved in size Reduction

3.2 Define mechanical efficiency and crushing efficiency.

3.3 State and explain (a) Rittinger's Law (b) Kick's Law (c) Bond's crushing law and work index.

3.4 Evaluate the power requirement for crushing and grinding.

3.5 Classify the size reduction equipment.Distinguish the crushing and grinding equipment.

3.6 Explain the working principles of following crushing equipment: Jaw crusher, GyratoryCrusher, Roll crusher.

3.7 Explain the working principles of the following grinding equipment: Hammer mill, Rod mill,Ball mill and Ultrafine grinders.

3.8 Evaluate angle of nip in crushing rolls.Evaluate the critical speed of Ball mill.

3.9 Mention the applications of various crushers and grinders.

3.10 Distinguish between closed circuit grinding and open circuit grinding.

3.11 Solve simple problems based on Rittinger's Law, Kick's Law and Bond's crushing law.

3.12 Solve problems on evaluating critical speed of a ball mill, angle of nip of Roll Crusher

4. Understand mechanical separations.

4.1 List out the industrial screens and mention their applications.

4.2 Demonstrate the working of Grizzlies, Trammels, Shaking and vibrating screens.

4.3 Understand various classifiers. Describe hydraulic classifiers-Mineral jig, Wilfley table

4.4 Explain the working principle of froth flotation.

4.5 Explain magnetic separation and electro separation.

4.6 Explain air separation methods-Air separator, cyclone separator, Bag filter.

4.7 Demonstrate working principles of Electrostatic precipitator and scrubber.

4.8 Describe the process of batch sedimentation and identify various zones.

4.9 Explain the Stokes law. Define terminal velocity.

4.10 Differentiate between free settling and hindered settling.

4.11 Explain the principle of working of industrial thickener with diagram.

4.12 Solve simple problems on terminal velocity.

5. **Know about filtration.**

5.1 State the principles of cake filtration.

5.2 State the principles of constant rate filtration and constant pressure filtration.

5.3 Demonstrate the working principle of plate and frame filter press and leaf filter.
5.4 Draw a neat sketch of rotary drum filter.
5.5 Explain the working principle of continuous rotary drum vacuum filter.
5.6 State various types of filter medium used and its requirements.
5.7 Understand the functions of filter aid and mention various filter aid.
5.8 State the principles of centrifugal filtration.
5.9 Mention application and selection of various filters.
5.10 Draw the neat sketches of centrifugal filters.
5.11 Explain the working principle of Batch and continuous centrifugal filters.

COURSE CONTENTS :

1. **Properties of particulate solids, Storage and conveyance of solids:** Particle size, shape, density and sphericity-mixed particle sizes 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 on screen Effectiveness.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.
2. **Mixing:** Objectives of mixing, Liquid-liquid mixers-paddles, turbines, propellers, agitators-
   Solid-liquid mixers, mixer for viscous masses-Banbury mixer, ribbon blenders, tumbling Mixers.
3. **Size Reduction:** Principles of communition-Size Reduction laws-Efficiencies in sizeReduction-Size reduction equipment (crushers and grinders)-Evaluation of angle ofNip-critical speed of ball mill-Closed circuit grinding and open circuit grinding- simple
   Problems on size reduction laws.
4. **Mechanical Separations:** Industrial screens-Their applications-Grizzlies, Trammels,Shaking, vibrating screens, classifiers-hydraulic classifiers, jigging, tabling, frothFlotation-Magnetic separation and electrostatic separation-Air separation-cycloneSeparator, bag filters, electrostatic separators.
5. **Filtration:** Application of filters-Classification of filters-Selection of filters-Plate andFrame filter press, leaf filters, continuous rotary filters-Filter aids-Constant pressure andConstant 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 Herriot.
McGraw Hill Publication, Fifth Edition.
2. Introduction to chemical Engineering by Warren L. Badger & Julius T. Banchero, McGraw – Hill publication.
3. Unit Operations –I & II, K.A.Ghavane, NiraliPrakasham Publications.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-403.1	1	1						2		
CHST-403.2	3	2	2		2			2	2	2
CHST-403.3	2	1	2	2				3		
CHST-403.4	2	3	2		2			3	2	1
CHST-403.5	3	2		2				2		
Average	2.2	1.8	2	2	2			2.4	2	1.5

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

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 and Properties of particulate Solids, Storage and conveyance**	18	17	3	6	8		1	2	1		**CO1**
2	**Mixing**	16	11	3	-	8		1	-	1		**CO2**
3	**Size Reduction**	20	11	3	3	8	**10***	1	1	1		**CO3**
4	**Mechanical Separations**	20	17	3	3	8	**10***	1	1	1		**CO4**
5	**Filtration**	16	14	3	3	8	**10***	1	1	1		**CO5**
***ONE QUESTION IN PART C OF 10 MARKS FROM CO3,CO4 & CO5**			10*								**1***	
	TOTAL	**90**	**80**	**15**	**15**	**40**	**10**	**5**	**5**	**5**	**1**	

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

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 3.12
Unit Test-II	From 4.1 to 5.11

MODEL QUESTION PAPERS FOR UNIT TESTS

UNIT TEST I **C –20, CHST -403**

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

IV Semester

Subject Name: **Mechanical Unit Operations**

Sub Code: CHST **– 403**

Time : 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following
   a) Name any two standard screening sieves
   b) Hopper is a temporary storage mean (T/F)
   c) Vortex formation leads to in efficient mixing (T/F)
   d) Operating speed of the ball mill is must be less than _____
2. State the importance of mechanical unit operations
3. Define open/bulk storage
4. Classify the mixing equipment
5. Define angle of nip in crushing rolls

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. Explain construction and working of a belt conveyor with a neat sketch.

   (OR)

   Explain differential and cumulative screen analysis

7. Explain the mixing of liquid- liquid systems

   (OR)

   Explain the construction and working of a Bunbury mixer with a neat diagram

8. Explain construction and working of a ball mill with a neat sketch

   (OR)

   Evaluate critical speed of a ball mill

***

UNIT TEST II **C –20, CHST -403**

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

IV Semester

Subject Name: **Mechanical Unit Operations**

Sub Code: CHST **– 403**

Time : 90 minutes **Unit Test II** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following

   a) Moisture content adversely affect the screening ((T/F)

   b) the porosity of cake is increased by adding _____

   c) write the driving force for filtration

   d) At early stages of filtration, the rate of filtration is _____

2. List various industrial screens
3. Define stokes law
4. Define filter medium
5. Write the classification of filtration equipment

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. Explain the working principle of cyclone separator with a neat diagram

   (OR)

   Explain construction and working of a trommel with a neat sketch

7. Explain batch sedimentation process with a neat diagram

   (OR)

   Explain construction and working of pressure filter with a neat sketch

8. Explain construction and working of a suspended batch centrifuge with a neat diagram

   (OR)

   Explain the working principle of a vacuum filter with neat sketch

***

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	Marks allocated	Bloom's category	CO addressed
	PART – A (30 marks)			
1.	Define mesh. List the various standard screening sieves	3	R	CO1
2.	Differentiate between actual & ideal screens	3	U	CO1
3.	List the applications of various conveyors	3	R	CO1
4.	State vortex formation	3	U	CO2
5.	Define size reduction. Name the basic principles of size reduction	3	R	CO3
6.	State angle of nip in a roll crusher	3	U	CO3
7.	Differentiate between free settling and hindered settling	3	R	CO4
8.	Draw and identify the parts of a cyclone separator	3	R	CO4
9.	Write the classification of filtration equipment	3	U	CO5
10.	Define filter aid and write its function	3	U	CO5
	PART – B (40 marks)			
1.	Explain about various storages adopted in Industries with neat diagrams(or) Explain construction and working of a screw conveyor with a neat sketch.	8	AP	CO1
2.	Explain liquid-liquid mixing with a neat sketch of mixing pattern (or) Explain the construction and working of Ribbon blenders with neat sketch.	8	AP	CO2
3.	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) Explain the working principle of a ball mill with neat diagram.	8	AP	CO3
4.	Explain the working principle of a froth flotation tank with a neat sketch(or) Explain batch sedimentation process with neat sketch	8	AP	CO4
5.	Explain construction and working of a plate and frame filter press with a neat diagram (or) Explain the working principle of a continuous rotary drum filter with a neat sketch	8	AP	CO5
	PART – C (10 marks)			
1.	Compare the various equipments used for grinding and crushing	10	AN	CO3

CHST – 404 MASS TRANSFER OPERATIONS-I

Course code	Course title	No. of periods/week	Total no of periods	Marks of FA	Marks for SA
CHST - 404	MASS TRANSFER OPERATIONS-I	5	75	20	80

TIME SCHEDULE

S.No	Chapter/unit title	No. of periods	CO's Mapped
1	Introduction about mass transfer operations	09	CO1
2	Diffusion	12	CO2
3	Inter phase mass transfer	12	CO3
4	Distillation	24	CO4
5	Absorption	18	CO5
Total		**75**	

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 iii. materials, packed bed columns, Mc-Cabe Thiele method of determine the number of stages, limiting operating conditions, stage and efficiency of distillation of column. iv. To know the operating equation for absorption and stripping, equilibrium diagrams, stages, characteristics, equipment used, problems based on for absorptions and stripping.

CO NOS		COURSE OUT COMES
CO1	CHST-404.1	Explain the basics of mass transfer operations
CO2	CHST-404.2	Evaluate the efficiency of diffusion.
CO3	CHST-404.3	Illustrate the basic operations of inter phase mass transfer
CO4	CHST-404.4	Analyse the distillation operation and equipment details
CO5	CHST-404.5	Examine the principle of absorption and equipment

LEARNING OUT COMES:

After the completion of the subject, the student will be able to

1.0 Introduction about mass transfer operations:

1.1 Define the mass transfer operation
1.2 Know about the unit process, unit operation with examples.
1.3 Know the classification of Mass Transfer operations
1.4 Distinguish various mass transfer operations.
1.5 Identify the different terms and symbols involved in different operations.
1.6 Explain the steady state and unsteady state operations.
1.7 Know about membrane separations
1.8 Understand Reverse osmosis

2.0 Diffusion

2.1 Understand the process of diffusion
2.2 Understand the meaning of equilibrium between phases.
2.3 Define Fick's First Law of diffusion
2.4 Explain the process of molecular diffusion with example
2.5 Explain eddy diffusion.
2.6 Distinguish molecular diffusion and eddy diffusion
2.7 Identify the unit operations that depend on diffusion.
2.8 Know the various fluxes and their units with examples.
2.9 Understand diffusion in single phase.
2.10 Diffusion in gases and liquids for the cases (i) equimolar counter diffusion and (ii) diffusion of a through non diffusion (Derivations not required).
2.11 Simple problems on molecular gas phase diffusion for the above two cases. Problems on molecular liquid phase diffusion for the above two cases

3.0 Interphase mass transfer

3.1 Understand Interphase mass transfer
3.2 Define mass transfer coefficient
3.3 Know the two resistance theory.
3.4 Write the relations between individual and overall Mass Transfer coefficient (Derivations not required).
3.5 Write various equations relating individual and overall Mass Transfer coefficient
3.6 Know the phase rule
3.7 Definitions of stage,cascade.
3.8 Know the concept of ideal stages multistage contact
3.9 Know the batch, continuous contact operations.
3.10 Know the co-current, counter- current contact and cross current operations.
3.11 Definition of stage efficiency.

4.0 D**istillation**

4.1 Define distillation,Apply phase rule to distillation.
4.2 Define Raoult's law, Henry's law and ideal solution.
4.3 Define relative volatility and its significance.
4.4 Know about equilibrium and boiling point diagrams.Define and explain equilibrium distillation.
4.5 Distinguish between batch distillation and continuous distillation.
4.6 State Rayleigh's equation,Understand steam distillation.
4.7 Explain the process of continuous distillation with rectification and stripping.
4.8 Discuss Bubble cap and sieve tray columns.
4.9 Analyze the effect of feed conditions and feed plate location.
4.10 Define reflux ratio and explain min and optimum reflux ration.
4.11 State Mc. Cabe Thiele assumptions, Solve problems in distillation and calculation of no. of ideal stages using Mc. Cabe – Thiele method.
4.12 Define and explain overall plate efficiency and factors influencing them.
4.13 Know about constant boiling mixture, high boiling and low boiling azeotropic mixture.
4.14 Explain the azeotropic distillation and its applications.Know the concept of multi component distillation.

5.0 Absorption and Adsorption:

5.1 Explain absorption with examples.
5.2 Know about stripping operation with examples
5.3 Know the choice of solvent for absorption.
5.4 Describe absorption towers and tower packings.
5.5 Equilibrium diagram for absorption operation
5.6 Apply material balances for absorption tower.
5.7 Understand minimum liquid to gas flow rate ratio.
5.8 Know the concept of number of transfer units
5.9 Know about HTU,HETP and height of a packed tower
5.10 Know about channeling, loading and flooding.
5.11 Know about flooding velocity
5.12 Know about packed towers
5.13 Distinguish between plate tower and packed tower.
5.14 Problems based on principles of absorption such as calculation of packed tower height, HTU, NTU.

COURSE CONTENTS:

1. **Mass transfer operation** – unit process – unit operation – classification of Mass Transfer Operations – terms and symbols involved – distinguish various Mass Transfer Operations – steady state and unsteady state operations- membrane separations - Reverse osmosis

2. **Diffusion** - understand equilibrium between phases -Principles of diffusion – molecular diffusion – Fick's first law – eddy diffusion – Distinguish between molecular and eddy diffusions – operations that depend on diffusion – various fluxes – diffusion in single phase – diffusion in gases and liquids – Equimolal diffusion – diffusion of "A" through non – diffusing "B" – problems.

3. **Interphase mass transfer** – various mass transfer coefficients – relation between individual and overall Mass Transfer Coefficient – two resistance theory – Phase rule – stage – cascade - ideal stage – multistage ,batch and continuous contacts – co-current , counter current contacts – stage efficiency
4. **Distillation** - Application of phase rule to distillation – Raoult's law – Henry's law – ideal solution – relative volatility – its significance – equilibrium and boiling point diagrams – equilibrium distillation – Batch distillation – continuous distillation – Rayleigh's equation – steam distillation – continuous distillation with rectification and stripping – feed conditions reflux ratio – minimum reflux and optimum reflux ratio – McCabe and Thiele assumptions – Mc. Cabe & Thiele method – stage efficiency – overall efficiency – factors influencing stage efficiency – bubble cap and sieve tray

columns – constant boiling mixtures – high boiling and low boiling azeotropic mixture – azeotropic distillation – problems on principles and Mc. Cabe Thiele method.

5. **Absorption,stripping** - Phase equilibrium in absorption – choice of solvent – absorption rower – tower packings – gas and liquid velocities – limitations – loading and unloading velocities – channeling – material balance – minimum liquid to gas rate ratio – number of transfer units – HTU – HETP - Problems-flooding velocity.

REFERENCE BOOKS:

S.NO	BOOK TITLE	AUTHOR	PUBLICATIONS
1.	Mass transfer operations	Robert E. Treybal	McGraw-Hill publications
2.	Unit operations of Chemical Engineering	L. McCabe, Julian C.Smith, Peter Harriot.	Mc. Graw Hill Publication, Fifth Edition
3.	Introduction to chemical engineering	Walter L. Badger & Julius T. Banchero	McGraw-Hill publications

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-404.1	2	1						2		
CHST-404.2	3	2	2		2			2	2	2
CHST-404.3	2	2	2	2	1			3		
CHST-404.4	3	3	2		2			3	2	2
CHST-404.5	3	2		2				3		
Average	2.4	1.9	2	2	1.6			2.6	2	2

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals,
attending seminars, learning software skills and watching the relevant in social media.

