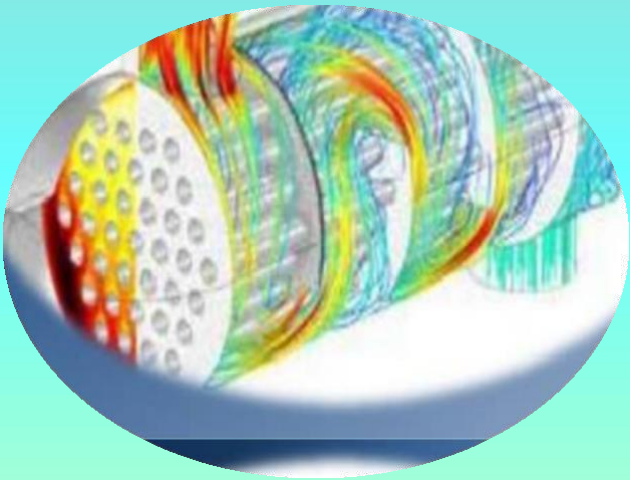
School of Studies of Engineering and Technology
Guru Ghasidas Vishwavidyalaya
(A Central University Established by University Act, 2009)



Student's Handbook
2021-22

Bachelor of Technology Programme
Department of Chemical Engineering

Personal Details

Name : ----------
Father's Name : ----------
Mother's Name : ----------
Date of Birth : ----------
Address : ----------

Phone : ----------
Mobile : ----------
e-mail : ----------
Local Guardian's
Name (if any) : ----------
In Case of emergency
Please contact : ----------

Phone : ----------
Mobile : ----------
Blood Group : ----------
Driving License
Number :----------
Other Information :----------

Chemical Engineering Student's Handbook

School of Studies of Engineering and Technology

GURUGHASIDAS VISHWAVIDYALAYA

(A Central University)

BILASPUR, C.G. 495009

Preface

The Institute of Technology under Guru Ghasidas Vishwavidyalaya (now a Central University since 15th Jan., 2009), Bilaspur (C.G.), was set up in the year 1997 with an objective of making available the facilities of quality higher education in the field of Engineering and Technology to the students of, particularly, the Central region of the country where the rural and tribal population still remains deprived of such facilities. The Institute, remaining fully conscious of its objectives and responsibilities, is growing towards the level of a centre of excellence for quality engineering education in the country. Especially, after up-gradation of the University as a Central University, there has been many fold enhancements in infrastructural facilities as well as faculty and staff. Today, the Institute has well equipped laboratories with latest equipments, a good library, adequate computational facilities and smart E-classrooms needed for ensuring quality in technical education and research. The mission of the Institute is to create an ambiance in which new ideas, research and scholarship flourish to produce leaders and innovators of tomorrow.

The University campus houses faculties like Arts, Science, Social Science, Humanities, Law and Management etc. Our students get opportunities of studying varied nature of elective courses from other faculties, and are groomed to work not only with a group of technically trained people but also with persons having knowledge in different domains of education.

The Institute on an average, admits around 400 students annually for the 4 - year undergraduate B. Tech programme in seven branches. Admissions are made through Joint Entrance Examination (JEE) (main) or the entrance examination conducted as per the directions of MHRD, Govt. of India. Presently, M.Tech. Programme is being run by two departments (Mechanical and Chemical Engineering) and students who are Graduate Aptitude Test in Engineering (GATE) qualified get admitted. To keep pace with new developments and changes in the field of technology, the Institute revises its Undergraduate and Postgraduate Programmes syllabi from time to time. Institute follows semester system of teaching (odd semester: July - December; and even semester: January – June).

Ours is a student-centric Institution and, therefore, the endeavor is always to ensure that students are offered the quality and value based education and training so as to create not only outstanding scientists and engineers but also good citizens.

This booklet contains comprehensive information on the existing Rules and Regulations governing the B.Tech. Programmes. The students and parents/ guardians are, therefore, advised in their own interest to get fully familiar with the academic system of the Institute and rules and regulations. Students' attention is particularly drawn to the attendance requirement, regular assessment procedures, conditions of promotion to higher semesters and grading system, etc.

Thank you for your interest in the Institute of Technology, Guru Ghasidas Vishwavidyalaya, Bilaspur. We wish all our students a very bright future and successful career.

Dean (SoS., Engg. & Tech.)

Introduction:

Guru Ghasidas Vishwavidyalaya (GGV), a Central University established by an Act 2009 of the Parliament, was originally established as a State University by an Act of State Legislative Assembly of the then undivided Madhya Pradesh on 16 June 1983. GGV is an active member of the Association of Indian Universities and Association of Commonwealth Universities. The National Assessment and Accreditation Council (NAAC) has accredited the Universities as B.

Situated in a socially and economically challenged area, the Vishwavidyalaya is appropriately named to honour the great Satnami Saint Guru Ghasidas (born in 17th century), who championed the cause of the downtrodden, and waged a relentless struggle against all forms of social evils and injustice prevailing in the society.

The Vishwavidyalaya is a semi-residential institution. The Vishwavidyalaya covers almost the total spectrum of higher education in 32 numbers of Vishwavidyalaya teaching departments offering various courses in the areas of Arts, Commerce, Education, Engineering and Technology, Humanities, Life Sciences, Management, Pharmacy, Sciences and Social Sciences. The lush green sprawling campus of the Vishwavidyalaya, spread over an area of approx. 655 acres, is located five KM away from the main Bilaspur Town. River Arpa, the lifeline of Bilaspur, runs parallel to the Vishwavidyalaya campus. Bilaspur is a fast Industrializing City, already having a large number of industrial units coming up in the region. The area is the nerve center of trade in iron and steel, coal, aluminum, textiles, food grains, Kosa silk, cement, paper, furniture and jewelry, and is internationally known for its rice production. The Vishwavidyalaya aims at disseminating and advancing knowledge by providing instructional and research facilities in various branches of learning. It promotes innovation in teaching learning process, interdisciplinary studies & research, establishing linkages with industries for the promotion of science & technology, educate and train man-power for the development of the country and is committed to the improvement of the social, and economic conditions of the people by educating them and helping in their intellectual, academic and cultural development.

The city is well connected with all parts of the country by road and rail. Being a railway zone, Bilaspur facilitates travel by train to and from any part of the country. 120 Kilometers away, at Raipur, the Capital of Chhattisgarh, is the nearest airport.

School of Studies of Engineering and Technology

The Institute of Technology is a prestigious institute of higher learning producing meritorious students with excellent career growth and universal recognition. Our students get the best of opportunities in the form of highly advanced courses, eminent faculty members, well-equipped laboratories, library, hostels and immense facilities to excel in research and development. The selection procedure for students at undergraduate and postgraduate is highly competitive and we get the most talented and bright students from all over the country. Highly scientific and innovative technology is used for teaching and carrying out

research activities. Every year institute adds to its credibility and national/international visibility by the laurels brought by its students and faculty in the form of research publications, projects, fellowships and industrial linkage.

The Institute awards Bachelors and Masters Degrees in various branches of technology. It has been making special efforts to recruit talented faculty on a world-wide basis. Bright young students are admitted from all over the country by a careful selection process throughCentral Counseling Board (CCB), Government of India based upon AIEEE merit. The Institute has about 1600 undergraduate students. We have one of the finest technological libraries with complete information retrieval system.

The Institute has well established Training & Placement Cell which provides the necessary facilities to the students for their placements. The Training & Placement Cell of the Institute will strive to develop itself as one of the best placement centre in our country.

The Institute of Technology is poised to reach heights with its quality research, training, collaborations, and projects. It has signed MOUs with some reputed organizations like IBM and IIT Kanpur. The faculty is also involved in research and development and has a number of publications to their credit, and some are under process. Our Institute of produces career ready graduates who are readily employable.

Department of Chemical Engineering

The Chemical Engineering is one of the Institute of Technology's most prestigious and oldest departments. The department was founded in 1997 with the goal of being one of the greatest chemical engineering study centers in the country, with a focus on cutting-edge technology research and the production of career-ready chemical engineers. The department offers chemical engineering B.Tech. and M.Tech. programmes with intake capacities of 75 and 23 students, respectively. GATE and VET qualified applicants are eligible for M.Tech admission. The course curriculum was created at the level of a renowned technical institute such as IIT/NIT, keeping current trends in the chemical industry in mind. The department is well-equipped with highly qualified faculty members who are dedicated to providing high-quality chemical engineering instruction. Faculty members have published over 100 papers in journals, international and national conferences, and seminars as well as four textbooks and two patents. It has well-equipped laboratories in chemical engineering's core and specialized fields. Funding agencies such as the AICTE and the UGC have awarded the department a total research grant of Rs. 51 lakhs. In the year 2011, the department founded a student society, the Chemical Engineering Students Society (ChESS). The society's goal is to give students a place where they may improve their talents and general personality. "ChESS" recently launched its own book club and will soon publish its own e-magazine, RaSAYAN (an in-house publication of ChESS). The department encourages undergraduate students to get involved in research and present their findings on scientific platforms. The department's students have actively participated in a variety of extracurricular and co-curricular activities at the institution, as well as at the national and international levels, and have achieved notable results. Mr. Thammina Kiran, a final-year student, and Mr. Utkarsh Patel, a recent graduate, recently