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	Introduction about mass transfer operations	09	14	3	3	8	-	1	1	1	-	CO1
2	Diffusion	12	14	3	3	8		1	1	1	1	CO2
3	Inter phase mass transfer	12		3	3	8		1	1	1		CO3
4	Distillation	24	14	3	3	8	*10	1	1	1		CO4
5	Absorption and Stripping	18	14	3	3	8	*10	1	1	1		CO5

***ONE QUESTION IN PART C OF 10 MARKS FROM CO4&CO5**			10*									
	TOTAL	**75**	**80**	**30**		**40**	**10**	**10**		**05**	**01**	

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	**Learning out comes to be covered**
Unit Test-I	**From 1.1 – 3.11**
Unit Test-II	**From 4.0-5.14**

MODEL QUESTION PAPERS FOR UNIT TEST

UNIT TEST-I **C-20,CHST-404**

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A.P

DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

IVSEMESTER

Subeject Name: MASS TRANSFER OPERATIONS-I

Sub Code: CHST-404

Time: 90 minutes **UNIT TEST-I** **Max.Marks:40**

Part-A **16 Marks**

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

(2) First question carries **four** marks of each one mark and remaining each question carries **three** marks

1. Answer the following
   a. Write the ideal gas law equation
   b. Distillation is one of the mass transfer operation (True / False)
   c. Total pressure exerted by a gas mixture is equal to the partial pressures of component gases present in the mixture is called _____
   d. _____ is the Driving force of mass transfer operation
2. Define unit operation with example
3. Differentiate eddydiffusion and molecular diffusion
4. Define mass transfer coefficient
5. Draw a neat diagram of co-current flow

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. Explain about reverse osmosis

   (or)

   Differentiate steady state and un-steady state operation in mass transfer operation

7. Explain about molecular diffusion with example

   (or)

   Explain Fick's law of diffusion

8. Explain the concept of multi stage contact

   (or)

   Explain about stage efficiency

***

UNIT TEST-II **C-20,CHST-404**

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A.P

DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

IV SEMESTER

Subject Name: MASS TRANSFER OPERATIONS-I

Sub Code: CHST-404

Time: 90 minutes **UNIT TEST-II** **Max.Marks:40**

Part-A **16 Marks**

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

(2) First question carries **four** marks of each one mark and remaining each question carries **three** marks

1. Answer the following

   a. A component with a higher boiling point with a lower vapour pressure at a given temperature is termed as _____

   b. In gas absorption .mass is transfer takes place from the ____ phase to _____ phase._____

   c. Packed columns are continuous gas- liquid contactors (True / False)

   d. In fractionating column, the liquid from tray above to tray below,flows via_____

2 Define reflux ratio

3. Differentiate absorption and adsorption

4. State Raoult's law

5.List various types of packing used in industries

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 Define relative volatility and its significance

(Or)

With a neat sketch explain about sieve tray column

7 Explain about azeotropic distillation

(Or)

Explain the choice of solvent for absorption

8 Explain the about packed towers used in absorption

(or)

Compare plate tower and packed tower

***

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.	Differentiate between steady state and un steady condition	R	3	CO1
2.	Define Molar diffusion,	R	3	CO2
3.	State Fick's law of Diffusion	R	3	CO2
4.	Write the importance of unit operation that depend on diffusion	R	3	CO4
5.	Draw a neat sketch of co-current and counter current flows.	R	3	CO4
6.	Define cascade	U	3	CO4
7.	Define Reflux ratio	R	3	CO4
8.	List out the applications of azeotropic distillation	R	3	CO1
9.	Differentiate between channelling and flooding	U	3	CO5
10.	Define adsorption with example	R	3	CO5
PART –B (40 marks)				
11.	Explain the classification of mass transfer operations(Or) Explain about Membrane separation	AP	8	CO1
12.	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 O2 in N2 is 1.81*10-5 m2/sDerive the equation for steady state diffusion of A through non-diffusing B	AP	8	CO2
13.	Write the concept of ideal stages multi stage contact.(or) Explain the two resistance theory	AP	8	CO3
14.	Define relative volatility and write its significane	AP	8	CO3
15.	Explain the choice of solvent for absorption (or) Distinguish between plate tower and packed tower	AP	8	CO4
PART – C (10 marks)				
16.	When steam distillation is preferred over simple distillation	AN	10	CO4

CH ST-405 SUGAR CANE AGRICULTURE and SUGAR CHEMISTRY

Course code	Course title	No. Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-405	SUGAR CANE AGRICULTURE AND SUGAR CHEMISTRY	4	60	20	80

S.NO.	Chapter/unit title	No. of periods	Cos mapped
1.	SUGAR CANE AGRICULTURE History and Botany of Sugar Cane, Soils and climate conditions	10	CO1
2.	Preparatory cultivation, seed selection and planting methods of sugar cane	12	CO2,
3.	Irrigation, drainage, drought in sugar cane, Ratooning and Lodging in sugar cane	14	CO3,
4.	Maturity and harvesting of sugar cane, Nutrition, pests and diseases	12	CO4,
5.	SUGAR CHEMISTRY Properties of Sugar, P^H and its role in sugar manufacture, principles of polarimetry	12	CO5
TOTAL		**60**	

COURSE OBJECTIVES:	1. To familiarize with the terms used in sugar cane Agriculture- Soil, climate, cultivation,seed,planting,Irrigation,Drainage,drought,Ratooning,lodging,nutrition. 2. To understand the seed selection, choose good yield verities of seed, land preparation for cultivation, irrigation methods to the crop, control pest and diseases of sugar cane. 3. To understand about stages of growth in sugar cane. nutrition for crop, Ratooning methods, lodging control methods, the pH of soil, good climatic condition to planting and harvesting of sugar cane,pH importance-principles of

LEARNING OUTCOMES

CO NOS		COURSE OUTCOMES
CO1	CHST-405.1	Explain concepts of agriculture, history and botany of Sugar Cane, Soils and climate conditions.
CO2	CHST-405.2	Indicate Seed selection, types of soil, cultivation Methods, land preparation.
CO3	CHST-405.3	Explain climatic condition, irrigation methods of drainage droughts, ratooning and lodging, in sugar cane
CO4	CHST-405.4	Suggest the maturity harvesting of sugar cane and explain pests, diseases, and nutrition for crop
CO5	CHST-405.5	Analyse the physical and chemical properties of sugar, pH, Understand about the polarimetry.

After completion of the course, the student will be able to

SUGAR CANE AGRICULTURE

1.0 Understand the History of sugar cane,

1.1 Explain origin and spread of sugar cane in India & other countries

1.2 Explain the development of sugar cane in India.

1.3 List the important countries, important states in India cultivating sugar cane and their place of ranking.

Understand the Botany of sugar cane

1.4 Distinguish between cultivated species and wild species of cane with examples.

1.5 Draw sketch of sugar cane and identify the parts.

1.6 Explain the importance of germination and root development in cane.

1.7 Explain the functions of stem, leaf, bud in cane.

1.8 State the importance of inflorescence, node, and internodes in cane.

Understand the, the elementary knowledge of soils and climatic condition of sugar cane

1.8 Define soil and composition of soils.

1.9 Explain the factors influencing in the formation of soils.

1.10 State the important types of soils in India with their characters. (Viz. Red, Alluvial, laterite, black).

1.11 Define 'Climate' and 'Tropical climate'.

1.12 State the general climatic conditions required for sugar cane growth to give good yield.

1.13 State the two types of crops cultivated in sugar cane and differentiate between EKSALIC & ADSALIC crops.

2.0 Understand the preparatory cultivation,

2.1 Explain the significance of preparatory cultivation.

2.2 State the points that should be kept in view for land preparation.

2.3 Explain the general schedule followed for cultivating sugar cane in our state.

2.4 State the various types of cultivation followed in our country and effect of depth preparatory cultivation.

2.5 Explain the cultivation methods of "Deep planting trenches" Ridgemer, Crow barying and Tractor followed in A.P.

Understand the, seed selection and planting methods of sugar cane.

2.6 Define seed rate.

2.7 State the influencing factors of seed rate.

2.8 State and explain the types of planting methods adopted for sugar cane.

2.9 State and explain the method of "FURROW" planting adopted in A.P and its advantages.

3.0 Understand the irrigation, drainage, drought in sugar cane.

3.1 Define irrigation.

3.2 Mention the factors for need of irrigation in sugar cane.

3.3 Explain the irrigation requirement for sugar cane whole life.

3.4 Explain the methods adopted for irrigating the sugar cane crop.

3.5 Define drainage and effects of drainage on sugar cane.

3.6 Explain the various methods adopted for solving the drainage problem.
3.7 Define drought.
3.8 Explain effects of drought and methods of control in sugar cane.

Understand the Ratooning and Lodging in sugar cane

3.9 Define Ratooning in sugar cane.
3.10 State the advantages and disadvantages of Ratooning crop.
3.11 Define lodging.
3.12 Explain the effects of lodging and its control methods.

4.0 Understand the maturity and harvesting of sugar cane

4.1 State the various factors effecting the quality and yield on the cane.
4.2 Explain the favorable factors for lodging and disadvantage due to lodging.
4.3 Explain the preventative methods adopted to lodging of sugar cane.
4.4 Define maturity of sugar cane.
4.5 State the three governing factors of maturity in sugar cane.
4.6 Explain the various factors affecting in ripping of maturity in sugar cane.
4.7 Explain the various tests conducted to identify the stage of maturity in sugar cane.
4.8 Explain the methods of harvesting in sugar cane.
4.9 Explain latest harvesting methods in sugar Cane cultivation.

Understand the application and essentiality of nutrition in sugar cane,

4.10 Define nutrition crop.
4.11 State the application of manures to crop.
4.12 Explain the influence of nutrients in sugar cane crop.
4.13 Explain the function & symptoms of deficiency and application of fertilizer elements (NPK).

Understand the sugar cane pests & diseases –and their control.

4.14 Define the pests in sugar cane & Explain the effects on cane due to pest
4.15 Explain the casual organism & symptoms of identification of various pests and their control methods of sugar cane Viz…Borer: Pyrilla: Termites: Mealy bug: Scale insect
4.16 Define diseases of sugar cane and effects of diseases in sugar cane.
4.17 Explain the casual organism symptoms to identify the diseases and control methods of various diseases. Viz.. Red rots; smut (or) whip smut; Wilt; Grassy shoot, Pineapple diseases.

SUGAR CHEMISTRY

5.0 Understand the properties of Sugar

5.1 Explain the physical properties of sugar
5.2 Explain the chemical properties of sugar

Understand the p^H and **its role in sugar manufacture**

5.3 Define pH.
5.4 Explain pH determination by test papers and pH meter.
5.5 Explain the role of pH in sugar manufacture.

Understand Polarimetry.

5.6 Define plane polarization.
5.7 Discuss specific rotating power in sugar.
5.8 Explain the principle of polarimetry.
5.9 Identify International Sugar scale or Sachari mete scale.
5.10 Explain the practical considerations while using Polari scope
5.11 Define normal weight of sugar
5.12 Prepare normal solution.
5.13 Differentiate a polarimeter and a saccharimeter**.**

Hyponated course content with Reference books:

1. **History of Sugar cane**

   Origin and spread of sugar cane – Development of sugar industry in India – Impartial countries, states in India cultivating sugar cane.

Botany of Sugar cane

Botanical classification of sugar cane-sketch and identification of various parts in sugar cane and their functions.

Soils and climatic conditions of sugar cane

Elementary knowledge of soils – Climate conditions favorable to sugar cane – Types of crops cultivated.

2. **Preparatory cultivation**

Preparation of land (field) for cultivation. General schedule of cultivation – type of cultivation

Seeds to selection and planting methods of sugar cane

Importance of seed selection – Methods of seed treatment, seed rate, planting methods adopted in sugar cane.

3. **Irrigation – Drainage – Drought of sugar cane**

Need of irrigation – Scheduling of irrigation – Normal requirement of irrigation – Methods adopted in sugar cane – Importance of drainage – Effects of drainage to crop – Methods adopted – Drought in sugar cane – Effects of drought removing methods.

Ratooning and Lodging in sugar cane

Importance of Ratooning – Pre required conditions for Ratooning – Advantages and disadvantages of crop – Manuring of rations – Mixtures, rotations of crop – Lodging

4. **Maturity and harvesting in sugar cane**

Factors affecting the quality and yield of sugar cane – Maturity and its governing factors – Factors affecting the ripening in sugar cane – Various tests for maturity – Harvesting

Methods of croping in sugar cane – Favorable factors of lodging disadvantages – Preventive methods.

Nutrition in sugar cane

Criteria for essentiality of nutrition – Composition of elements in crop Requirement of elements Influence of nutrients – Functions Symptoms of deficiency and application of fertilizer elements (NPK)

Sugar cane pests and diseases

Various types of diseases occurring to cane – Their effects – Casual organism Symptoms of identity – Controlling methods. Various types of pests attacked to cane their effects casual organism – Symptoms of identity – Control methods.

5. **Properties of Sugar**

Properties of sugar -physical properties, chemical properties.

p^H and **its role in sugar manufacture**

Determine p^H by colorimetric & Electrometric method. Role of p^H in sugar manufacture.

Principles of Polarimetry

Polarimetry, specific rotatory power of sugar, polarimeter, international sugar scale,normal weight of sugar.

REFERENCE BOOKS

S.No.	Book Title	Author
1	Hand book of Cane Sugar Technology	R.B.L. Mathur.
2	Sugar Cane	Babu
3	Technology in Sugar Cane growing	M Lakshmi Kantam
4	Diseases of Sugar Cane	V.P. Agnihotri
5	Cane Sugar Agriculture	NoeL Derr
6.	Hand book of sugars	Junk
7.	Sugar Science and Technology.	Birch
8.	N.S.I and V.S.I	Notes
9.	Chemistry and processing sugar cane	Clarke

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-405.1	2							2		
CHST-405.2	3	2	2					2	2	2
CHST-405.3	3	2		2	1			3		
CHST-405.4	2		2					2	2	1
CHST-405.5	3	2		1				3		
Average	2.4	2	2	1.5	1			2.5	2	1.5

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

MODEL BLUE PRINT WITH WEIGHT AGES 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.	History and Botany of Sugar Cane, Soils and climate conditions	10	11	3		8		1		1		**CO1**
2.	Preparatory cultivation, seed selection and planting methods of sugar cane	12	17	9	8		10*	3	1		1*	**CO2**
3.	Irrigation, drainage, drought in sugar cane, Ratooning and Lodging in sugar cane	14	17	9	8			3	1			**CO3**

4.	Maturity and harvesting of sugar cane, Nutrition, pests and diseases	12	14	6	8			2	1			**CO4**
5.	Properties of Sugar, P^H and its role in sugar manufacture, principles of polarimetry	12	11	3		8		1		1		**CO5**
* ONE QUESTION IN PART-C for 10 MARKS FROMCO1TO CO5			10^*									
Total		**60**	**80**	**30**	**24**	**16**	**10**	**10**	**3**	**2**	**1**	

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	**Learning outcomes to be covered**
Unit Test - I	From 1.1 to 3.8
Unit Test - II	From 3.9 to 5.13

MODEL QUESTION PAPERS FOR UNIT TESTS

UNIT TEST I **C –20, CHST -405**

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

IV Semester

Subject Name: **SUGAR CANE AGRICULTURE AND SUGAR CHEMISTRY**

Sub Code:CHST **- 405**

Time : 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following
   a) what is the botanical name of sugar cane ---------
   b) India all most all states are producing sugar cane except "jammu-kashmir" (T/F)
   c) The average yield sugar cane in Andhra Pradesh is --------
   d) India is considered as the origin of the sugar cane (T/F)
2. Define EKSALIC crop.
3. Explain the composition of soils.
4. Explain the phases of sugar cane crop.
5. Define seed rate.

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) Draw sketch of sugar cane and identify the parts.

   or

   (b) Explain the development of sugar cane in

7. (a) Explain the important types of soils in India with their characters.

   Or

   (b) Explain the types of planting methods adopted for sugar cane.

8. (a) Explain the irrigation requirement for sugar cane whole life.

   Or

   (b) Explain effects of drought and methods of control in sugar cane.

***

C –20, CHST -405

MODEL QUESTION PAPERS FOR UNIT TESTS

UNIT TEST II

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

IV Semester

Subject Name: **SUGAR CANE AGRICULTURE AND SUGAR CHEMISTRY**

Sub Code:CHST **- 405**

Time : 90 minutes **Unit Test II** **Max.Marks:40**

Part-A **16Marks**

Instructions: (1) Answer **all** questions.
(2) First question carries **four** marks of each one mark and remaining each question Carries**three** marks

1. Answer the following

   a) Ratoons often give better quality cane. (T/F)

   b) The Earthing up is preventive methods ----------

   c) The melay buge is reduction in germination of seed sets. (T/F)

   d) supply of water to the crop is known as ---------

2. Define lodging
3. Explain the three governing factors of maturity in sugar cane.
4. Define pH
5. List the pests in sugar cane

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) Explain the function & symptoms of deficiency and application of fertilizer elements (NPK). (CO4)

   or

   (b) Define diseases of sugar cane and effects of diseases in sugar cane.

7. (a) Explain the physical and chemical properties of sugar.

   or

   (b) Explain pH determination by test papers and pH meter.

8. (a) Explain the principle of polarimetry.

   Or

   (b) Differentiate a polarimeter and a saccharimeter**.**

***

MODEL BLUE PRINT WITH WEIGHT AGES FOR BLOOMS CATEGORY AND QUESTIONS FOR EACH CHAPTER AND COS MAPPED

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	Question	Blooms category	Marks allocated	CO addressed
Part-A(30 marks)				
1.	Write the types of crop in sugar cane.	Remembering	3	CO1
2.	Define seed rate and influencing factors of seed rate.	Remembering	3	CO2
3.	State the main points for land preparation	Remembering	3	CO2
4.	Define drainage and effects of drainage on sugar cane.	Remembering	3	CO3
5.	State the various factors influencing drought	Remembering	3	CO4
6.	Define lodging in sugar cane.	Remembering	3	CO4
7.	State the various factors affecting the quality and yield on the sugar cane.	Remembering	3	CO4
8.	Define the pests and diseases of sugar cane.	Remembering	3	CO4
9.	State the application of manures to crop.	Remembering	3	CO4
10.	Define normal weight of sugar.	Remembering	3	CO5
Part-B(40 marks)				
11	Explain the development of sugar cane in India. Or Explain the factors influencing in the formation of soils.	Application	8	CO1
12	Explain the significance of preparatory cultivation. Or State the influencing factors of seed rate.	understanding	8	CO2
13	Explain the irrigation requirement for sugar cane whole life. Or State the advantages and disadvantages of ratooning crop.	understanding	8	CO3
14	Explain the methods of harvesting in sugar cane. Or Explain the influence of nutrients in sugar cane crop.	understanding	8	CO4
15	Explain pH determination by various methods. Or Explain the principle of polarimetry.	Application	8	CO5
Part-C(10 marks)				
16	Compare various types of soils for sugar cane cultivation	Analyze	10	CO1

CH ST -406 SUGAR TECHNOLOGY CHEMICAL CONTROL

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-406	SUGAR TECHNOLOGY CHEMICAL CONTROL	4	60	20	80

S.NO.	Chapter/unit title	No. of periods	Cos mapped
	I. **MILL HOUSE CONTROL**		
1	Importance of chemical control & Introduction to milling control and milling terms	06	CO1
2	Mill extraction & Reduced mill extraction	16	CO2
3	Mill sanitation , Brix curves & Calibration of vessels	10	CO3
	II. **BOILING HOUSE CONTROL**		
4	Introduction to boiling house control, Boiling house terms , Boiling house extraction & Reduced boiling house recovery	16	CO4
5	Stock taking & Chemical balances of sugars, non-sugars	12	CO5
TOTAL		**60**	

COURSE OBJECTIVES	1 To familiarize with the objectives of sugar technology chemical control-milling control terms- M.E. &R.M.E 2 To familiarize with the Importance mill sanitation-effects on recovery- remedy methods adopted- Brix curves & Calibration of vessels **3** To understand and reinforce the concepts of boiling house control, Boiling house terms , Boiling house extraction & Reduced boiling house recovery-Solving problems of Stock taking & Chemical balances of sugars, non-sugars in sugar industries for better production results.

CO NOS		COURSE OUTCOMES
CO1	CHST-406.1	Explain basic concepts chemical control and milling control terms.
CO2	CHST-406.2	Solvemill extraction (M.E) and reduced mill extraction (R.M.E).
CO3	CHST-406.3	Analyse the importance mill sanitation on recovery, brix curves & Calibration of theVarious weighing scales.
CO4	CHST-406.4	Analyse the various boiling house terms and boiling house extraction &solve problems on BHR ,RBHR
CO5	CHST-406.5	Solve problems on stock taking procedure. & apply chemical balances of sugar and non-sugars for better recovery

COURSE OUTCOMES

Upon completion of the course the student will be able to

I. MILL HOUSE CONTROL

1.0 Understand chemical control and milling control and the various milling terms.

1.1 Define chemical control.
1.2 Explain the importance of chemical control.
1.3 Define milling control.
1.4 Define the terms viz., brix, pol, purity, gravity, solids, refractive solids, apparent purity, gravity purity, true purity, brix free cane water, fibre.

2.0 Understand mill extraction (M.E) and reduced mill extraction (R.M.E).

2.1 Explaindirect inferential methods of determination of mixed juice % cane.
2.2 Calculation of bagasse % cane.
2.3 Calculation of added water % cane.
2.4 Calculation of cane % cane.
2.5 Calculation of pol % cane.
2.6 Calculation of mill extraction.
2.7 Calculation of fibre % cane.
2.8 Calculation of added water % fibre.
2.9 Calculation of added water extracted in mixed juice % added water in cane.
2.10 Calculation of undiluted juice lost in bagasse % fibre.
2.11 Calculation of brix free cane water % fibre.
2.12 Define R.M.E.
2.13 Explain the importance of R.M.E and solve problems
2.14 Compare the mill efficiencies of two sugar factories on R.M.E basis and interpret the results.
2.15 Calculate whole reduced extraction (Mittal) and P.I

3.0 **Understand the mill sanitation, brix curves & Calibrate the Various weighing scales**.

3.1 Explain the importance of mill sanitation.
3.2 List the micro organisms causing loss of sugar at mills.
3.3 Explain the methods adopted for mill sanitation.
3.4 Explain E.R.Q.V – Significance.
3.5 Solve problems on E.R.Q.V.
3.6 Explain the purpose of drawing the brix curves.
3.7 Calculate ideal brixes.
3.8 Draw graph between ideal and actual mixes.
3.9 Analyze the performance of mills with the help of brix curves.
3.10 Calibrate the imbibition's water weighing scale.
3.11 Calibrate the automatic juice weighing scale. (M.B. SCALE)
3.12 Calibrate the final molasses weighing scale.

II. BOILING HOUSE CONTROL

4.0 Understand the various boiling house terms and boiling house extraction.

4.1 Define the terms viz., standard granulated, equivalent standard granulated.
4.2 Derive S.J.M. formula for available sugar and molasses.
4.3 Explain the Winters formula for available sugars and molasses.
4.4 Calculate the available sugar and available molasses from the given material using S.J.M
4.5 Define the terms viz., B.H.R., B.B.H.R., B.H.R (ESG), B.H.P., and overall extraction.
4.6 Calculate B.H.R., B.B.H.R., B.H.R (ESG), B.H.P and over all extraction.
4.7 Calculate sugar (ESG).
4.8 Define the virtual purity of final molasses.
4.9 Calculate the virtual purity of final molasses.

Understand reduced boiling house recovery (extraction).

4.10 Define R.B.H.R.
4.11 Explain Noel deer's formula for R.B.H.R
4.12 Solve problems on Gundurao's formula for R.B.H.R.
4.13 State modified formula of Gundurao for R.B.H.R.
4.14 Calculate theoretical recovery % cane.
4.15 Calculate theoretical molasses % cane.

5.0 Understand stock taking procedure

5.1 Solve problems on stock taking calculations of sugar house products.
5.2 Calculate clarification efficiency and factor

Understand the chemical balances of sugar and non-sugars

5.3 Solve problems on pol balance, brix balance, non-sugar balance and crystal balance.
5.4 Interpret the results from above.
5.5 Explain the various losses in pol balances and Calculate the unknown loss.

COURSE CONTENTS :

I. MILLING CONTROL :

1. **Definition and importance of chemical control &Definition of milling control** :
   Definition of the terms viz., brix, pol, purity, gravity solids, refractive solids, apparent purity, gravity purity, true purity, brix free cane water, fibre.

2. **Mill extraction & Reduced mill extraction**
   Direct / inferential methods of determination of mixed juice % cane, bagasse % cane, added water % cane, cane % cane, pol % cane, mill extraction, fibre % cane, added water % fibre, added water extracted in mixed juice % added water in cane, undiluted juice lost in bagasse % fibre, brix free cane water % fibre.
   Definitions – Importance of R.M.E., Derivation of RME formula, solve problems on RME, comparison of efficiencies of two sugar factories on RME basis, whole reduced extraction (Mittal), calculation of preparatory index, mill loss, java ratio.

3. **Mill sanitation, Brix curves**
   Importance of mill sanitation, micro – organisms causing loss of sugar at mills, ERQV and its meaning, solve problems on ERQV.
   Purpose of drawing brix curves, calculation of ideal brixes and interpretation of results
   Calibration of weighing scales
   Imbibition water, mixed juice and final molasses weighing scales.

II. BOILING HOUSE CONTROL:

4 **Boiling house terms & Boiling house extraction** :
Standard granulated, equivalent standard granulated (ESG).
Derivation of S.J.M. formula for available sugars molasses, Winter's formula calculation of available sugar's molasses, using S.J.M and Winter's formula. Define the terms viz., B.H.R., B.B.H.R., B.H.R (ESG), B.H.P over all extraction. Calculation of B.H.R., B.B.H.R., B.H.R (ESG), B.H.P over all extraction, sugar (ESG). Definition of virtual purity of final molasses. Calculation of virtual purity of final molasses
Reduced boiling house recovery :
Define R.B.H.R – To know the Noel Deer's and Gundurao's formula for R.B.H.R – and modified formula of Gundurao for R.B.H.R – Calculation of theoretical recovery % cane and molasses % cane.

5 Stock taking procedure
Stock taking calculations of sugar house products-. clarification factor and efficiency
Chemical balances of sugar and non-sugars:
Preparation of pol, brix, non-sugar and crystal balances – Interpretation of results – Calculation of unknown losses,.

REFERENCE BOOKS

1. System of Technical Control for Cane Sugar Factories in India –N.C. Varma (STAI Publication).
2. N.S.I. Kanpur notes.
3. V.S.I Pune notes.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-406.1	3	3	2					2		
CHST-406.2	3	2	3		3			2	3	2
CHST-406.3	2	2	1	2				3		
CHST-406.4	3	3	2					2	2	2
CHST-406.5	2							3		
Average	2.6	2.5	2	2	3			2.4	2.5	2

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

MODEL BLUE PRINT WITH WEIGHT AGES 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.	Importance of chemical control & Introduction to milling control and milling terms	06	11	3		8		1		1		CO1
2.	Mill extraction & Reduced mill extraction	16	17	9	8			3	1			CO2
3.	Mill sanitation , Brix curves & Calibration of vessels	10	14	6	8			2	1			CO3
4.	Introduction to boiling house control, Boiling house terms , Boiling house extraction & Reduced boiling house recovery	16	14	6	8		10*	2	1		1*	CO4
5.	Stock taking & Chemical balances of sugars, non-sugars	12	14	6	8			2	1			CO5
***ONE QUESTION IN PART C OF 10 MARKS CO1 TO CO5**			10									
Total		90	80	30	32	8	10	10	4	1	1	

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning outcomes to be covered
Unit Test - I	From 1.1 to 3.12
Unit Test - II	From 4.1 to 5.5

MODEL QUESTION PAPERS FOR UNIT TESTS

UNIT TEST I **C –20, CHST -406**

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

IV Semester

Subject Name: **SUGAR TECHNOLOGY CHEMICAL CONTROL**

Sub Code:CHST **- 406**

Time : 90 minutes **UNIT TEST I** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following

   a) Cane + AW= M.J + ---------

   b) Fiber % cane = 50.3 (T/F)

   c) Brix curves are plotted to identify the fermentation of the juice (T/F)

   d) ---------- is used For automatic juice weighing scale

2. Define Bagasse
3. Explain determination of Pol% Bagasse by R.P.E
4. Explain the terms a) R M E b)B.F.C.W.
5. Calculate Fiber % Bagasse, data Fiber % cane = 15.0, Bagasse % cane = 30 ,

   moisture % Bagasse = 50.5

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) DATA

CANE CRUSHED	=	1500MT
M.J. EXTRACTED	=	1350MT
A.W.	=	300MT
BX% P.J.	=	16.60
POL% M.J.	=	12.50
PURITY OF L.M.J.	=	12.00
POL% BAG.	=	3.10
MOISTURE% BAG	=	49.50

Calculate a)M.E. b)R.M.E.

or

(b) Explain the objectives of chemical control.

7. (a) DATA

Pty. of M.J.	=	86.75
Pty. of L.M.J	=	74.80
Pty. of P.J.	=	86.20

Calculate ERQV of i) M.J.Ii) L.M.J.

Or

(b) Explain the importance of BRIX CURVES

8. (a) From the following DATA calculate
i)A.W.% FIBRE
ii)A.W. EXTRACTED IN M.J.% cane
iii)A.W. EXTRACTED in M.J.% A.W. on cane.

DATA

A.W.% cane	=	22.50
M.J.% cane	=	90.00
FIB.% cane	=	13.20
BX.% P.J.	=	16.20
BX.% M.J.	=	14.60

OR

(b) Explain the working of M.B. scale with neat sketch

***

MODEL QUESTION PAPERS FOR UNIT TESTS

UNIT TEST II C –20, CHST -406

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

IV Semester

Subject Name: **SUGAR TECHNOLOGY CHEMICAL CONTROL**

Sub Code:CHST **- 406**

Time : 90 minutes Unit Test II Max.Marks:40

Part-A 16Marks

Instructions: (1) Answer **all** questions.
(2) First question carries **four** marks of each one mark and remaining each question Carries**three** marks

1. Answer the following

   a) Recovery in a sugar industry is 30-40 (T/F)

   b) Molasses % cane ----------

   c) Total losses in process should not be more than -------

   d) Abbreviation of ICUMSA ---------

2. Define Molasses

3. DATA
   POL in SUGAR PRODUCED % CANE = 11.6
   POL% CANE = 13.80
   Calculate OVERALL EXTRACTION.

4. Write the formulae of RBHR
   i)GUNDU RAO
   ii)NOEL DEER

5. DATA
   Purity of P.J. = 83.50
   BHR = 86.50
   Calculate VIRTUAL PURITY OF FM

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 butnot the length of the answer.

6. (a) Derive the S.J.M. formula for AVAILABLE SUGAR by Noel Deer

or

(b) DATA

CANE CRUSHED	=	80,426MT
M.J. EXTRACTED	=	70,540MT
POL% F.C.	=	1.10
F.C.% Cane	=	3.17
BX.% M.J.	=	15.38

Pty. of M.J. = 82.52
Pty. of Cl.J. = 83.04
Calculate i) CLARIFICATION EFFICIENCY
ii) CLARIFICATION FACTOR

7. (a) Explain the significance of virtual purity of Final molasses.

or

(b) By stock taking procedure calculate i)AVAILABLE SUGARii)AVAILABLE MOLASSES

Material	BX.%	POL%	SP.GRAVITY	VOLUME
A.M/C	92.22	82.83	1.41	800m^3
F.M.	91.67	35.08	-	-

8. (a) Explain various pol losses in sugar industry

Or

(b) From the following DATA
Calculate i)B.H.R. ii)B.B.H.R. iii)B.H.P.
DATA

BX% M.J. = 14.64
POL% M.J. = 12.54
M.J.% Cane = 91.00
REC.% cane = 9.84
POL.% SUGAR = 98.85
MOISTURE% Sugar = 0.045

***

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

C-20-CHST-406

BOARD DIPLOMA EXAMINATION (C-20)

DIPLOMA IN CHEMICAL ENGG (SUGAR TECHNOLOGY)

IV SEMESTER EXAMINATION

CHST-406: SUGAR TECHNOLOGY CHEMICAL CONTROL

Time : Three Hours **Max.: 80 Marks**

Part A

Marks : 10 x 3 = 30

Note:- (1) Answer all questions and each question carries 3 marks.
(2) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1.	Define a) IMBIBITION b) SYRUP	CO1
2.	DATA POL in SUGAR PRODUCED % CANE = 11.6 POL% CANE = 13.80 Calculate OVERALL EXTRACTION.	CO4
3.	Define CHEMICAL CONTROL	CO1
4.	Explain the terms a) R M E b)B.F.C.W.	CO2
5.	Explain the IMPORTANCE OF MILL SANITATION	CO4
6.	Explain the determination of POL % BAGASSE by use of Rapi-Pol-Extractor	CO2
7.	DATA Purity of P.J. = 83.50 BHR = 86.50 Calculate VIRTUAL PURITY OF FM	CO4
8.	Explain the sugar losses in POL BALANCE	CO5
9.	DATA POL. In Cl.J.% cane = 11.40 Pty. of Cl.J. = 80.5 Pty. of F.M. = 30.5 Calculate THEORITICAL REC.% CANE.	CO5
10.	Write the formulae of RBHR i) GUNDU RAO ii) NOEL DEER	CO4

Part B

Note:- (1) Answer all questions and each question carries 8 marks. 5 x 8 = 40
(2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.
(3) Data any missed may be assumed as per standards.

11.	From the following DATA calculate i)A.W.% FIBRE ii)A.W. EXTRACTED IN M.J.% cane iii)A.W. EXTRACTED in M.J.% A.W. on cane. DATA A.W.% cane = 22.50 M.J.% cane = 90.00 FIB.% cane = 13.20 BX.% P.J. = 16.20	CO1

BX.% M.J. = 14.60

OR

Explain the importance of CHEMICAL CONTROL

12. DATA

Pty. of M.J. = 86.75
Pty. of L.M.J. = 74.80
Pty. of P.J. = 86.20
Calculate ERQV of i) M.J. Ii) L.M.J.

OR

DATA

CANE CRUSHED = 1500MT
M.J. EXTRACTED = 1350MT CO2
A.W. = 300MT
BX% P.J. = 16.60
POL% M.J. = 12.50
PURITY OF L.M.J. = 12.00
POL% BAG. = 3.10
MOISTURE% BAG = 49.50
Calculate a)M.E. b)R.M.E.

13. Explain calibration of M.J. Weighing scale

OR

Explain the importance of BRIX CURVES CO3

14. Derive the S.J.M. formula for AVAILABLE SUGAR by Noel Deerr CO4

OR

By stock taking procedure calculate i)AVAILABLE SUGARii)AVAILABLE MOLASSES

Material	BX.%	POL%	SP.GRAVITY	VOLUME	
A.M/C	92.22	82.83	1.41	800m^3	F.M.
91.67	35.08	-	-		

15. DATA

CANE CRUSHED = 80,426MT
M.J. EXTRACTED = 70,540MT
POL% F.C. = 1.10
F.C.% Cane = 3.17
BX.% M.J. = 15.38
Pty. of M.J. = 82.52
Pty. of Cl.J. = 83.04

Calculate i) CLARIFICATION EFFICIENCY CO5
Ii) CLARIFICATION FACTOR

OR

Calculate the POL BALANCE from the following DATAANE = 100

Material	POL%	%CANE
M.J.	12.92	90.67
BAG.	2.11	30.92
F.C.	1.169	4.52
F.M.	31.76	3.85
SUGAR	98.85	10.93

Part C

1x10=10

Note:- (1) Answer the following question and the question carries 10 marks.
(2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.
(3) Data any missed may be assumed as per standards.

16 Compare various types of boiling house extraction AN/CO4

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CH ST-407 ELECTRICAL TECHNOLOGY LABORATORY

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CHST-407	Electrical Technology Laboratory	3	45	40	60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods(3periods per Session)
1	Network Laws & Theorems	06
2	Calibration of meters	06
3	Measurement of Power	06
4	Speed control of DC Motor	06
5	Brake test on 3-phase squirrel cage induction motor	03
6	Identification of components	06
7	Earthing and Safety	06
8	Test and Review	06
	TOTAL	**45**

Course Objectives	(i) To familiarize with the knowledge of different materials tools used in Electrical Engineering processes (ii) To use various basic capacities used in elecrtical 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	Analyses the experimental results to draw inferences to make recommendation's
	C05	Practice ethics & etiquette while working in a group and display professionalism while communicating as a member and leader in a group

LEARNING OUTCOMES

Upon the completion of the practice the student shall be able to

I Verify Network Laws & Theorems

1. Verify Ohm's Law
2. Verify the limitations of Ohm's law
3. Verify Kirchoff's current Law
4. Verify Kirchoff's Voltage law

II Calibrate the different meters

1. Calibrate Dynamometer type of wattmeter
2. Calibrate single phase Energy meter

III Measure Power in DC and AC circuit

1. Measure power across a Resistor using voltmeter and ammeter when connected across a DC supply.
2. Measure power and Power factor in 1 - Ø inductive circuit by using Wattmeter, Volt meter and Ammeter when connected across an AC supply.

IV PerformSpeed control of DC Shunt Motor by

(a) Rheostatic control method
(b) Field control method

V Conduct Brake test on 3-phase squirrel cage induction motor.

1. Conduct brake test on 3-phase squirrel cage induction motor.

VI Identify the various components

1. Identify resistors based on their colour code.
2. Identify capacitors based on their colour code.
3. Identify diodes with their rating
4. Identify Zener diode.
5. Identify the type of transistor (NPN or PNP)and their terminals (C,E,G).

VII DemonstrateEarthing and Safety

1. Demonstrate Pipe Earthing
2. Demonstrate Plate Earthing
3. Demonstrate Procedure of first aid on Electric shock.

Safety Precautions

General Safety Precautions to be observed by the student for all Electrical laboratory Practices

1. Every student has to bring insulated tool kit and follow the general safety precautions throughout the lab sessions
2. Whenever handling/using a meter check for 'zero' position of the pointer and adjust for 'zero' position if there is any deviation

COURSE CONTENT

(I) Network Laws & Theorems

Ohm's Law - limitations of Ohm's law-. Verification of Ohms Law - Kirchoff's current Law- Kirchoff's Voltage law -Super position theorem-Thevenins theorem

(II) Calibration of meters

Dynamometer type of wattmeter-Single phase Energy meter

(III) Measurement of Power

Across a Resistor in DC circuit- Across an Inductive circuit in an AC circuit.