obtained the 59th and 30th, All India Rank (AIR) in Gate 2022, respectively. DuPont, Reliance, ESSAR Oil, GACL, SAHARA (UAE), Jindal, BALCO, Ma'aden (KSA) HDFC, Nu-Vista Limited (NUVOCO Cement) and many other reputable companies are among the alumni. Suggestions for further enhancement are warmly welcomed by the department.

Achievements of Students in last years

- 07 students, qualified in GATE-2022 examination
- Mr. Thammina Kiran, a final-year student, and Mr. Utkarsh Patel, a recent graduate, recently obtained the 59th and 30th, All India Rank (AIR) in Gate 2022, respectively.
- 01 student cleared iPATE- 2022 examination
- 06 students students are placed in reputable companies like WIPRO, INFOSYS, Macleods and Cipla Pharmaceutical
- 08 students selected for final round of interview in Suzalchem Technologies Pvt. Ltd. Hyderabad.
- Students of the department actively participate in a variety of extracurricular and co-curricular activities at the institution, as well as at the national and international levels.
- Organizes industrial visits for students to gain an understanding of company operations.

Bachelor of Technology (B.Tech.) Under Choice Based Credit System

Governing the award for the Degree of Bachelor of Technology (B.Tech.)-4 years (8 Semester)

Degree Course

(Ordinance prepared as per the provisions given in Statute 28(1) (b) of The Central Universities Act, 2009)

1.0 TITLE AND COMMENCEMENT

1.1 The Ordinance shall be called as Ordinance for four years (Eight Semesters) B.Tech. Degree programme.

1.2 The first degree of four years (Eight Semester) programme in Engineering & Technology, hereinafter called 4- year B. Tech degree course, shall be designated as 'Bachelor of Technology' in respective Branches. The conduct of the programme and the performance evaluation of B. Tech. programmes are on the basis of percentage of marks earned as well as credit system.

1.3 This ordinance will come into force from the Academic Session commencing after the date of notification issued by the University and shall replace the existing ordinance.

2.0 DEFINITION & KEY WORDS

2.1 "Vishwavidyalaya" or "University" means Guru Ghasidas Vishwavidyalaya (A Central University established by the Central Universities Act, 2009 No. 25 of 2009) located at Koni, Bilaspur, Chhattisgarh.

2.2 "Student" means one who has been admitted in the four years B.Tech. programme of this University through merit list of Joint Entrance Examination (JEE) (main) or any other procedure decided by Guru Ghasidas Vishwavidyalaya for Admission to B. Tech. degree course time to time.

2.3 The candidate shall be eligible for admission on the basis of the "Academic Year" means two consecutive (one odd and one even) semesters.

2.4 "Choice Based Credit System (CBCS)" means a program that provides choice for students to select from the prescribed courses (Basic Science, Humanities, Engineering Science, Mandatory Courses, Professional Core, Open Elective, Professional Elective, etc.) as per the guidelines issued by UGC / AICTE / regulatory bodies where ever applicable and as approved by the appropriate bodies of the University.

2.5 Course" means "papers" through different modes of delivery and is a component of a programme as detailed out in the respective program structure.

2.6 "Credit Point" means the product of grade point and number of credits for a course.

2.7 "Credit" means a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture, seminar or tutorial) per week or two hours of practical work/field work/project etc. per week. The number of credits for each course shall be defined in the respective examination scheme.

2.8 "Cumulative Grade Point Average (CGPA)" means a measure of overall cumulative performance of a student in all semesters. The CGPA is the ratio of total credit points secured by a student in various courses registered up to the semester concerned and the sum of the total credits points of all the registered courses in those semesters concerned. It is expressed up to two decimal places.

2.9 "Grade Point" means a numerical weight allotted to each letter grade on a 10 point scale or as prescribed by the AICTE/ University from time to time.

2.10 "Letter Grade" means an index of the performance of students in a course. Grades are denoted by letters O, A+, A, B+, B, C, P, and F.

2.11 "Semester Grade Point Average (SGPA)" means a measure of performance of a student in a particular semester. It is the ratio of total credit points secured by a student in various courses registered in a semester and the total credits of all courses in that semester. It shall be expressed up to two decimal places.

2.12 "Semester" means an academic session spread over 15-18 weeks of teaching work with minimum 90 teaching days. The odd semester may normally be scheduled from July to December and even semester from January to June.

2.13 "Grade Card" means a certificate based on the grades earned. Grade card shall be issued to all the students registered for the examination after every semester. The grade card will contain the course details (code, title, number of credits, grade secured) along with SGPA of the semester and CGPA earned till that semester. The final semester grade card shall also reflect the cumulative total of marks obtained by the student in all semesters out of maximum marks allocated for which the grades of the program were evaluated. However, the final result will be based on the grades/CGPA.

2.14 "Transcript" means a certificate issued to all enrolled students in a program after successful completion of the program. It contains the SGPA of all semesters and the CGPA;

2.15 "Ex-student" means a student who fails to clear in the supplementary examination all the backlogs of theory, practical / sessional subjects of the odd and even semesters, he/she will not be promoted to the odd semester of the next higher year, and such student shall be treated as ex-student.

2.16 "Sessional" means a subject which is practiced by student in a semester for which there is no end semester exam.

3.0 DURATION

The duration of undergraduate (U.G.) degree programmes leading to B. Tech. degree, shall be normally four years and the maximum duration shall be 7 years from the date of initial registration in First year B.Tech. course. If a candidate will not be able to complete the course in the maximum duration of 7 years then he / she will not be eligible to continue the course from that point of time itself and he / she will automatically exit from the program.

4.0 ADMISSION PROCEDURE AND ELIGIBILITY

The minimum qualification for admission to the first year B. Tech. shall be the passing of Higher Secondary School Certificate Examination (10+2) scheme with Physics, Chemistry and Mathematics conducted by Central Board of Secondary Education or any other equivalent examination from recognized Board or University. The candidate shall be eligible for admission on the basis of the merit list of Joint Entrance Examination (JEE) (main) or any other procedure decided by Guru Ghasidas Vishwavidyalaya for Admission to B. Tech. degree course time to time. In general the admission to B. Tech. degree course shall be governed by the rules of, MHRD, Government of India (GoI) and Guru Ghasidas Vishwavidyalaya. The reservations in admission, cancellation of admission and fee refund will be as per MHRD, GoI / GGV norms and notifications issued in this regard from time to time.

5.0 ENROLMENT IN THE UNIVERSITY

Every student admitted to the programme shall be enrolled before appearing in the first semester examination through the procedure prescribed by the competent authority from time to time.

6.0 TYPES OF COURSES

Basic Science, Humanities, Engineering Science, Mandatory Courses, Professional Core, Open Elective, Professional Elective, etc. as per the guidelines issued by AICTE / University where ever applicable and as approved by the appropriate bodies of the University.

7.0 ATTENDANCE AND ELIGIBILITY TO APEAR IN THE EXAMINATION

A Student shall be required to attend at least 75% of the classes actually held in the

semester which may include theory class, seminars, sessionals, practicals, projects, as may be prescribed. Provided that the Dean of the School of Engineering & Technology on the recommendations of the concerned Head of the Department may condone the shortage in attendance of those students who have secured at least 65% attendance. This condonation should not exceed 10% on the following satisfactory grounds.

(a) Illness / Medical leave of the student certified by the University Medical Officer / Government Doctor.

(b) Unforeseen miss happening with parents.

(c) For participating in the extra and co-curricular events with prior approval from the university authority.

(d) For participating in the sports activity with prior approval from the university authority.

(e) For attending in interviews with valid proof and prior permission of the concerned head of department.

(f) Natural calamities.

The application must be supported by such documents as considered to be fit for granting such condonation.

7.1. A student who does not satisfy the requirement of attendance as per clause above, he/she will be detained due to shortage of attendance in a particular semester and he/she will have to repeat the same semester taking re-admission as a regular student in the next commencing academic session by paying fee as per the University norms.