(IV) PerformSpeed control of DC Shunt Motor by
Rheostatic control method - Field control method

(V) Brake test on 3-phase squirrel cage induction motor.
Conduct Brake test on 3-phase squirrel cage induction motor.

(VI) Identify the various components
Identify the various components- Resistors,Capacitors,Diode, Zener Diode,Transistor.

(VII) Earthing and Safety.
Demonstrate Pipe Earthing-Plate Earthing-First aid

LIST OF EXPERIMENTS IN ELECTRICAL TECHNOLOGY LAB.

1. Verification of ohms Law and Determination of the resistance of the given resistor.
2. Calibrate the given 1-phase energy meter (know how to connect the energy meter in a given circuit)
3. Measurement of power in D.C. Circuit consisting of resistance in a) Series b) parallel
   c) Series and parallel combination.
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 Conduct the Brake test on 3-phase squirrel cage induction motor.
8. Identify the resisters based on the color coding.
9. Study of Earthing (i) Pipe Earthing (ii) Plate Earthling
10. Study the procedure of first aid on Electric shock.

REFERENCE BOOKS

S.No.	Book Title	Author	Publications
1	Electrical Technology (Vol – I and Vol – II)	1. B.L. Theraja 2. A.K. Theraja	S.CHAND Publishing House
2	Fundamentals of Electrical Engineering and Electronics	B.L. Theraja	S.CHAND Publishing House
3	Electrical measurements	U.A. Bakshi	Technical publications

CH-ST-408 COMMUNICATIONS SKILLS

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHST-408	Communication Skills	3	45	40	60

TIME SCHEDULE

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 CHST-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.

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.

CH-ST-409SUGAR TECHNOLOGY CHEMICAL CONTROL LABORATORY

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CHOT-409	SUGAR TECHNOLOGY CHEMICAL CONTROL LABORATORY	6	90	40	60

TIME SCHEDULE

S.No.	Major Topics	Periods
1.	Brix pol; purity of sugar samples	15
2.	Bagasse	9
3.	Filter cake	12
4.	Test papers	12
5.	PH of solutions	6
6.	Testing of sugar traces in condensate water	9
7.	Sucrose analysis	12
8.	Test and Review	15
Total		**90**

Course title : CHST-409 SUGAR TECHNOLOGY CHEMICAL CONTROL 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

LEARNING OUT COMES

On completion of the course the student should be able to

1.0 Analysis of Brix.pol,purity of sugar samples

1.1 Determine the brix of the juice present in cane by hand – refracto meter.

1.2 Determine the brix : pol : purity of sugar cane juices.

1.3 Determine the brix; pol; purity of syrup/molasses/massecuites by dilution and semi normal method.

2.0 Analysis of Bagasse.

2.1 Determine the moisture percent in bagasse.

2.2 Determine the pol % bagasse by rapipol extractor / bagasse digester.

3.0 Analysis of filter cake.

3.1 Determine the moisture percent in filter cake.

3.2 Determine the pol percent in filter cake.

4.0 Prepare B.T.B and other test papers.

4.1 Prepare the B.TB. test papers in the lab and test the pH of juices.

5.0 pH determination method in sugar samples.

5.1 Determine the pH of the clear juice / sulphited juice / syrup by using

a) pH meter

b) Test papers

c) pH comparator.

6.0 Analysis of condensate water for sugar traces.

6.1 Determine the sugar traces by alphanaphthol test in condensed water.

7.0 Analysis of sucrose.

7.1 Determine the sucrose content in juices / syrup / molasses by Jackson and Gills method.

7.2 estimation of Sucrose/Ash ratio in final molasses

8.0 Test and Review.

8.1 Evaluation of all the experiments done.

8.2 Review of all the experiments conducted.

8.3 Conducting of pre final practical exam.

COURSE CONTENTS :

1. Analysis of brix; pol; purity of sugar samples.
2. Analysis of bagasse.
3. Analysis of filter cake.
4. Preparation of test papers.
5. pH determination.
6. Testing of sugar traces in condensed water.
7. Analysis of sucrose./Ash in sugar samples
8. Test and Review.

REFERENCE BOOKS :

1. S.T.C.C. by N.C. Verma, N.S.I. Kanpur.
2. Hand Book of Sugar Cane Technology by R.B.L. Mathur.

CHST-410MECHANICAL UNIT OPERATIONS LABORATORY

Course code	Course title	No. of periods/week	Total no of periods	Marks of FA	Marks for SA
CHST - 410	MECHANICAL UNIT OPERATIONS LABORATORY	3	45	40	60

TIME SCHEDULE

S.No.	Major Topics	Periods
1.	SIEVE ANALYSIS	06
2.	CRUSHERS	06
3.	BALL MILL	06
4.	FROTH FLOTATION	06
5.	HYDRO CLASSIFIER	06
6.	CYCLONE SEPARATOR	06
7.	VERIFICATION OF STOKES LAW	06
8.	TEST AND REVIEW	03
TOTAL		**45**

Course Objectives	i) To reinforce theoretical concepts by conducting relevant experiments / exercises ii) To Apply process principles learnt in other chemical engineering courses to practical situations iii) To Perform precise operations/tasks with Engineering equipment or instrument for investigation of Engineering problems iv) To broaden their professional foundation v) Laboratory work could provide students with knowledge and practical skills	
Course Outcomes	**C01**	Comprises experiments related to various aspects of heat, mass and momentum transfer. After successfully conducting an experiment, the students need to write a well formatted technical report
	C02	Identify and analyse the fundamental physical parameters of an experimental system
	C03	Write technical reports
	C04	Observe various parameters, their variations and graphically represent the same
	C05	Analyse the experimental results to draw inferences to make recommendations

LEARNING OUTCOMES:

List of Experiments:

1. **SIEVE ANALYSIS**
   1.1 Perform screen analysis for determination of average size, Specific surface area, Particle Population for the given sample

2. **CRUSHERS**
   2.1 Verification of the various laws of crushing by using Jaw crusher.
   2.2 Verification of various crushing laws using roll crusher.
   2.3 Determination of angle of nip in roll crusher.
3. **BALL MILL**
   3.1 Determination of critical speed & energy consumed in size reduction using ball mill / rod Mill

4. **FROTH FLOTATION**
   4.1 Perform froth flotation experiment to concentrate the ore

5. **HYDRO CLASSIFIER**
   5.1 perform an experiment on hydro classifier to separate a mixture into fraction

6. **CYCLONE SEPARATOR**
   6.1 perform an experiment on cyclone separator to determine the efficiency

7. **VERIFICATION OF STOKES LAW**
   7.1 Verification of Stokes law by settling a particle in a liquid column

Reference books:

1. "Unit Operations of Chemical Engineering" by Warren L. McCabe, Julian C.Smith, Peter Herriot.McGraw Hill Publication, Fifth Edition.
2. Introduction to chemical Engineering by Warren L. Badger & Julius T. Banchero, McGraw – Hill publication.
3. Unit Operations –I & II, K.A.Ghavane, NiraliPrakasham Publications.

V SEMESTER

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
V SEMESTER
SCHEME OF INSTRUCTIONS AND EXAMINATION

Sub code	Name of the subject	Instruction Periods/Week		Total periods / year	Scheme of examination			
		Theory	Practicals		Duration	Sessional marks	End exam marks	Total marks
THEORY SUBJECTS								
CH-ST-501	Industrial management and entrepreneurship	5	-	75	3	20	80	100
CH-ST-502	Thermo dynamics and reaction engineering	6	-	90	3	20	80	100
CH-ST-503	Mass transferOperations-II	4	-	60	3	20	80	100
CH-ST-504	Sugar equipment capacity calculationS	5	-	75	3	20	80	100
CH-ST-505	By products and pollution control	4	-	60	3	20	80	100
PRACTICALS								
CH-ST-506	Sugar equipment drawing and plant lay out	-	6	90	3	40	60	100
CH-ST-507	Mass transferOperation sLaboratory	-	3	45	3	40	60	100
CH-ST-508	Life Skills	-	3	45	3	40	60	100
CH-ST-509	Sugar technology Laboratory	-	3	45	3	40	60	100
CH-ST-510	Project work		3	45	3	40	60	100
	Total	**24**	**18**	**630**		**300**	**700**	**1000**

***NOTE:508 Common to All branches**

CHST-501 INDUSTRIAL MANAGEMENT AND ENTREPRENEUR SHIP

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-501	Industrial Management and Entrepreneurship	5	75	20	80

TIME SCHEDULE

S.No.	UNIT TITLE	No of Periods	CO's mapped
1.	Principles and functions of Management	08	CO1
2.	Organisation structure & organisational behaviour	12	CO1
3	Production Management	10	CO2
4.	Materials Management	11	CO2
5.	Marketing,Sales & Feasibility study	10	CO3
6.	Industrial legislation & safety	08	CO3
7.	Introduction to ISO 9000 & T.Q.M.	08	CO4
8.	Role of Enterprenuer and Entrepreneurial Development	08	CO4
	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

CO NO		Course outcomes
CO1	CHST-501.1	To familiarize with the basics, principles and functions of management, ownership and marketing
CO2	CHST-501.2	To familiarize with production management& materials management
CO3	CHST-501.3	To know the marketing, feasibility report, Industrial legislation & safety
CO4	CHST-501.4	To understand ISO9000 , quality standards to in the industry& Role of Enterprenuer

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-501.1	3		2					2		
CHST-501.2	2	2	3		2			3	1	
CHST-501.3	3		1					2		2
CHST-501.4	2	2	2	2				3		
Average	2.5	2	2	2	2			2.5	1	2

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

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 Explain 1.ownerships 2.joint stock companies
2.2 Explain 1. philosophy and need of organisation structure of an industry. 2. line and staff organisations and advantages and limitations
2.3 List different departments in a large scale industry.
2.4 Explain the factors of effective organisation and organisational behaviour
2.5 Conduct for analysis.
2.6 Outline the 1.selection process. 2. sources of manpower
2.7 State 1.motivation theories 2. Maslow's Hierarchy of needs.
2.8 Explain 1.phenomena of satisfaction. 2. Performance levels.3. quality of work life.
2.9 Design reward system and communication process.
2.10 Explain socio-technical and socio-psychological approach.
2.11 List out different leadership models.
2.12 Explain 1. trait theory of leadership. 2. behavioural theory of Leadership
2.13 Analyse the behaviour of groups in an organisation.
2.14 Explain 1.group dynamics. 2. process of decision Making. 3. 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 1.safety stock. 2. reorder level
4.5 Derive an expression for economic ordering quantity.
4.6 Explain 1. stock layout. 2. stores records. 3. Bin card
4.7 Describe Cardex method.
4.8 Explain purchasing procedures.
4.9 List out purchase records.
4.10 Describe 1. stores equipment 2. material handling methods and need.
4.12 Describe material lifting methods. List out hoists, cranes, conveyers, trucks, and forklift trucks.
4.13 Explain 1. concept of cost. 2. elements of cost.
4.14. Explain the concept of contribution.
4.15 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 1. employer and employee relations.2. Trade Unions. 3. mechanics of settlement of in outs.
6.2 Explain the significance of collective bargain.
6.3 List out 1.Welfare activities. 2. subsidy schemes.
6.4 Explain the total welfare concept.
6.5 List out the rights and responsibilities of employees and employers.
6.6 List out the salient features of 1.Indian Factories Act. 2. Minimum Wages Act 3. Industrial DisputesAct.
6.7 List out the salient features of 1.Workmen's Compensation Act 2. E. S .I. Act 3. consumer protection rights Act
6.8 Explain the 1. importance of safety at Work place. 2. significance and mechanics of safety Education 3. hazard and accident.

6.9 List out the important provisions related to safety.
6.10 List out different hazards in the Industry.
6.11 Explain the direct and indirect cost of accidents.
6.12 List out Electrical Hazards.
6.13 List out types of fire extinguishers.
6.14 Describe the method of 1.artificial Respiration. 2. method of CPR. 3. mechanics of safety Drills.
6.15 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 of1. Entrepreneurship. 2. entrepreneur.
8.2 Explain the role of 1.Entrepreneurship. 2. profile of an entrepreneur
8.3 Explain the requirements of an entrepreneur.
8.4 Outline the 1. expectations of Entrepreneurship.
8.5 Determine the role of entrepreneurs in promoting Small Scale Industries.
8.6 Describe the details of self-employment schemes.
8.7 Explain the method of product selection.
8.8 Explain the method of1. site selection. 2. plant layout.
8.9 State the needs for a planned and co-ordinated effect.
8.10 State the importance of follow up.
8.11 Describe the small business scheme.
8.12 List the financial assistance programmes.
8.13 List out the organisations that help an entrepreneur.
8.14 Conduct a 1.demand survey. 2. market survey.

COURSE CONTENTS

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, Total Welfare 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, Shigco Shingo.

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.

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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	8	3	3		10	-	1		1		CO1
2.	Organisation structure &organisationalbehaviour	12	14	6	8			2	1			CO1
3.	Production Management	10	3	3	-		-	1				CO2
4.	Materials Management	11	14	6	8			2	1			CO2
5.	Marketing ,Sales & Feasibility study	10	11	3	8			1	1			CO3
6.	Industrial legislation & safety	08	3	3	-			1				CO3
7	Introduction to ISO 9000 & T.Q.M.	08	11	3	8			1	1			CO4
8	Role of Enterprenuer and Enterprenuerial Development	08	11	3	8			1	1			CO4
***ONE QUESTION IN PART C OF 10 MARKS FROM CO1,CO2,CO3,&CO4**			10									
Total		**75**	**80**	**30**	**40**	**10**		**10**	**5**	**1**		

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

Unit Test	Learning outcomes to be covered
Unit Test-I	From 1.1 to 4.15
Unit Test-II	From 5.1 to 8.14

UNIT TEST I **C –20, CHST -501**

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

V Semester

Subject Name: INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Sub Code:CHST - 501

Time : 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following
   a) Raw material availability is most important in site selection (T/F)
   b) The person in top most position in industry is ----------
   c) Stores materials are recorded in --------
   d)write the abbreviation PERT
2. Define mass laws of hierarchy of needs
3. Compare the features of Decision making
4. List various hazards in sugar industry
5. State the need of materials management in industry

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) Explain the Principles of management

   or

   (b)Differentiate management and administration .

7. (a) Explain the motivational theories.

   or

   (b) Explain various types of plant layout

8. (a) Explain ABC analysis

   or

   (b) Explain methods of purchasing

***

UNIT TEST 1 **C –20, CHST -501**

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

V Semester

Subject Name: INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Sub Code:CHST - 501

Time : 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following
   a) Safety is an important parameter for employ welfare----- (T/F)
   b) Raw material cost is not included in cost calculation ------(T/F)
   c) -------- schemes are promoted by central government for enterpreneur
   d)Write the abbreviation TQM
2. State the objectives of the maintenance management
3. Compare the features market survey and demand survey
4. List various causes of accidents in sugar industry
5. State the need of ISO

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) Explain the importance of safety at place (CO4)

   or

   (b)Differentiate direct and indirect costs

7. (a) Explain various self employment schemes

   or

   (b) Explain requirements of enterpreneur

8. (a) Explain the role of trade unions

   Or

   (b) Explain the basic concepts of ISO 9000

***

MODEL QUESTION PAPER FOR END EXAMINATION

Q.No	Question	Blooms category	Marks allocated	CO adressed
Part-A(30 marks)				
1.	List outScientificManagementprinciples	remembering	3	CO1
2.	Define jointstock company	Remembering	3	CO1
3.	Explain importanceofmotivation	understanding	3	CO2
4.	Write about scheduling	Remembering	3	CO2
5.	ExplainRe-orderlevel	understanding	3	CO2
6.	ExplainBincard	Remembering	3	CO3
7.	Listoutthecomponentsofcost	understanding	3	CO3
8.	DefineTradeUnion.	remembering	3	CO1
9.	Listoutvarious causes of accidents in industry	remembering	3	CO4
10.	Mentionthequalities ofagoodentrepreneur	remembering	3	CO4
Part-B(40 marks)				
11	Differentiate jobdescriptionandjobspecification? (Or) Explain selectionprocedure of an employee	understanding	8	CO1
12	Differentiate between PERT/CPM (Or) ExplainCardexmethod of material management	understanding	8	CO2
13	Explainmarketingconditions (Or) Explainthe preparation Feasibilityreport	understanding	8	CO2
14	Explain thebenefitsof ISO (Or) Explaintheelementsofqualitysystems?	understanding	8	CO3
15	Explain factors for selection of site of an industry (Or) Explain the mass laws of Hierarchy of needs	understanding	8	CO4
Part-C(10 marks)				
16	Explain various terms used in net work diagrams	analyzing	10	CO3

CHST-502 THERMODYNAMICS AND REACTION ENGINEERING

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-502	Thermodynamics and Reaction Engineering	6	90	20	80

S.No.	Chapter/unit title	No. of periods	Cos mapped
	THERMODYNAMICS		
1.	Introduction, First law of thermodynamics and Volumetric properties of pure fluids	25	CO1
2.	The second law of thermodynamics and Chemical reaction equilibria	25	CO2
3	Refrigeration and Liquefaction	10	CO3
	REACTION ENGINEERING AND CATALYSIS		
4.	Chemical kinetics and ideal reactors	20	CO4
5	Catalysis and Industrial reactors	10	CO5
	Total	**90**	

Course Objectives	(i). To understand the theory and applications of classical thermodynamics, thermodynamic properties, equations of state, methods used to describe and predict phase equilibria. (ii) To apply knowledge from differential equations, thermodynamics, general chemistry, and material and energy balances to solve reactor design problems, To examine reaction rate data to determine rate laws, and to use them to design chemical reactors, To simulate several types of reactors in order to choose the most appropriate reactor for a given need, To design chemical reactors with associated cooling/heating equipment (iii) To make the student understand the properties of catalyst and mechanism of catalytic reactions for the design of processes involving catalytic reactions