8.0 EXTRA ORDINARY LONG ABSENCE

If a student does not participate in the academic activities of the School of Studies of Engineering and Technology of this Vishwavidyalaya for a period exceeding two years for reasons of ill health or medical grounds only, he / she shall neither be permitted to appear in any subsequent examinations nor shall be admitted or promoted to any semester and he / she shall cease to be a student of B. Tech. Degree Course. Here participation in academic activity means attending Lectures, Tutorials, Practicals/Sessionals and such other activities declared as academic activities.

9.0 MEDIUM OF INSTRUCTION/EXAMINATION

Medium of instruction and examination shall be English only.

10.0 EXAMINATION AND EVALUTION

10.1 Practical/ Sessional Work – The student shall be required to complete the Laboratory / Drawing / Design / Job preparation and other academic work assigned for that semester in the session.

10.2 There shall be a full End Semester Examination at the end of each semester consisting of theory papers, practicals/ sessionals.

10.3 There shall be one End Semester Examination (ESE) at the end of each semester conducted by Guru Ghasidas Vishwavidyalaya. Only those students, who will satisfy the attendance requirement to be eligible to appear at the End Semester Examination as per clause 7.0, will be permitted to appear in the End Semester Examination. The examination will consist of theory papers, laboratory practical/sessional and viva-voce as per the scheme of examination of that semester. These examinations shall be designated as follows.

(a). During First year - I & II sem. B. Tech. Examination
(b). During Second year- III & IV sem. B. Tech Examination
(c). During Third year - V & VI sem. B. Tech. Examination
(d). During Fourth year - VII & VIII sem. B. Tech. Examination

10.4 The semester examination will normally be held in the month of November-December and April – May in every academic session, or as decided by the University from time to time.

10.5 Supplementary examination will be held only once in a year (for both even and odd semesters) normally in the month of June/July or as decided by the University from time to time.

10.6 End Semester Examination time table shall be declared by the Controller of Examination before the commencement of examination.

10.7 Basis of Subjects Evaluation

10.7.1 For passing in a subject (theory / practical/sessional) the performance of the candidate in each semester shall be evaluated subject wise. There shall be continuous assessment throughout the semester by conducting class tests, called as Internal Assessment (I.A.) carrying 30% weightage, and End Semester Examination (E.S.E.) carrying 70% weightage. A student has to secure minimum 35% (24 marks) in the particular theory subject and minimum 40% marks in a particular practical subject to pass that subject in the end semester examination. For each practical/sessional subject 60% weightage will be given to the actual practicals /sessionals performed during the semester I.A. and 40% weightage will be given to

the End Semester Examination (ESE).

10.7.2 For evaluation of end semester practical/sessional examination of a subject, there shall be two examiners, one internal examiner who has conducted the practical in that semester and other external examiner to be appointed by the Head of the Department from amongst faculty members of the department concerned.

10.7.3 To allot the marks of Internal Assessment (IA), there shall be two Class Tests (CT) I & II each of 15 marks.

10.7.4 For passing a subject the student is required to fulfill the following conditions:

(a) Student has to secure minimum 35% (24 marks) in a particular theory subject to pass that subject in the end semester examination.

(b) Student has to secure minimum 40% marks in a particular practical / sessional subject to pass that subject (practical / sessional) in the end semester examination.

(c) Must have secured minimum 40% marks (Marks of Internal Assessment + Marks of End Semester Examination) for each theory subject.

(d) Must have secured minimum 50% marks (Marks of Internal Assessment + Marks of End Semester Examination) for each project/practical/sessional subject.

(e) Must have scored minimum SGPA of 5.0 in the semester. If a student has cleared all the Theory and Practical/Sessional subjects of one or and both semesters of a year, but has failed to secure SGPA of 5.0 in the semester or and semesters of a year then he/she will be allowed to re-appear in the supplementary Examination in those subjects in which the student's Grade Points less than 5. If the student fails to secure SGPA of 5.0 even in the supplementary examination, he/she will not be promoted to the odd semester of the next higher year, and such student shall be treated as an ex-student. Other condition of promotion of the ex-student will be applicable as per Clause 11.

(f) If a student has passed a semester examination in all the subjects as per clause **10.7.4** (a- e), he/she shall not be permitted to reappear in that examination for improvement in grades/division.