Co nos		Course outcomes
CO1	CHST-502.1	Analyse the fundamental laws of thermodynamics and volumetric properties of fluids
CO2	CHST-502.2	Explain the 2nd law of thermodynamics, entropy.
CO3	CHST-502.3	Analyse the refrigeration and liquefaction processes
CO4	CHST-502.4	Describe the reaction kinetics, and material and energy balances
CO5	CHST-502.5	Examine catalyst mechanism and types of catalytic reactors

LEARNING OUTCOMES:

1. **Introduction and 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. And derive an expression of first law of thermodynamics for the following processes:
     a) Closed process b) Steady state flow process.
   - 1.4 Differentiate between state and path functions. And distinguishes extensive and

intensive properties. Define heat capacity and specific heat

1.5 Derive the relation of constant volume and constant pressure processes

1.6 Explain (a) Equilibrium (b) Reversible process.

1.7 Describe the PVT behavior of pure substances.

1.8 Define ideal gas and the characteristics of ideal gas. Derive $C_p - C_v = R$ for a mole of an ideal gas.

1.9 Define compressibility factor and know about compressibility Chart

1.10 Explain about the following processes.
a) Isobaric b) Isochoric c) Isothermal and d) Adiabatic.

1.11 Derive expression for ΔU, ΔH, Q and W in the above processes connecting PVT properties.

1.12 Solve problems on calculation of ΔU, ΔH, Q and W in the above processes connecting PVT Properties

2. The second law of thermodynamics and Chemical reaction equilibria

2.1 Explain the statements of second law of thermodynamics.

2.2 Distinguish between heat engine and heat pump. And draw the schematic representation

2.3 Define cop in heat engine and heat pump.

2.4 Explain the thermodynamic temperature scales

2.5 Derive thermodynamic temperature and the ideal gas scale.

2.6 State and explain Carnot cycle principle.

2.7 Define entropy and its SI units. List the entropy characteristics. Explain the entropy changes of an ideal gas.

2.8 State the mathematical statement of 2^{nd} law of thermodynamics. And State third law of thermodynamics

2.9 Know the property relations for homogeneous phases
(a) H=U+PV **(b)** A=U-TS **(c)** G=H-TS **(d)** fundamental property relations**(e)** Maxwell's equations

2.10 Explain the reaction coordinate. Application of equilibrium criteria to chemical reactions

2.11 Derive the relation between standard Gibbs free energy change(ΔG^0) and the equilibrium constant(K)

2.12 Derive an expression for the effect of temperature on equilibrium constant.

3. Refrigeration and Liquefaction.

3.1 Define refrigeration. Explain the cycle of refrigeration.

3.2 Classify various methods of refrigeration.

3.3 List various applications of refrigeration.

3.4 Define refrigerant. Classification of refrigerants (primary and secondary).

3.5 Explain the principle of Carnot cycle refrigerator. Explain choice of refrigerant.

3.6 Explain the method of obtaining vapor compression refrigeration.

3.7 Explain the method of obtaining vapor absorption refrigeration.

3.8 Solve simple problems on refrigeration capacity, COP on refrigeration

3.9 Explain liquefaction process. State Various methods of liquefaction

3.10 Explain Linde liquefaction process

3.11 Explain Claude liquefaction process

4. Chemical kinetics and ideal reactors

4.1 Explain the importance of reaction kinetics in chemical industries.

4.2 Classification of reactions.

4.3 Define reaction rate and know its units. Explain the variables affecting the rate of reaction.

4.4 Define single, multiple, elementary and non-elementary reactions.

4.5 Differentiate between molecularity and order of reaction.

4.6 Define rate constant **k** and know representation of a rate equation.

4.7 Explain temperature – dependent term and temperature dependency from Arrhenius

law.

4.8 Explain constant – volume batch reactor.

4.9 Explain a) Integral method of analysis of data.
b) Differential method of analysis of data.

4.10 Define the following with examples.
a) Zero order b) First order c) Second order .

4.11 Define space time and space velocity.

4.12 Explain broad classification of reactor types. And derive design equation
a) Ideal batch reactor
b) Ideal steady state mixed flow reactor
c) Ideal steady state plug flow reactor

5. Catalysis and Industrial reactors.

5.1 Understand the catalysis. Classification of catalysis.

5.2 Comprehend the characteristics of a catalytic reaction.

5.3 Define auto catalysis.

5.4 State the function of promoters, accelerators, carriers, inhibitors in catalytic reaction with examples.

5.5 Explain catalyst poisoning.

5.6 List out some important commercially available catalysts.

5.7 Name some industrial catalytic processes.

5.8 Understand the working principle of the following with the help of neat sketches.
a) Fixed bed reactors
b) Moving bed reactors
c) Fluidized bed reactors

COURSE CONTENTS :

1. Introduction and First law of thermodynamics and Volumetric properties of pure fluids.

The scope of thermodynamics- Internal energy –enthalpy- Formulation of first law –closed process – First law for Steady state flow process – State functions and path functions- heat capacity and specific heat- Constant volume and constant pressure processes - Equilibrium – Reversible process.

PVT behavior of pure substances – Ideal gas —Definition of compressibility factor-cubic equation of state-Vanderwaal's equation, Redlich Kwong equation-derivation of $C_p - C_v = R$ for a mole of an ideal gas-State and explain about the following processes : a) Isochoric b) Isobaric c) Isothermal and d) Adiabatic.- different expressions for ΔU, ΔH, Q and W for the above processes connecting PVT properties- Problems on calculation of ΔU, ΔH, Q and W in the above processes

2. The second law of thermodynamics:

Statements of second law – The heat engine and heat pump- Carnot principle-thermodynamic temperature scales- 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 -property relations for homogeneous phases-enthalpy, Helmholtz energy, Gibb's energy –fundamental property relations-Maxwell's equations—Problems on entropy and adiabatic mixing.

Reaction coordinate-Application of equilibrium criteria to chemical reactions – The standard Gibbs energy change and the equilibrium constant – Effect of temperature on the equilibrium constant

3. Refrigeration and Liquefaction:

The Carnot refrigerator – Vapor –Compression cycle – Comparison of refrigeration cycles – Refrigerants – Choice of refrigerant –Absorption refrigeration – Heat pump-Liquefaction- Linde liquefaction- Claude liquefaction

process

4. Chemical kinetics and ideal reactors

Importance of 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 reaction rate –Temperature dependent term of rate equation-Arrhenius Law-Constant volume batch reactor – Integral method of analysis of data-irreversible unimolecular first order reaction-irreversible bimolecular type second order reactions-empirical rate equation for nth order-over all order of irreversible reactions from the Half life– 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.

5. 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 Engineering Thermodynamics – by Smith and Vannes, 4th Edition.
2. Chemical reaction Engineering – by Octave Levenspiel, 2nd edition.
3. Introduction to Chemical Reaction Engineering – by K.A. Gavane, Nirali Publications.
4. Chemical Kinetics – by J.M. Smith.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-502.1	2	2	2					1		
CHST-502.2	3	2			2			2	2	2
CHST-502.3	2	1	2	2				3		
CHST-502.4	3	3	2		2			2	3	2
CHST-502.5	2			1				2		
Average	2.4	2	2	1.5	2			2	2.5	2

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

MODEL BLUE PRINT WITH WEIGHT AGES 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 and First law of thermodynamics and Volumetric properties of pure fluids	25	17	6	3	8	10*	2	1	1	1*	**CO1**
2.	The second law of thermodynamics and Chemical reaction equilibria	25	17	3	6	8		1	2	1		**CO2**
3.	Refrigeration and Liquefaction	10	11	3		8		1		1		**CO3**
4.	Chemical kinetics and ideal reactors	20	14	3	3	8	10*	1	1	1		**CO4**
5.	Catalysis and Industrial reactors	10	11		3	8	10*		1	1		**CO5**
***ONE QUESTION IN PART C OF 10 MARKS FROM CO1,CO4 & CO5**			10^{*}									
Total		**90**	**80**	**15**	**15**	**40**	**10**	**5**	**5**	**5**	**1**	

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning out comes to be covered
Unit Test-I	**From 1.1 – 2.12**
Unit Test-II	**From 3.1—5.8**

MODEL QUESTION PAPERS FOR UNIT TESTS

UNIT TEST I C –20, CHST -502

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

V Semester

Subject Name: THERMODYNAMICS AND REACTION ENGINEERING

Sub Code: CHST–502

Time : 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following

a) Properties which depends upon mass are called _____
b) Write the units of Gibbs free energy
c) Adiabatic process is a constant temperature process (T/F)
d) The measure of degree of disorderness is
   1. Enthalpy
   2. Entropy
   3. Gibbs free energy

2. State reversible process
3. Prove Cp-Cv=R
4. Draw the schematic representation of heat engine and heat pump
5. Define reaction co ordinate

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. Apply first law of thermodynamics to a closed system and derive the equation

(or)

Explain PVT behavior of pure substances

7. State and explain Carnot cycle principle for heat engine

(or)

Derive Maxwell statements

8. Explain the relation between standard Gibbs free energy change and equilibrium constant

(or)

Air is compressed reversibly from an initial condition of 1atm and 30°C to a final state of 5atm and 30°C by the following process. Heating at constant volume followed by cooling at constant pressure. Calculate ΔU, ΔH, Q and W for the two processes separately and for the entire process? Assume Air as ideal gas $C_P = (7/2)RC_V = (5/2)R$

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UNIT TEST II **C –20, CHST -502**

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

V Semester

Subject Name: THERMODYNAMICS AND REACTION ENGINEERING

Sub Code: CHST–502

Time : 90 minutes **Unit Test II** Max.Marks:40

Part-A **16Marks**

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

1. Answer the following
   a) A reversed heat engine cycle is known as refrigeration cycle (T/F)
   b) Write the example of zero order reaction
   c) Sum of the powers of the concentration is _____
   d) The substance which promote the activity of a catalyst is
      1) Poison
      2) Accelerator
      3) Promoter
2. Name the methods used to obtain Liquefaction
3. State the variables affecting rate of reaction
4. Define catalyst poisoning
5. Differentiate between space time space velocity

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. Explain the vapor compression refrigeration cycle with a neat diagram

   (or)

   Explain with neat diagram Linde liquefaction process

7. Derive the design equation of a ideal mixed flow reactor with neat sketch

   (or)

   With a neat sketch explain of activation energy changes for exothermic and endothermic Reactions

8. State and explain the function of promoters, accelerators and inhibitors in catalytic reaction with examples

   (or)

   Explain the working principle of fluidized bed reactor with a neat diagram

***

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	Marks allocated	Bloom's category	CO addressed
	PART – A (30 marks)			
1.	Differentiate between state and path functions	3	U	CO1
2.	Define reversible process	3	R	CO1
3.	State cubic equation of state	3	U	CO2
4.	Define entropy and write its characteristics	3	R	CO3
5.	Draw the schematic representation of a heat engine and heat pump	3	R	CO3
6.	Define reaction co-ordinate	3	U	CO3
7.	Write the applications of a refrigeration	3	R	CO4
8.	List the variables affecting rate of reaction	3	U	CO5
9.	Distinguish between space time and space velocity	3	R	CO4
10.	Define catalyst poisoning with an example	3	U	CO5
	PART – B (40 marks)			
1.	Apply first law of thermodynamics for steady state flow process (or) Calculate ΔU, ΔH, Q and W for one g-mole ideal gas which is cooled from 160^{o}C to 85^{o}C at constant pressure process? Given C_P = (5/2)R, C_V =(3/2)R and R = 8.314 J/g-mole K	8	AP	CO1
2.	Explain Carnot cycle principle for a heat engine with a neat sketch (or) Explain the effect of temperature on equilibrium constant	8	AP	CO2
3.	Explain vapour compression refrigeration cycle with a neat diagram (or) Explain the Linde liquefaction process with a neat sketch	8	AP	CO3
4.	Derive the design equation of a plug flow reactor with a neat diagram (or) Explain temperature dependency from Arrhenius law	8	AP	CO4
5.	Explain the moving bed catalytic reactor with a neat diagram (or) Explain the role of promoters, accelerators and inhibitor in catalysis	8	AP	CO5
	PART – C (10 marks)			
1.	Suggest the modifications in catalytic reactors	10	AN	CO5

CHST-503 MASS TRANSFER OPERATIONS-II

Course code	Course title	No. of periods/week	Total no of periods	Marks of FA	Marks for SA
CHST - 503	**MASS TRANSFER OPERATIONS-II**	**4**	**60**	**20**	**80**

TIME SCHEDULE

S.No.	Major Topics	No. of periods	CO's Mapped
1	Extraction and Leaching	13	CO1
2	Adsorption	10	CO2
3	Drying	15	CO3
4	Humidification& Dehumidification	11	CO4
5	Crystallization	11	CO5
Total		**60**	

CO NOS		COURSE OUT COMES
CO1	CHST-503.1	Describe the basic concepts of mass transfer operations
CO2	CHST-503.2	Explain the principles of adsorption- equipments- and solve problems
CO3	CHST-503.3	Explain the principles of drying- equipments-and solve problems
CO4	CHST-503.4	analyze the principles of humidification and dehumidification.
CO5	CHST-503.5	Examine the principles of crystallization- equipments

COURSE OBJECTIVES	1) To use various basic industrial applications of extraction, leaching,adsorption, Humidification, drying and crystallization. 2) To know the operating equation for characteristics, equipment used, problems based on for extraction, leaching, adsorption Humidification and drying equipment , basic terminology associated, psychrometer charts, constant rate and falling rate, drying rate curves problems on drying. 3)To reinforce theoretical concepts of extraction and Leaching, crystallization and adsorption, equipment required for conducting extraction and leaching, crystallization and adsorption.

LEARNING OUT COMES:

After the completion of the subject, the student will be able to

1.0 Extraction and Leaching

1.1 Know about extraction and leaching operations
1.2 Know different examples of extraction and leaching
1.3 Application of phase rule to extraction and leaching operations
1.4 Equilibrium relation (Binodal curve) for complete immiscible system.
1.5 Distinguish the processes of extraction and leaching.
1.6 Notation used in equilibrium diagram of extraction operation.
1.7 Choice of solvent for extraction operation
1.8 Describe single stage and multistage equipment used for extraction
1.9 Explain mixer – settler with a neat sketch.
1.10 Explain the working principle of a rotating disk contactor(RDC) with a neat sketch.
1.11 Explain about shanks system.
1.12 Explain the working principle of an agitated vessel with a neat sketch.
1.13 Explain the working principle of a Dorr agitator,Dorr classifier with a neat sketch..
1.14 Explain the working principle of a Rotocel,Bollman extractor with a neat sketch.

2.0. Understand adsorption

2.1 Define adsorption with examples
2.2 Understand equilibrium in adsorption.
2.3 Write about types of adsorption
2.4 Know about the nature of adsorbents
2.5 Give examples of various adsorbents.
2.6 Know the Freundlich equation
2.7 Know the Langmuir adsorption isotherm

3.0 Understand Drying

3.1 Know about drying operation with examples.
3.2 Know the equilibrium relationship in drying operation
3.3 Apply phase rule to drying operation.
3.4 Define various terms involved in drying operation.
3.5 Know the constant drying conditions
3.6 Explain batch-drying process under constant drying condition

3.7 Explain the rate of drying curves
3.8 Know the factors influencing
3.9 Calculate rate of drying and time of drying for batch drying process
3.10 Classification of driers.
3.11 Know about tray driers, vaccum driers with neat sketches
3.12 Know about rotary driers, drum driers with neat sketches
3.13 Know about spray driers, fluidized bed driers with neat sketches
3.14 Know about flash drier with neat sketch.
3.15 Problems on calculation of time drying

4.0 Understand humidification & Dehumidification operations

4.1 Define various terms involved in humidification &dehumidification operations
4.2 Discuss adiabatic saturation
4.3 Know the adiabatic saturation temperature.
4.4 Explain the wet bulb and dry bulb temperatures
4.5 Determine the humidity of a gas system
4.6 Understand the psychometric chart.
4.7 Know the use of the psychometric chart.
4.8 Describe the humidification equipment – cooling towers.
4.9 Know about dehumidification with examples.
4.10 Know about air conditioning.
4.11 Simple problems on humidity calculations.
4.12 Know about humidifiers and de humidifiers with sketches.

5.0 Understand Crystallization

5.1 Define crystallization.
5.2 Know the principles of crystallization.
5.3 Define Crystal geometry, nucleation and crystal growth
5.4 Explain the various methods for attaining the super saturation
5.5 Describe the classification of crystallizers.
5.6 Explain the working principles of tank crystallizers, agitated tank crystallizers with sketches
5.7 Explain the working principles of Swenson-Walker crystallizer, circulating magma crystallizer with sketches.
5.8 Explain the working principles of vacuum crystallizers, Krystal crystallizers with sketches
5.9 Explain caking of crystals
5.10 Know the prevention of caking of crystals-critical humidity
5.11 Problems on crystallization based on mass balance.

COURSE CONTENTS:

1. Phase rule application to extraction and leaching – Binodal curve – Process of extraction and leaching examples – single stage and multistage equipments mixer settles –notations used in extraction and leaching - equipment.

2. Adsorption—definition – examples – equilibrium – Adsorbents-freundlich equation – Laungmuir isotherm.

3. Drying – equilibrium diagrams – various terms – batch drying – constant drying conditions – rate of drying curve – factors influencing the rate – time of drying classification of driers – know different driers – problems.

4. Humidification – various terms involved – adiabatic saturation temperature – wet bulb temperature – dry bulb temperature – humidity – psychrometric chart – humidification equipment – cooling towers – air conditioning – humidifiers & dehumidifiers.

5. Crystallization – crystal – Crystal growth – methods for super saturation – classification of crystallizers – equipment – caking of crystals – prevention – critical humidity – problems.

REFERENCE BOOKS

S.NO	BOOK TITLE	AUTHOR	PUBLICATIONS
1.	Mass transfer operations	Robert E. Treybal	McGraw-Hill publication.
2.	Unit operations of Chemical Engineering'	Warren L. McCabe, Julian C.Smith, Peter Harriot.	Mc. Graw Hill Publication, Fifth Edition
3.	Introduction to chemical engineering	Walter L. Badger & Julius T. Banchero,	McGraw-Hill publication

COs-POs MAPPING STRENGTH:

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-503.1	3	3	2					3		
CHST-503.2	2	2	3		2			2		1
CHST-503.3	2	4	1	1				3		
CHST-503.4	3	3	2	2				2	1	2
CHST-503.5	2									
Average	2.4	3	2	1.5	2			2.5	1	1.5

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

MODEL BLUE PRINT WITH WEIGHT AGES FOR BLOOMS CATEGORY AND QUESTIONS FOR EACH CHAPTER AND COS MAPPED

Table specifying the scope of syllabus to be covered for unit tests

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.	Extraction and leaching	13	14	3	3	8	*10	1	1	1		CO1
2.	Adsorption	10	14	3	3	8	*10	1	1	1		CO2
3.	Drying	15	14	3	3	8	*10	1	1	1	*1	CO3
4.	Humidification & Dehumidification	11	14	3	3	8	*10	1	1	1		CO4
5.	Crystallization	11	14	3	3	8	*10	1	1	1		CO5
***ONE QUESTION IN PART C OF 10 MARKS FROM CO1,CO2,CO3,CO4& CO5**			10*									
	TOTAL	60	70	30		40	10	10		5	1	

Unit Test	Learning out comes to be covered
Unit Test-I	**From 1.1 – 3.15**
Unit Test-II	**From 4.1-5.11**

MODEL QUESTION PAPERS FOR UNIT TEST

UNIT TEST-I C-20,CHST-503

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A.P

DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

III SEMESTER

Subeject Name: MASS TRANSFER OPERATIONS-II

Sub Code: CHST-503

Time: 90 minutes UNIT TEST-I Max.Marks:40

Part-A 16 Marks

Instructions: (1) Answer **all** questions
(2) First question carries **four** marks of each one mark and remaining each question carries **three** marks

1. Answer the following
   (a)Removal of moisture by _____ means is more costly than mechanical means
   (b)In extraction operation the liquid solution which is to be extracted is called feed (True / False)
   (c) _____ is used to separate two miscible liquids using a solvent which preferentially dissolves one of them.
   (d) _____dryer is commonly used for wet filter cakes and wet lumpy solids
2. Define leaching with example
3. Differentiate between Distillation and extraction
4. Define wet bulb temperature
5. Classify different types of adsorbents CO1

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 thecontent but not the length of the answer

6. Explain about equilibrium diagram of extraction operation
   (or)
   Explain about shank's system

7. Explain the nature of adsorbents
   (or)
   Explain constant rate of drying curves

8. With a neat sketch Explain the tray drier
   (or)
   Explain about rate of drying curves

***

UNIT TEST-II **C-20,CHST-503**

STATE BOARD OF TECHNICAL EDUCATION AND TRAINING, A.P

DIPLOMA IN CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)

III SEMESTER

Subeject Name: MASS TRANSFER OPERATIONS-II

Sub Code: CHST-503

Time: 90 minutes **UNIT TEST-II** **Max.Marks:40**

Part-A **16 Marks**

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

(2) First question carries **four** marks of each one mark and remaining each question carries **three** marks

1. Answer the following

(a) _____ is the driving force of crystallization.

(b) The temperature of the air-water vapour mixture record by a thermo meter whose bulb is kept dry is called _____

(c) The temperature at which the condensation will first occur is known as dew point (True / False)

(d)In crystallization, mass transfer occurs from the solution to _____phase

2. Define air conditioning
3. Classify crystallizers
4. Define crystal growth
5. Define humidification

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. Explain adiabatic saturation temperature

(Or)

Explain the wet bulb temperature and dry bulb temperatures

7. Explain the use of the psychometric chart

(Or)

Explain the working principle of tank crystallizers

8. Explain the working principle Swenson-walker crystallizer with neat sketch

(or)

Explain the prevention of caking of crystal-critical humidity

***

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 extraction and with example	R	3	CO1
2.	List out the choice of solvent for extraction operation	R	3	CO5
3.	Classify adsorption operation	R	3	CO2
4.	Define adsorbent	R	3	CO1
5.	Write the factors influence the drying operation	R	3	CO3
6.	Write the classification of driers	U	3	CO5
7.	State percentage humidity	R	3	CO1
8.	Differentiate between wet bulb and dry temperature	R	3	CO3
9.	Write the principle of crystallization	U	3	CO1
10.	Define crystal growth	R	3	CO4
	PART –B (40 marks)			
11.	With a neat sketch explain mixer-settler extraction (or) Explain about shank's system	AP	8	CO1
12.	Explain batch dying process (or) Write the characteristics of adsorbent	AP	8	CO2
13.	Explain the construction and working of a rotary drier (or) Explain the rate of drying curves with a neat diagram	AP	8	CO3
14.	Explain air conditioning (or) Explain the construction and working of cooling towers	AP	8	CO4
15.	Explain in detail nucleation and crystal growth in crystallization (or) Explain the various super saturation methods	AP	8	CO5
	PART – C (10 marks)			
16.	Compare various types of dryers	AN	10	CO3

CHST-504 SUGAR EQUIPMENT CAPACITY CALCULATIONS

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-504	Sugar Equipment Capacity calculations	5	75	20	80

S.NO.	Chapter/unit title	No. of periods	Cos mapped
1.	Location and site selection of sugar industry, Gravity and Non gravity plants, Weighing scales	14	CO1
2.	Mill House equipments	15	CO2
3.	Boiling House equipments	15	CO3
4.	Evaporators and Pans	16	CO4,
5.	Crystallizers, centrifugals and Spray pond	15	CO5
		75	

COURSE OBJECTIVES:	1 To familiarize the site selection of sugar industry, Gravity and non gravity plants, raw juice pumps, imbibitions pumps, juice and molasses weighing scales capacity calculations 2 To get acquaintance of Sugar mill equipments like cane kicker, leveller, shredder 3 To familiarize juice heaters, juice sulphitors, settlers, milk of lime of tanks, SO_2 burner's capacity calculations 4 To familiarize evaporators, semi kestners, vapour pipe line, brixes of the juice in Individual bodies, steam consumption for evaporators 5 To get acquaintance of capacity calculations for Crystallizers, Centrifugals and spray pond.

CO NOS		COURSE OUTCOMES
CO1	**CHST-504.1**	Explain the merits and demerits of a Gravity and Non Gravity plants.
CO2	**CHST-504.2**	Find the capacities of sugar industry equipments.
CO3	**CHST-504.3**	Find the capacities of juice heaters and milk of lime
CO4	**CHST-504.4**	Calculate the capacity of evaporators, vapour cells
CO5	**CHST-504.5**	Estimate the capacities of spary pond and cooling tower.

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-504.1	3	3	2					3		
CHST-504.2	2	2	3		3			2		1
CHST-504.3	2	4	1					3		
CHST-504.4	3	3	2					2	1	2
CHST-504.5	2									
Average	2.4	3	2		3			2.5	1	1.5

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

LEARNING OUT COMES:

Note :1. Only MKS/SI units are invariably followed.
2. Only 2500 T.C.D sugar plant capacity calculations should be followed.

On completion of the course the student will be able to

1. Location and site selection of sugar industry, Gravity and Non gravity plants, Weighing scales

1.1 Explain the points to be considered to start an industry
1.2 State primary and secondary parameters considered to start up Sugar industry
1.3 Describe a gravity plant
1.4 Describe a Non-gravity plant
1.5 Distinguish between a gravity and non-gravity plants
1.6 Explain Water and irrigation facility
1.7 Estimate the imbibition pump required
1.8 Estimate the Mixed juice pump capacity
1.9 Calculate mixed juice weighing scale required
1.10 Calculate juice weighing scale capacity
1.11 Solve the molasses weighing scale required

2. Mill House equipments

2.1 Calculate Total cane area required..
2.2 Calculate Cane yard. Area required.
2.3 Calculate Weigh Bridge.
2.4 Calculate Cane handling – sling type crane, capacity, power, speed and no. of sling type cranes required.
2.5 Calculate Area, power and no. of feeder tables required.
2.6 Calculate Total length of the cane carrier required to suit the installation of (a) Fibrizer (b) Swing hammer shredder.
2.7 Calculate Slope and speed of the cane carrier.
2.8 Calculate Capacity and power required for the cane carrier.
2.9 Calculate Power and no. of knives required for cane kicker, cane leveler and cane cutter.
2.10 Calculate Capacity and power required for fibrizer and shredder (swing hammer type).
2.11 Calculate mill capacity using Hugot, Arnold, Cubon and NSI formulas.
2.12 Calculate Capacity of raw juice receiving tank.

3.0 Boiling house equipments

3.1 Calculate Quantity of heat required for heating the juice in juice heaters.
3.2 Calculate Quantity of heat available for heating the juice in juice heaters.
3.3 Calculate 1.Pressure drop (loss of head), 2.Heat transfer co-efficient, 3.Mean temperature, in juice heaters.
3.4 Calculate 1.Velocity of juice, 2.Heating surface of juice heaters, sulphured juice heaters
3.5 Calculate Quantity of vapours required for raw juice heaters.
3.6 Calculate Quantity of vapours required for sulphured juice heaters.
3.7 Calculate Quantity of 1. lime stone needed. 2. capacity of lime slacker.
3.8 Calculate Capacity of 1.MOL storage tank. 2. lime pumps capacity.
3.9 Calculate Tray area required for batch and continuous type sulphur burner for juice and syrup sulphitation..
3.10 Calculate Capacity of air compressor for juice and syrup sulphitation.
3.11 Calculate the diameter, retention time, working height of a 1.continuous sulphitation tank. 2.continuous Syrup sulphitor.
3.12 Calculate total filtering area, number of filter presses required.
3.13 Calculate total filtering area and number Oliver filters required at filtration unit.
3.14 Calculate diameter and juice retention time in Rapidor-444 and graver classifiers.

4.0 Evaporators and Pans

4.1 Calculate Quantity of water to be evaporated in Quadruple effect evaporator.
4.2 Calculate heating surface required for Quadruple effect evaporator.
4.3 Calculate specific evaporation co-efficient.
4.4 Calculate vapour pipe diameter of an evaporator.
4.5 Calculate the brixes of the juice in the bodies
4.6 Calculate the condensate pump capacity
4.7 Solve the evaporation in the individual bodies
4.8 Summarize saving in steam in evaporators as per Rillieux principle
4.9 Solve the pans capacity.
4.10 Calculate vapour diameter of a Calandria pan.

5.0 Crystallizers, centrifugals and Spray pond

5.1 Calculate the number of centrifugal machines required for a batch and continuous model.
5.2 Calculate the capacity of crystallizers for A,B,C grades of massecuites .
5.3 Calculate Number of sugar elevators required.
5.4 Calculate the Sugar bin capacity
5.5 Calculate sugar melter capacity.
5.6 Calculate the size of final molasses storage tank required.
5.7 Calculate cooling water requirement at spray pond/cooling tower
5.8 Calculate no of spray nozzles, area of spray pond/ cooling towers.
5.9 Calculate Injection water required for multijet/barometric condenser at evaporator.
5.10 Calculate Injection water required for multijet/barometric condenser at pans.

COURSE CONTENTS:

1.0 Location and site selection of sugar industry, Gravity and Non gravity plants, Weighing scales

Points to be considered to start a sugar industry, primary and secondary parameters, Gravity plant, Non-gravity plant, Water and irrigation facility, Imbibition pump capacity, Mixed juice pump capacity, mixed juice weighing scale capacity, Calculate juice weighing scale capacity, molasses weighing scale capacity,

2.0 Mill House equipments

Total cane area required, Cane yard Area required, Weigh Bridge capacity,Crane/Grab capacity, Crane power, speed capacity, Feeder table Area, power and number of tables required, Total length of the cane carrier required, Slope and speed of the cane carrier, power required for the cane carrier, Power and no. of knives required for cane kicker, cane leveler and cane cutter, mill capacity using EHugot, Arnold, Cuban and NSI formulas, raw juice receiving tank capacity.

3.0 Boiling house equipments

Quantity of heat required for heating juice in juice heaters, Quantity of heat available for heating the juice in juice heaters, Pressure drop (loss of head), Heat transfer co-efficient, Mean temperature, in juice heaters, Heating surface of sulphured juice heaters, Quantity of vapours required for raw juice heaters, Quantity of vapours required for sulphured juice heaters, Quantity of lime stoneneeded, Lime slacker capacity, MOL storage tank capacity, Lime pump capacity, Tray area Calculation for SO_2 burner, Air compressor capacity calculation for juice and syrup sulphitation, thediameter, retention time, working height of a continuous sulphitor/syrup sulphitor, Filtering area and number of filter presses/Oliver filters required, Diameter and juice retention time for Rapidor-444 and graver classifiers.

4. Evaporators and Pans

Evaporation in Quadruple effect evaporator, Heating surface required for Quadruple effect evaporator, Specific evaporation co-efficient, Vapour pipe diameter of an evaporator, Brixes of the juice in the individual bodies, Condensate pump capacity, Evaporation in the individual bodies, Saving in steam in evaporators as per Rillieux principles, Pans capacity, vapour diameter of a Calandria pans.

5. Crystallizers, centrifugals and Spray pond

Number of centrifugal machines required for a batch and continuous model, Crystallizers capacity for A,B,C grades of massecuites, Number of sugar elevators required, Sugar bin capacity, Sugar melter capacity, Size of final molasses storage tank, Cooling water requirement at spray pond/cooling tower, No of spray nozzles, area of spray pond/ cooling towers. Injection water required for multijet/barometric condenser at evaporator/Pans.

REFERENCE BOOKS

S.No	Title of the book	Name of the author
1	Hand book of Cane sugar technology	R.B.L Mathur
2	Cane sugar manufacture in india	D.P.Kulakarni
3	Hand book of sugar cane Engineering	Emile.Hugot
4	Technology in sugar cane growing	M.Lakshmikantam
5	Principles of Sugar technology Clarification- Volume-1 (Clarification)	Pieter Honig
6	Principles of Sugar technology Clarification- Volume-2 (Crystallization)	Pieter Honig
7	Principles of Sugar technology Clarification- Volume-3 (Evaporation &Centrifugation)	Pieter Honig
8	Introduction to Sugar cane technology	Elsevier
9	Training manual for Sugar mills	Mangal Singh
10	Introduction to Cane Sugar Technology	G.H.Jenkings
11	Cane Sugar Hand book	Spencer Meade
12	Hand book for cane Sugar manufacturers	
13	Sugar cane cultivation	Lucky james
14	The Sugar hand book	David w Blymyer
15	Cane Sugar	Noel Deerr
16	Sugar House notes and tables	Noel Deerr
17	Sugar cane processing and By products of molasses	H.Panda
18	Chemical control in sugar factories	Nabu press
19	Production of lump Sugar-Gur	Ajith k ghosh, Ashok K Srivatsava , V.P.Agnihotri
20	Cane Sugar (A text book on the Agriculture of the Sugar Cane)	Noel Deerr, Norman Rodger
21	Factors Determining the Keeping Quality of Cane Sugar	Kopeloff Nicholas
22	Methods Of Chemical Control In Cane Sugar Factories	H. C. Prinsen Geerligs
23	The Deterioration of Cane Sugar in Storage	William Ludwell Owen
25	Chinese Sugar	Nabu Press
26	Processing and Storage of Sugarcane Juice	Thakar Harsh

MODEL BLUE PRINT WITH WEIGHT AGES 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.	Location and site selection of sugar industry, Gravity and Non gravity plants, Weighing scales	14	14	3	11		10*	1		2	1*	**CO1**
2.	Mill House equipments	15	14		14				3			**CO2**
3.	Boiling House equipments	15	14	3	3	8		1	1	1		**CO3**
4.	Evaporators and Pans	16	14	6		8		2		1		**CO4**
5.	Crystallizers, centrifugals and Spray pond	15	14	3	3	8		1	1	1		**CO5**
***ONE QUESTION IN PART C OF 10 MARKS FROM CO1 TO CO5**			**10**									
Total		**75**	**80**	**15**	**31**	**24**	**10**	**5**	**5**	**5**	**1**	

Table specifying the scope of syllabus to be covered for unit tests

Unit Test	Learning out comes to be covered
Unit Test-I	**From 1.1 – 3.14**
Unit Test-II	**From 4.1-5.10**

MODEL QUESTION PAPERS FOR UNIT TEST

UNIT TEST I C –20, CHST -504

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

V Semester

Subject Name: SUGAR EQUIPMENT CAPACITIES CALCULATIONS

Sub Code:CHST - 504

Time : 90 minutes **Unit Test I** Max.Marks:40

Part-A **16Marks**

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

1. Answer the following

   a) Raw material availability is most important in site selection (T/F)

   b) A-massecuite% cane-------

   c) Steam consumption for juice heater------

   d)write the abbreviation TCD--------

2. For a plant of 2500 T.C.D, find the power required for cane kicker
3. Plant capacity =5000T.C.D, added water%cane =32, find the imbibitions pump capacity
4. Plant capacity=2500 T.C.D, find the area of feeder table required in m^2
5. Find the mixed juice tank capacity at 4 minutes retention time of a 2500 T.C.D plant at

mixed juice % cane =105

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) For plant of 2500 T.C.D find the length of horizontal portion as well as inclined portion of a carrier in which height of the inclined portion is 8m and the angle of slope $\phi=18^0$

(OR)

(b) From the following data, calculate the mill capacity in T.C.H using E.Hugot formula:

Data: Coefficient of preparatory devices=1.15,
Length of the roller=1.7m
Roller speed=4.5 r.p.m,
No of rollers in the milling tandem=15
Dia of the roller=0.85m,
Fiber per unit cane=0.15 (CO1)

7. (a) Calculate the capacity of the imbibitions water weighing tank from the following

Given: Crushing capacity =2500 T.C.D, Added water % cane =35,

No. of imbibition weighing tanks dropped per hour=10

(OR)

(b) Calculate the capacity of the imbibitions water weighing tank from the following

Given: Crushing capacity =2500 T.C.D, Added water % cane =30,

No. of imbibition weighing tanks dropped per hour=12

8. For a plant of 2500 T.C.D Crushing rate of 22 hrs/day

Juice heater heating surface = 70m^2 ; tube length =3.65m ; tube Diameter = 0.042m;

juice velocity = 2m/sec ; mixed juice% cane = 105 ; density of juice =1.06 From the above given data calculate: (a) Total number of passes (b) Number of tubes/pass (c) Total number of tubes

(OR)

Given: plant capacity = 2500 T.C.D Mixed juice% cane =110,

Specific heat of the juice = 0.9, Temp of the heating media = 105^{0}C

Temp of the incoming juice = 35^{0}C Temp of the outgoing juice = 55^{0}C

Velocity of the juice = 2 m/sec

From the above given data find the heating surface required to heat the mixed juice by using vertical type of juice heater.