10.7.5 Basis of Credits- Credit of a theory or practical/sessional subject is decided by: Credit = (L+ T+P/2),

Where; L = Lecture periods per week,

T = Tutorial period per week,

P = Practical/Sessional periods per week.

Credit in a subject will be an integer, not in a fractional number. If a credit in a

subject turns out in fraction, it will be taken as next integer number.

10.7.6 For Theory Subjects-For the assessment of performance of students in a semester, continuous evaluation system will be followed with two components: Internal Assessment (IA), carrying 30% weightage and End Semester Examination (ESE), carrying 70% weightage. There will be two class tests each of 15 Marks, in each theory subject in a semester forming the part of Internal Assessment (IA).

10.7.7 For Projects/Practical/ Sessional Subjects- Evaluation of project/practical/sessional during the semester will carry 60% weightage for Internal Assessment (IA) and the End Semester Examination (ESE) will carry 40% weightage. The internal assessment will carry equal weightage of attendance (20% weightage), practical records (20% weightage) and internal viva – voice examination (20% weightage). The marks for attendance shall be awarded in project/practical/sessional subject as per the following Table.

Percentage of attendance	65 - ≤ 75	> 75 - ≤ 80	>80- ≤ 85	>85- ≤ 90	>90- ≤ 95	>95-≤ 100
Percent weightage of Marks	10	12	14	16	18	20

10.7.8 Grading System- Percentage as well as absolute grading system will be followed, in every subject, theory or practical/sessional. A student will be awarded a Letter Grade, based on his combined performance of Internal Assessment (IA) and End Semester Examination (ESE). These grades will be described by letters indicating a qualitative assessment of the student's performance through a number equivalent called "Grade Point" (GP) as given below. The following is the Grade Point pattern. Grade 'F' indicates not clearing (passing) of the subject.

Letter Grade (LG)	O	A+	A	B+	B	C+	P	F	Ab
Grade Point	10	9	8	7	6	5	4	0	0

The Letter Grades are O (Outstanding), A+ (Excellent), A (Very Good), B+ (Good), B(Above Average), C (Average), P (Pass), F(Fail) and Ab (Absent in end semester examination). Grades will be awarded for every theory and practical/sessional subject separately.

10.7.9 Absolute Grading System

(a) The Absolute Grading System as explained below will be adopted for theory and project/practical/sessional subjects.

GRADE	Percentage of Marks Obtained	
	THEORY	PRACTICAL/SESSIONAL/PROJECT
O (Outstanding)	>90- ≤100	>90-≤ 100
A⁺(Excellent)	>80 - ≤ 90	>80-≤ 90
A (Very Good)	>70 - ≤ 80	>70 - ≤ 80
B⁺(Good)	>60 -≤ 70	>60- ≤ 70
B (Above Average)	>50- ≤ 60	>55- ≤ 60
C (Average)	>40-≤ 50	>50-≤ 55
P (Pass)	=40	=50
F (Fail)	00 - <40	0 - < 50

(b) 01 Grace Mark shall be given only once at the time of award of the degree to improve the Grade in overall result.

10.7.10 Semester Grade Point Average (SGPA)- Performance of a student in i th semester is expressed by [SGPA]i which is a weighed average of course grade points obtained by a student in the semester, and is expressed by

$$[SGPA]_i = \frac{[C_1G_1 + C_2G_2 + ...]_i}{[C_1 + C_2 + ...]_i} = \frac{[\sum C_jG_j]_i}{[\sum C_j]_i} = \frac{N_i}{D_i}$$

Where C_j stands for Credit and G_j stands for Grade points corresponding to j th subject in a semester. SGPAs will be calculated up to two places of decimal without rounding off. SGPA will be calculated only when a student clears a semester without failing in any subject, theory or practical/sessional/project.

10.7.11 Cumulative Grade Point Average (CGPA)- This is a weighed average of course grade points obtained by a student for all the courses taken, since his / her admission. Thus, CGPA in the i th semester with "i ≥2" will be calculated as follows:

$$[CGPA]_i = \frac{\sum_{k=1}^{k=i} N_k}{\sum_{k=1}^{k=i} D_k}$$

If a student repeats a course or is declared fail in a subject, then only the grade points earned in the attempt when he / she cleared the course (subject) are

counted towards CGPA. CGPA will be calculated in every semester along with SGPA, so that a student knows his / her latest CGPA.