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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	Question	Marks allocated	Blooms category	CO adressed
	PART-A			
1.	State advantages of Gravity plant	3	Remembering	CO1
2.	Generalize the types of sugar industry	3	understanding	C01
3.	State the pumps used at Mixed juice tank	3	Remembering	CO2
4.	Distinguish between Cutter and shredder	3	understanding	CO2
5.	State merits of Continuous melter	3	Remembering	CO3
6.	Explain factors which influence efficiency of evaporation	3	Remembering	CO3
7.	lieux first principle	3	understanding	CO4
8.	State the significance of S/ ratio	3	understanding	CO4
9.	Explain MVC	3	Understanding	CO5
10.	Define centrifugal force	3	Remembering	CO5
	PART-B			
11	Explain a Gravity plant OR Explain a Non Gravity plant	8	applying	CO1
12	From the following data, calculate the mill capacity in T.C.H using E.Hugot formula:**Data:** Coefficient of preparatory devices=1.15, Length of the roller=1.7m Roller speed=4.5 r.p.m, No of rollers in the milling tandem=15 Dia of the roller=0.85m, Fiber per unit cane=0.15 OR For a plant of 2500 T.C.D find (a) the area of a feeder table (b) no of feeder tables required (c) power required for each feeder table in H.P	8	applying	CO2
13	Crushing capacity =2500 T.C.D, Sulphur consumption % cane=0.1% on cane. Capacity of continuous type of sulphur burner =80Kg/m^2/hr. calculate the tray area required for juice as well as syrup sulphur burners. **OR** For a plant of 2500 T.C.D Given : height of the clarifier =6m ,Rapi-Dorr retention time =2.5hrs ,density of clear juice=1.06 ,mixed juice% cane=110find the diameter of the clarifier	8	applying	CO3
14	Given plant capacity =2500T.C.D. (a) A massecuite%cane =30 (d) A m/c boiling time = 4hrs. (b) B massecuite%cane =10 (e) B m/c boiling time = 6hrs.	8	applying	CO4

<table>
<tr><td></td><td>(c) C massecuite%cane =07 (f) C m/c boiling time = 12hrs.
If a pan of 50 tons Capacity is designed find the number of pans required For A, B and C boilings
OR
Calculate vapour pipe diameter of calendria pan of heating surface 185m^2 at a vacuum of 26 inches of Hg. Rate of evaporation is 41kg/m^2/hr ;specific volume of vapour = 10m^3/kg ; vapour velocity = 60m/sec.</td><td></td><td></td><td></td></tr>
<tr><td>15</td><td>Design and distribute the batch type centrifugal station for 2500T.C.D plant, crushing rate/day =22hrs.
<table><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>M massecuite % cane</td><td>25</td><td>15</td><td>10</td></tr><tr><td>C capacity of the machine in T/hr/machine</td><td>14</td><td>12</td><td>6</td></tr></table>
OR
For a plant of 2500 T.C.D find the following to operate a cooling tower.
(a) Plat form area required
(b) cubic contents of tower
(c) capacity of cistern required</td><td></td><td>applying</td><td>CO5</td></tr>
<tr><td colspan="5">PART-C</td></tr>
<tr><td>16</td><td>Compare between gravity and non gravity plants</td><td>10</td><td>Analyze</td><td>CO1</td></tr>
</table>

CHST-505 BY PRODUCTS AND POLLUTION CONTROL

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-505	BY PRODUCTS AND POLLUTION CONTROL	4	60	20	80

S.NO.	Chapter/unit title	No. of periods	Cos mapped
	BY PRODUCTS OF SUGAR INDUSTRY		
1	Bagasse	16	CO1
2	Filter cake	10	CO2
3	Molasses	12	CO3
	POLLUTION CONTROL		
4	Environment & Air pollution	10	CO4
5	Water pollution & waste water treatment	12	CO5
		60	

COURSE OBJECTIVES:	1. To familiarize with the sugar industry By products-Bagasse,Filtercake,Molasses- definitions - production –characteristics 2. To familiar -Bagasse,Filtercake,Molasses--uses-industrial importance-role of pollution in industry-financial aspects. **3.** To understand and reinforce the concepts of environment, pollution, types of pollution, effects on environment, control methods, waste water treatment. Solving issues / problems of pollution in sugar /chemical industries for better production results.

CO NOS		COURSE OUTCOMES
CO1	**CHST-505.1**	Analyse the roll on pollution in industry
CO2	**CHST-505.2**	Explain the characteristics of filter cake
CO3	**CHST-505.3**	Analyse the various pollution in industry
CO4	**CHST-505.4**	Explain environment ,pollution & types .
CO5	**CHST-505.5**	Evaluate the methods of waste water treatment in sugar /chemical industries

CO-PO/PSO MATRIX

CO No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CHST-505.1	3	3	2					1		
CHST-505.2	3	2	3		3			2		2
CHST-505.3	2	2	1	2				3		
CHST-505.4	3	3	2					2	2	2
CHST-505.5	2									
Average	2.6	2.5	2	2	3			2	2	2

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

NOTE : Un mapped or weakly mapped PO'S of above may be achieved by the following activities

PO6: Appropriate quiz programme/ Seminars/industrial visits may be conducted at intervals and duration as decided by concerned teacher.

PO7: Several activities are to be planned that students visit library to refer standard books on related to the subject and latest updates in reputed national and international journals, attending seminars, learning software skills and watching the relevant in social media.

LEARNING OUTCOMES

Upon completion of the course the student will be able to

I. BY PRODUCTS OF SUGAR INDUSTRY:

1.0 Understand the features of Bagasse.
1.1 Define of Bagasse.
1.2 State physical properties of Bagasse
1.3 Explain chemical characteristics of Bagasse
1.4 Explain handling ,storage & transportation of Bagasse
1.5 Explain the uses of Bagasse
1.6 Explain use of bagasse as fuel.
1.7 Explain use of bagasse in cattle feed.
1.8 Explain the process of production of Bio-gas, Bio manure, fibre board and furfural from bagasse.
1.9 Explain use of bagasse in manufacture of fibre board
1.10 Explain use of bagasse in paper industry
1.11 Explain use of bagasse in manufacture of furfural
1.12 Analyse the financial aspects of Bagasse role in sugar industry
2.0 Understand the features of Filter cake
2.1 Define Filter cake / press mud &State physical properties of **Filter cake**
2.2 Explain the characteristics of carbonation cake and sulphitation cake.
2.3 Explain chemical characteristics of **Filter cake**
2.4 Explain handling ,storage & transportation of **Filter cake**
2.5 Explain the uses of **Filter cake**
2.6 Explain use of **Filter cake** as building material
2.7 Explain use of **Filter cake** / press mud as manure..
2.8 Explain the process of manufacture of cane wax from press mud.

2.9 Analyse the financial aspects of filter cake role in sugar industry

3.0 Understand the features of Molasses

3.1 Define of **Molasses**

3.2 State physical properties of **Molasses**

3.3 Explain chemical characteristics of **Molasses**

3.4 Explain handling ,storage & transportation of Molasses

3.5 Explain Alcoholic & non-alcoholic fermentation of molasses

3.6 Explain the uses of **Molasses**

3.7 Explain use of **Molasses** in breviaries

3.8 Explain use of **Molasses** in cattle feed and baking

3.9 Explain the process of manufacture of rectified spirit, denatured spirit, and Absolute alcohol from molasses.

3.10 Analyse the financial aspects of **Molasses** role in sugar industry

II. POLLUTION CONTROL:

4.0 Understand the term environment.

4.1 Define environment.

4.2 Know the different segments of environment i.e, Litho sphere, Hydro sphere, and Atmosphere and Bio sphere.

4.3 Define pollution and its types.

4.4 Explain the effects of pollution.

Understand the air pollution and it's important.

4.5 Define air pollution.

4.6 Explain atmosphere and its composition.

4.7 Classify various types of air pollutants.

4.8 Explain various effects of air pollution on environment and human being.

4.9 Explain various control methods of air pollution.

5.0 Understand water pollution

5.1 Define water pollution.

5.2 Explain various sources of waste water in environment & effects of water pollution on environment, human being

5.3Explain various control methods of water pollution.

Understand waste water treatment in sugar industry.

5.4 Explain various sources of waste water in sugar industry.

5.5 Explain the characteristics of waste water from sugar industry.

5.6 Explain the effects of waste water on receiving stream.

5.7 Explain the treatment of waste water in sugar /chemical industries by various methods.

a) Preliminary
b) Primary
c) Secondary
d) Territory.

COURSE CONTENT :

I. BY PRODUCTS OF THE SUGAR INDUSTRY :

1. Bagasse:

Characteristics of Bagasse USES -production of Bio-gas, Bio manure, fabric board and furfural. Uses of bagasse as fuel and cattle feed.

2. Molasses:

Characteristics of molasses, USES -alcoholic fermentation – Manufacture of rectified spirit, denatured spirit and absolute alcohol, non alcoholic fermentation.

3. Filter cake:

Characteristics of carbonation and sulphitation press mud, USES - extraction of cane was, use of press mud as manure.

II. POLLUTION CONTROL:

4. Environment:

Definition – Types of pollutions – Effects of pollutions.

Air pollution:

Definition – Atmosphere and its composition – Classification of air pollutants – Effects of air pollution and control methods used.

5. Water pollution

Definition –effects-Control methods

Waste water treatment

Sources of waste water in sugar industry – Characters of waste water – Effects of waste water on receiving streams – Treatment of waste water in sugar industry.

REFERENCE BOOKS :

1. By products of Cane Sugar Industry by G. Paturace.
2. Co-Generation in Cane Sugar Industry by Pyne.
3. Environmental Engineering by S.S. Dava (S.Chand and Co).
4. Industrial Effluents Origin Characteristics, Effects, Analysis and Treatment by N. Manivasakam.
5. Environmental Control. By C.S. Rao.

MODEL BLUE PRINT WITH WEIGHT AGES 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.	Bagasse	16	11	3		8		1		1		CO1,
2.	Filter cake	10	17	9	8			3	1			CO2,
3.	Molasses	12	14	6	8			2	1			CO3
4.	Environment & Air pollution	10	14	6	8		10*	2	1		1*	CO4
5.	Water pollution & waste water treatment	12	14	6	8			2	1			CO5
***ONE QUESTION IN PART C OF 10 CO1, CO2,CO3,CO4& CO5**			10									
Total		**60**	**80**	**30**	**32**	**8**	**10**	**10**	**4**	**1**	**1**	

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

Unit Test-I	From 1.1 to 3.10
Unit Test-II	From 4.1 to 5.7

MODEL QUESTION PAPERS FOR UNIT TESTS

UNIT TEST I C –20, CHST -505

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

V Semester

Subject Name: BY PRODUCTS AND POLLUTION AND CONTROL

Sub Code:CHST - 505

Time : 90 minutes **Unit Test I** **Max.Marks:40**

Part-A **16Marks**

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

1. Answer the following

   a) Bagasse % cane ---------

   b) Final molasses purity is 45 (T/F)

   c) -------- is added to R.S to make it as D.S

   d)Non alcoholic fermentation is done in molasses tanks(T/F)

2. Define filter cake.
3. Explain the uses of bagasse
4. List various uses of molasses
5. Explain alcoholic fermentation

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) Explain the physical and chemical composition of bagasse

   or

   (b) Explain the production of bio gas and bio manure.

7. (a) Explain the production of Rectified spirit and absolute alcohol

   or

   (b) Explain handling and storage of molasses

8. (a) Explain the production of cane wax from press mud

   Or

   (b) Explain the uses of filter cake

***

UNIT TEST-II C –20, CHST -505

State Board of Technical Education and Training, A. P

Diploma in Chemical Engineering (Sugar Technology)

V Semester

Subject Name: BY PRODUCTS AND POLLUTION AND CONTROL

Sub Code:CHST - 505

Time : 90 minutes UNIT TEST-II Max.Marks:40

Part-A 16Marks

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

1. Answer the following
   a) Nitrogen is an important gas in resperation----- (T/F)
   b) The top most layer of the atmosphere is ----------
   c) The PH of the polluted water is alkaline in nature (T/F)
   d) The undesired change in environment is known as ---------
2. State the characteristics of polluted water
3. Explain various types of pollution
4. List various causes of water pollution
5. Define BOD and COD

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) Explain various segments of environment

   or

   (b) Explain various effects of pollution on human being

7. (a) Explain various sources of waste water in sugar industry

   or

   (b) Explain various control methods of air pollution

8. (a) Explain the treatment of waste water treatment in sugar industry

   or

   (b) Explain various effects of water pollution on environment

***

C-20 CH-ST-505

BOARD DIPLOMA EXAMINATION (C-20)
D.CH.ST. - V SEMESTER EXAMINATION
CH.ST-505: BY PRODUCTS & POLLUTION CONTROL

Time: Three Hours **Maximum: 80 Marks**

Part A

Note: - (1) Answer all questions and each question carries 3 marks. Marks: 10 x 3= 30
(2) Answers should be brief and straight to the point and shall not exceed five Simple sentences.

1.	Define Filter cake	R/CO1
2.	Explain environment	U/CO4
3.	Explain atmosphere and its composition	U/CO3
4.	Explain the uses of Bagasse	U/CO1
5.	Explain various sources of waste water from sugar industry.	R/CO4
6.	Explain composition of Molasses	R/CO2
7.	Explain the effects of Air pollution	U/CO4
8.	Explain .storage& handling of Molasses	U/CO2
9.	Define pollution and its types	R/CO3
10.	Explain the factors of environmental protection act.	U/CO4

Part B

5 x 8 = 40

Note: - (1) Answer all 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 the answer.

11. Explain the physical & chemical composition of Bagasse
OR
Explain Bagassestorage & handling U/APP/CO1

12. Explain the uses of filter cake U/APP/CO2
OR
Explain the Characteristics of Filter cake

13. Explain alcoholic & non alcoholic fermentation. Of Molasses U /APP/CO3
OR
Explain the uses of Molasses

14. Explain various control methods of air pollution U/APP/CO4
OR
Explain various segments of environment

15. Explain effects of water pollution on environment and human being. U/APP /CO5

OR

Explain the treatment of chemical industry waste water with a neat sketch

Part-c

Note: - (1) Answer question carries 10 marks. 1x10=10

(2) The answer should be comprehensive and the criteria for valuation is the content but not the length of the answer.

16. Recommend betweenaerobic and anaerobic ponds CO5

***

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

CHST-506 SUGAR EQUIPMENT DRAWING AND PLANT LAYOUT

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CHST-506	SUGAR EQUIPMENT DRAWING AND PLANT LAYOUT	06	90	40	60

S.No.	Chapter/unit title	No. of periods	CO's Mapped
01.	Conventions and symbols for representing various sugar / chemical engineering equipments	24	**CO1**
02.	Conventions and symbols used in flow sheet of a process	24	**CO2**
03.	Line sketch of sugar / chemical layout	18	**CO3**
04.	Details drawing of various equipment units in sugar industry	24	**CO4,CO5**
Total periods		**90**	

Course objectives

Course objectives	(i) To draw various heat transfer, mass transfer and mechanical unit operations equipment symbols &line sketchs (ii) Todraw process block diagram/flow diagram using process description **(iii)** To draw process equipments /instrumentation diagrams, process layouts and plant layouts of Sugar industry

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 sugar / chemical compounds
	CO3	Sketch the various equipment diagrams of sugar industry
	CO4	Follow the principles of process equipment layout in sugar process industries
	CO5	List the factors in identification of plant location for the proposed sugar process plant layout

LEARNING OUTCOMES

On completion of the course the student should be able to draw

1.0 Know the conventions and symbols.

1.1 Draw/ sketch the heat transfer symbols, heat exchange water cooler, steam heater, re-boiler, condensers water and air, cooling coils jet condensers.

1.2 Draw / sketch the pumps – piston or plunger and centrifugal compressors piston and turbo type.

1.3 Draw / sketch of Tanks – vertical, horizontal, pressure, boiler etc.

2.0 Know the conventions and symbols used in flow sheet of a process.

2.1 Draw/ sketch symbols for pipe lines.

2.2 Draw / sketch symbols for flow metes.

2.3 Draw/ sketch symbols for various types of valves.

2.4 Draw/ sketch instrumentation symbols.

3.0 Draw the plant layout considering the following factors.

3.1 Factors in planning layout.

3.2 Methods of layout planning.

3.3 Principles of plant layout.

3.4 Plant expansions.

3.5 Factors in plant location.

3.6 Types of plant layout H – L – T.

4.0 Draw the sketchs of various units in sugar industry.

4.1 Draw / sketch the imbibitions in mills (simple and compound).

4.2 Draw / sketch the automatic juice weighing scale. (M B SCALE)

4.3 Draw / sketch the juice sulphitation unit of N.S.I design.

4.4 Draw / sketch the juice heater tube plate arrangement.

4.5 Draw / sketch the vertical calandria type Evaporator

4.6 Draw the detail drawing of condensate extraction system of quadruple effect evaporator.

4.7 Draw / sketch the syrup sulphitation unit of N.S.I design

4.8 Draw the detail drawing of vacuum pan.

4.9 Draw the detail drawing of a multi jet condenser.

4.10 Draw the detail drawing of a Barometric condenser

COURSE CONTENTS :

1. **Conventions and symbols for representing various sugar / chemical engineering equipments :** Heat transfer equipment – Cooling equipments – Condensers etc.
2. **Conventions and symbols used in flow sheet of a process :** Symbols for pipe lines – Flow meters – Valves etc.
3. **Line sketch of sugar / chemical industrial location and layout :** Factors in plant location – Plant layouts –H – L – T etc.
4. **Sugar equipment drawings :** imbibition in mills (simple and compound) – Automatic juice weighing scale – Juice heaters –Evaporator –juice/Syrup sulphitation unit- Pans, Multi jet /barometric condenser.

REFERENCE BOOKS :

1. Chemical Engineering Plant Design by F.C. Vibrant and C.E. Dryden.
2. Introduction to Chemical Engineering by Badger and Benchero
3. Chemical Engineering Drawing by K.A. Gawhana.
4. Hand book of Cane Sugar Engineering by Hugot.
5. Hand book of Cane Sugar Technology by R.B.L. Mathur.
6. Sugar Machines of Sugar Cane Factories by L.A. Tromp.

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	Conventions and symbols for representing various sugar / chemical engineering equipments	24	**8**		**4**				**2**			**CO1**
2	Conventions and symbols used in flow sheet of a process	24	**4**		**4**				**1**			**CO2**
3	Line sketch of sugar / chemical layout	18	**8**		**4**				**2**			**CO3**
4	Details drawing of various units in sugar industry	24	**40**			**20**				**2**		**CO4,CO5**
	Total	**90**	**60**		**20**	**40**			**5**	**2**		

QUESTION PAPER MODEL

PART-A

Short questions 5x4 MARKS=20marks (NO CHOICE)
PART-B

Essay questions 2x20 MARKS=40marks(2 ONLY EITHER OR)
Total:60

C-20 CH-ST-506

BOARD DIPLOMA EXAMINATION (C-20)
C-20 D.CH.ST. - V SEMESTER EXAMINATION
CHST-506: SUGAR EQUIPMENT DRAWING & PLANT LAYOUT

Time: Three Hours **Maximum : 60 Marks**

PART-A **5 X 4=20**

Instructions: (1) Answer all questions and each question carries four marks
(2) Draw the sketches to a suitable scale neatly

1. Draw any two instrumentation symbols

2. Write the factors in planning lay out

3. Draw any two equipment symbols related to heat transfer equipment

4. Draw the sketch of Juice sulphitation unit of NSI design

5. Draw any two flow sheet symbols related to pipe lines

PART-B **2X20=40**

Instructions: (1) Answer all questions. Each question carries twenty marks.
(2) Draw the sketches to a suitable scale neatly

6. Draw the detailed drawing of a multi jet condenser and label the parts

(OR)

Draw the sketch of M B scale of M .J. weighing tank and label the parts

7. Draw the sketch of Vaccum pan and label the parts

(OR)

Draw the detailed drawing of RAPI DORR-444 and label the parts

***

CHST-507 MASS TRANSFER OPERATIONS LABORATORY

TIME SCHEDULE

Course code	Course title	No.Of Periods / week	Total number of periods	Marks for FA	Marks for SA
CHST-507	**MASS TRANSFER OPERATIONS LABORATORY**	**03**	**45**	**40**	**60**

S.No.	Major Topics	Periods
1.	Standard plots of a given binary system	06
2.	Verification of Rayleigh's equation	06
3.	Steam distillation	03
4.	Vapor liquid equilibrium	03
5.	Mc.Cabe Thiele method	06
6.	Characteristics of drying	06
7.	Liquid –liquid equlibrium	06
8.	MTO equipments demonstration	06
9.	Test and Review	03
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 OBJECTS:

On completion of the study of the subject the student should be able to,

1. Standard plots of a given binary system

1.1 To draw a graph of specific gravity Vs mole fraction of a given binary system.
1.2 To draw a graph of refractive index Vs mole fraction of a given binary system

2. Verification of Rayleigh's

2.1 Verification of Rayleigh's equation by conducting a simple distillation experiment.

3. **Steam distillation**

3.1 Verification of Steam distillation law by conducting steam distillation experiment

4. **Vapour liquid equilibrium**

4.1 Estimation of vapour liquid equilibrium data of a given binary system.

5. **McCabe Thiele method**

5.1 To determine the no. of trays required using Mc.Cabe Thiele method

6. **Characteristics of drying**

6.1 Calculation of time of drying of a given material and to draw the rate of drying curve.

7. Liquid –liquid equilibrium

7.1 To draw the Binodal curve for the given ternary liquid system.

8. **Demonstrate the MTO equipments**

8.1 Different types of packing columns
8.2 Different types of Plates in a distillation column
8.3 Different types of agitators
8.4 Variable transformer valve

CHST-508LIFE SKILLS

Course Code	Course Title	No. of Periods/Week	Total No. of Periods	Marks for FA	Marks for SA
CHST-508	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 CHST-508	**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 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 andinteraction 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 **feasibile** 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.

CHST-509 SUGAR TECHNOLOGY LABORATORY

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CHST-509	SUGAR TECHNOLOGY LABORATORY	3	45	40	60

TIME SCHEDULE

S.No.	Major Topics	Periods
1.	CaO content in lime	3
2.	CaO content in juices/molasses	6
3.	P_2O_5 content in juices	6
4.	Reducing sugars	6
5.	Sieve analysis	6
6.	SO_2 content in syrup and sugar crystal	6
7.	Crystal content	6
8.	Test & review	6
Total		**45**

Course title : CHST-509 SUGAR TECHNOLOGY LABORATORY		
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 OUT COMES

On completion of the course the student should be able to

1.0 Analysis of active CaO in lime.
Determine active CaO in lime sample by 'Sucrose method'.

2.0 Analysis of 'CaO' content in juices and molasses.
2.1 Estimate 'CaO' content in juices and molasses by EDTA method.

3.0 Analysis P_2O_5 content in a given sample of juices.

Estimate P_2O_5 content in juices by uranium acetate method.

4.0 Determine of reducing sugars in molasses.
Estimate reducing sugars in molasses by Lane and Eynon methods.

5.0 Sieve analysis of sugar.
5.1 Identify the different grades of sugar by sieve analysis.

6.0 Analysis of SO_2 in syrup and Sugar crystal

6.1 Estimate the SO_2 content in a given sample of syrup.

6.2 Estimate the SO_2 content in a given sample of Sugar crystal

7.0 Analysis of crystal content in massecuite.
7.1 Determination of crystal content in massecuite by Inferential method.

COURSE CONTENTS:

1. Analysis of 'CaO' in lime.
2. 'CaO' content in juices.
3. Analysis of 'P_2O_5' in juices.
4. Reducing sugar analysis.
5. Sieve analysis.
6. Analysis of SO_2 content n syrup.
7. Crystal content estimation.

REFERENCE BOOKS :

1. S.T.C. by N.C. Verma N.S.I. Kanpur.
2. Hand book of Sugar Cane Technology by R.B.L. Mathur.

CH-ST-510 PROJECT WORK

Course code	Course title	No. of periods/week	Total no.of periods	Marks for FA	Marks for SA
CHST-510	PROJECT WORK	3	45	40	60

Course title : Project WorkSubject Code: CH–ST-510		
Course Objectives	(i) To familiarize with the knowledge of various equipments and materials/ tools used in sugar/chemical industry (ii) To use various basic implements used in 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 OUT COMES

A list of topics suggested for project work.

1. Prepare project report to start a SUGAR INDUSTRY for 2500 TCD Plant.
2. Prepare project report for commissioning aindustry using By Products of sugar industry.
3. Case Study of the Sugar / Chemical Plant with concluding remarks whether the Industry is making profits (or) not with reasons there of and suggestion to over come the draw backs.
4. Feasibility report for increasing the existing capacity of the Sugar/Chemical plant.
5. Design and fabricate spiral proto type sugar/ chemical engineering equipments useful for doing experiments in the laboratory.
6 Prepare on process report on industrially important chemicals.
7. To conduct a survey of a SUGAR/CHEMICAL industry and produce to report 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 plant.
   e) Maintenance schedule of sugar/ chemical engineering equipments.
   f) Raw materials / process materials, transportation and storage.

8 Basic design on cost estimation of the following equipment based on the problems suggested by the industry on topics.
- 8.1 Mill setting
- 8.2 Boilers
- 8.3 Clarification units
- 8.4 Evaporation units
- 8.5 Heat exchangers and condensers
- 8.6 Pan boiling units
- 8.7 Crystallization units
- 8.8 Dryers
- 8.9 Effluent treatment
- 8.10 Distillation units
- 8.11 Absorption system
- 8.12 Pumping installation
- 8.13 Production of bio diesel
- 8.14 Tray less classifier
- 8.15 Molasses storage tanks
- 8.16 Go downs
- 8.17 Graders etc.

9 Any other projects or Suggested (or) required by Sugar/ Chemical (or) Allied Industries.

Note: Any one of the above Topic is allotted for two or three students for each batch. The Project title is allotted to the student at the starting of the V semester and guidance is given by the relevant branch qualified faculty (Guide) to prepare the project before the commencement of Industrial training and students are instructed to prepare the project during Industrial training of their VI SEM. and submit the same for V semester end Exams.

Evaluation Scheme for Project Work

S. No.	Tasks	Max. Marks Allotted for each task INTERNAL /EXTERNAL (40+60=100)
1.	Formulation of the problem	2/4
2.	Preparation of action plan	4/6
3.	Literature survey	5/8
4.	Collection of relevant data, field surveys	4/7
5.	Planning, design, drawing, estimation, experimentation as the case may be	10 /15
6.	Preparation of models, if any	5/8
7.	Report preparation and presentation	10 /12
	Total:	**40/60 (100)**

VI SEMESTER

CURRICULUM-2020
3 YEAR SANDWICH DIPLOMA COURSE IN
CHEMICAL ENGINEERING (SUGAR TECHNOLOGY)
VI SEMESTER
SCHEME OF INSTRUCTIONS AND EXAMINATION

CH-ST 601- INDUSTRIAL TRAININGDURATION : 6 MONTHS

NOTE:

FOR DIPLOMA IN CHEMICAL ENGG.(SUGAR TECHNOLOGY) STUDENTS, THE INDUSTRIAL TRAINING -VI SEMESTER HAS BEEN MOSTLY ARRANGED IN SUGAR INDUSTRIES THAT WORKS IN A PARTICULAR SEASON i.e., From SEPTEMBER TO MARCH. HENCE THE PERIOD OF TRAINING WILL BE CHOOSEN CONVENIENT TO THE SEASON/NEED OF SUGAR INDUSTRY ONLY.SO THE DURATION OF TRAINING SIX MONTHS WILL BE ARRANGED FROM 1ST SEPTEMBER TO 28TH FEBRUARY OF THAT ACADAMIC YEAR (THIRD YEAR)

HENCE THE **V SEM**. CLASS WORK WILL COMMENCE FROM 15TH MAY OF THAT ACADAMIC YEAR (THIRD YEAR) TO 31ST AUGUST & 5TH MARCH TO 31st MARCH OF THE SAME ACADEMIC YEAR IN TWO SPELLS / SESSIONS IN THIRD YEAR AND V SEMESTER END EXAMS WILL BE CONDUCTED IN APRIL OF THE SAME ACADAMIC YEAR

DIPLOMA IN CHEMICAL ENGG.(SUGAR TECHNOLOGY) (C-20)
CH-ST 601 VI SEMESTER
(PRACTICAL TRAINING)
DURATION : 6 MONTHS

LEARNING OUTCOMES

On completion of a spell of practical training in a Sugar/ Chemical or allied industry, the student will be able to

1.0 Explain the organizational set up from top executive to workmen level

1.1 **Explain** the function of each department/section

1.2 **Explain** the inter relationship among various department/sections

2.0 Identify the various raw materials used as feed stock and state chemical composition and theirsource.

2.1 List the various intermediates produced and their further processing and/or waste disposal.

2.2 State the final products, its composition and its commercial importance's, uses and applications.

3.0 Describe the various stages involved in processing, sequential arrangement of different equipment.

3.1 Draw the block flow diagram, detail flow diagram of each process after line tracing.

3.2 Pictorially explain the arrangement of various process equipment in systematic manner in a less possible area of site.

4.0 Describe importance process variables required to be maintained in each process equipment of each unit like temperature, pressure, flow p^{h} etc.

4.1 Explain the effects of changes of process parameters.

5.0 Describe the various unit operations in each process parameters.

5.1 State the unit operations principles

5.2 Apply unit operations theory learned at the Institution

5.3 Explain the various unit processes (Chemical reactions in each process plant)

5.4 Identify the side reactions in each process plant

6.0 Explain the various analytical methods used in the quality control department

6.1 **Describe** the experimental methods to find out the compositions and physical properties of various raw materials, intermediates and final products

6.2 **Explain**Operate various analytical instruments that are used in laboratory.

7.0 Describe the trouble shooting in process operation

7.1 Explain preventive precautions of the same for each equipment in each process

7.2 **Explain**Startup and shut down procedures for the equipment and plant.

8.0 Explain various measuring instrument, recording instruments and control instruments.

8.1 **Describe the D.C.S** in each process

8.2 Identify various sensing elements, transmission elements, and indication devices.

9.0 Explain the importance of safety in chemical industries

9.1 State the safety about personnel protection, equipment protection

9.2 Explain the usage of various safety devices

9.3 **Explain**Precautionary measures to be taken.

10.0 Explain the various effluents from each process plant.

10.1 **Explain** effects of hazardous effluents

10.2 **Explain** treatment method and disposal.

And effective operation to minimize the effluents.

11.0 Explain the various Technical skills adopted by workmen in process plant

11.1 State the various Technical skills adopted by workmen in processPlant

11.2 Explain various processing units and process adopted in the plant to the Examiner during assessment

COURSE CONTENTS

Organizational set up

Raw materials, intermediates and end products

Process descriptions (Process flow diagrams and line tracing, detailed flow diagrams etc.)

Process parameters (such as temp., pressure, flow level etc.)

Unit operations and unit process in each process

Quality control of raw materials, intermediates and end products

Operational troubles and preventive measures

Process instrumentation

Safety aspects (personnel, equipment etc.)

Effluent treatment

Technical skills adopted by workmen in process plant

INDUSTRIAL TRAINING

Subject Title : Industrial Training
Subject Code : CHST-601
Duration : 6 months

Time schedule

S.NO	Code	TOPICS	Duration
1	CHST-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; Conclusions.	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

Scheme of evaluation

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	***Identification of various Equipments/Instruments***	*20*
2	***Supervising the Process of various manufacturing units in Chemical Engineering***	*25*
3	***Handling, Operating procedures of Equipments, Instruments***	*18*
4	***Troubleshooting Skills***	*20*
5	***Safety aspects and crisis management***	*17*
6	***Soft skills and Reporting skill***	*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 60 out of 75 marks, then the marks of 60 shall be enhanced to 120 proportionately as (60/75)*120=96.

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 Manufacturing units/super vision/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 assessments) 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 including 1. Head of section(concerned branch of the discipline), 2. External examiner and 3. Faculty members who assessed the students during Industrial Training as members.

Guidelines and responsibilities of the faculty members who are assessing the students'performance during Industrial Training:

1. **Every Teacher (Including Head of section of relevant branch only) 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. Shallassess 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 misbehavior as the case may be.

DEPARTMENT OF TECHNICAL EDUCATION
NAME OF THE INSTITUTION
INDUSTRIAL TRAINING ASSESSMENT

PIN:

NAME OF THE STUDENT:

Skill Set Sl.No	***SKILL SET***	***Max Marks Allotted For each parameter***	***Marks obtained***
1	***Identification of various Equipments/Instruments***	*20*	
2	***Supervising the Process of various manufacturing units in Chemical Engineering***	*25*	
3	***Handling, Operating procedures of Equipments, Instruments***	*18*	
4	***Troubleshooting Skills***	*20*	
5	***Safety aspects and crisis management***	*17*	
6	***Soft skills and Reporting skill***	*20*	
	Total	*120*	

(Marks in words:)

Signature of the Training In-charge (Mentor) Signature of the visiting staff (Guide)
Name: Name:
Designation: Designation:

Industrial training assessment
Department of Technical Education

Semester (VI)

Name of the institution: Visit (I /II)

PIN: Date of visit

Name of the student: Period of training

Name of the Industry Maximum marks (120)

*Mistakes are with reference to Techniques, Procedure & Precautions, while precision refers to technique, procedure, precautions, time & result

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	***Identification of various Equipments/Instruments (20)***					
	(i) Construction and Specifications of equipment and instruments	*12*	*12*	*10*	*7*	*5*
	(ii) Measuring the process parameter	*8*	*8*	*6*	*5*	*3*
2	***Supervising the Process of various manufacturing units in Chemical Engineering (20)***					
	(i) Raw materials and Product, End uses	*4*	*4*	*3*	*2*	*1*
	(ii) Process Flow diagram, Line diagrams	*4*	*4*	*3*	*2*	*1*
	(iii) Process monitoring	*4*	*4*	*3*	*2*	*1*
	(iv) Design aspects	*4*	*4*	*3*	*2*	*1*
	(v) Quality control and Quality assurance	*4*	*4*	*3*	*2*	*1*
3	***Handling, Operating procedures of Equipments, Instruments (20)***					
	(i) Working condition parameters	*5*	*5*	*4*	*3*	*2*
	(ii) Startup-Shutdown	*7*	*7*	*6*	*4*	*3*
	(iii) Maintenance	*8*	*8*	*7*	*5*	*4*
4	***Troubleshooting Skills (20)***					
	(i) Fault-Finding	*12*	*12*	*10*	*7*	*5*
	(ii) Rectification	*8*	*8*	*6*	*5*	*3*
5	***Safety aspects and crisis management (20)*** ***S***					
	(i) Safety procedures	*6*	*6*	*5*	*4*	*2*
	(ii) Use of Personnel Protection Equipment	*4*	*4*	*3*	*2*	*1*
	(iii) Crisis management during hazards, accidents	*5*	*5*	*4*	*3*	*2*
	(iv) Pollution control techniques	*5*	*5*	*4*	*3*	*2*
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 awarded in words and Figures:

Signature of the Training in-charge (Mentor) Signature of the faculty In-charge (Guide)
Name Name
Designation Designation

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