11 PROMOTION TO NEXT YEAR AND SEMESTER

11.1 Those students who have cleared all the registered theory, practical/sessional subjects prescribed for the B.Tech. first year shall be promoted to the B.Tech. second year. Those students who have cleared all the registered theory, practical/sessional subjects prescribed for the B.Tech. second year shall be promoted to the B.Tech. third year. Those students who have cleared all the registered theory, practical/sessional subjects prescribed for the B.Tech. third year shall be promoted to the B.Tech. fourth year.

11.2 Supplementary examinations will be held only once in a year (for both even and odd semesters) normally in the month of July after declaration of results of even semester examination of the incumbent session, or as decided by the University time to time.

11.3 Those students who would have backlogs in registered theory and/ or practical/ sessional subjects in the odd and or even semesters of any academic year will be allowed to appear in the supplementary examinations of the same year.

11.4 Those B.Tech. students who are allowed to appear the supplementary examination (of odd or even or both semester), may be allowed to attend the classes provisionally of the next higher odd semester of the next year. However, such provisionally permitted students will get their regular admission only after passing in all their backlog papers in supplementary examination, if eligible otherwise. The percentage of attendance shall be counted from the date of commencement of the semester classes.

11.5 If a student fails to clear in the supplementary examination all the backlogs of theory, practical/sessional subjects of the odd and even semesters, he/she will not be promoted to the odd semester of the next higher year, and such student shall be treated as ex-student.

11.6 Ex-students, {as per clause 10.7.4(e)}, shall be required to clear their backlog papers (theory and or practical/sessional subjects), in the end semester examination of the corresponding semesters (odd and even) and supplementary examination to be conducted next year (in the following academic session). Such ex-students will be required to deposit the examination fees only.

11.7 If a student fails to appear in the internal assessment / sessional of a semester due to unforeseen incident, a makeup test/examination may be conducted, if required, strictly on the recommendation of the concerned Head of the

Department, and approval of the Dean (Engineering & Technology).

12 AWARD OF CLASS OR DIVISION

12.1 The class/division awarded to a student with B. Tech. Degree shall be determined by the student's CGPA after clearing all the subjects of all the eight semesters, as given below:

First Division with Distinction or Honours: 7.5 ≤CGPA ≤ 10.0

First Division : 6.5 ≤CGPA< 7.5

Second Division : 5.0 ≤ CGPA< 6.5

12.2 Division shall be awarded to a student only after clearing all the eight semesters successfully, and having earned at least total credit of 160 for the award of B.Tech. degree. It shall be based on the integrated performance of the candidate for all the eight semesters as per clause 10.3.

12.3 No student shall be declared to have passed the final B.Tech. course unless he/she has fully passed all the eight semesters. The results of the eighth semester of those students, who have not passed examination in any previous semester, will be withheld. Such students shall be deemed to have passed the final B.Tech. examination in the year in which they pass / clear all the subjects of all the eight semesters, within the limit of the prescribed period of the whole course.

13 TRANSCRIPT

Based on the Letter grades, grade points and SGPA and CGPA, the Vishwavidyalaya shall issue the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

14 CONVERSION OF CGPA / SGPA IN PERCENTAGE

There is no equivalence between the CGPA/SGPA scale and percentage.

However notionally, Percentage of particular semester = (SGPA) × 10

Percentage of B.Tech. Degree = (CGPA) × 10

15 RANKING

Only such candidates who complete successfully all courses in the programme in single attempt shall be considered for declaration of ranks, medals etc declared and notified by the university, if any.

16 DISCIPLINE

- Every student is required to observe discipline and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to bring down the prestige of the Institute.

- Any act of indiscipline of a student reported to the concerned Head / Dean (Engineering & Technology), will be investigated and necessary action will be taken as per university rules from time to time.

- Ragging of any dimension is a criminal and non-bail able offence in our country. The current State and Central legislations provide for stringent punishment, including imprisonment. Once the involvement of a student is established in ragging, the offending student will be dismissed from the University and will not be admitted into any other Institution. Avenues also exist for collective punishment, if individuals can not be identified in this inhuman act. Every senior student, along with the parent, shall give an undertaking every year in this regard and this should be submitted at the time of admission / registration.

17 REGISTRATION REQUIREMENTS

- Every student is required to be present and register at the commencement of each semester on the day(s) fixed for and notified in the Academic Calendar from time to time.

- Late registration will be permitted with a fine as decided from time to time up to three weeks from the date of commencement of each semester as notified in the Academic Calendar from time to time. If the student does not register in the specified time he/she have to be registered in the next year in the same semester.

- Percentage attendance for all students will be counted from the date of commencement of the semester, irrespective of his/her date of registration. However, in case of first year first semester, attendance will be counted from date of admission into the School or date of commencement of class work, whichever is later.

- Minimum 4 weeks Industrial training/Internship in during summer break is compulsory after end semester examination of sixth semester. The student has to submit the industrial training / Internship report to the concerned department at the time of registration in the seventh semester and required to defend his/her industrial training/Internship during seventh semester in the department.

- If a student finds his/her academic/course load heavy in any semester, or for any other valid reason, he/she may drop courses within 15 instructional days from the commencement of the semester with the recommendation of his/her Head of

Department and approval of the Dean, Engineering & Technology.

- The curriculum for any semester, except for the final semester will normally carry credits between 21 to 29.
- Minimum number of credits that a student can register in any given semester (excepting for final semester) is 15. Maximum number of credits that can be registered in a semester is 29.
- However, in the final semester, a student may earn less than 15 credits if it is sufficient for him/ her to fulfill the requirements for the award of the degree.
- A student who has successfully secured CGPA equal and more than 7.0 in his/her First Year courses, can be registered for non-credit courses in other departments of the university for his/her higher semesters of study. The registration in non-credit courses will be done after recommendation of Head of the Department and approval of the Dean, Engineering & Technology followed by the same of the Head of the Department concerned of the non-credit course offered in. The student has to attend the classes of the non-credit courses in addition to the fulfilling the requirements of registered regular subjects in his/her department prescribed by the Head of Department. For non-credit courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

18 TRANSFER OF CREDITS

With due approval the courses studied through on line / off line like Massive Open online Courses (MOOCS) through National Programme on Technology Enhanced Learning (NPTEL) under Study Webs of Active –Learning for Young Aspiring Minds (SWYAM) in Indian/ Foreign University/Institutions by the students during their study period at GGV Bilaspur (C.G.) may count towards the credit requirements for the award of B.Tech. degree. The credit transferred will reduce the number of courses to be registered by the student at GGV. The guidelines for such transfer of credits are as follows.

- On successful completion of the courses opted by students under SWYAM, the credits earned by them shall be included in their Grade card.
- Credits transferred will not be used for SGPA/CGPA computations except SWYAM. However, credits transferred will be considered for overall credits requirements of the programme.
- Students can earn credits only from other department of the University (GGV) / IISC/IITs/NITs/Central Universities and other Indian and Foreign Institutions/Universities with which GGV has an MOU (and that MOU must have specific clauses for provisions of credit transfer by students).

- Credit transfer can only be considered for the courses at same level (i.e., UG, PG, etc.).
- The credits / grades indicated in the grade sheet obtained from the university in which the student has completed the courses should be used by the student as part of his/her transcripts.

19 INTERPRETATION OF REGULATION

In case of any dispute in the matter of interpretation of this Ordinance, the decision of the Vice- Chancellor of the University shall be final and binding on the students.

20 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council of the University has the right to propose any modifications or amendments to the Executive Council for final decision of the above regulations and further actions from time to time.

21 Matters not covered in this Ordinance shall be governed by the relevant ordinance of the University.

Scheme & Syllabus

I- SEM. & II-SEM.

(B.Tech.-1st Year)

SCHEMEOF EXAMINATION B.Tech-I Year, Common to All Branches, Course – A, w.e.f. Session: 2020-21

S.No.	COURSE No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
THEORY									
1.	MA201TBS01	MATHEMATICS-I	3	1	-	30	70	100	4
2.	CY201TBS02	CHEMISTRY	3	1	-	30	70	100	4
3.	CE201TES01	ENGINEERING MECHANICS	3	1	-	30	70	100	4
4.	CS201TES02	COMPUTER PROGRAMMING	3	0	-	30	70	100	3
5.	CM201TES03	BASIC CIVIL & MECHANICAL ENGINEERING	3	0	-	30	70	100	3
6.	LW201TMC01	INDIAN CONSTITUTION	2	0	-	-	-	-	-
		TOTAL	**17**	**3**	**-**	**150**	**350**	**500**	**18**
PRACTICALS									
1.	CY201PBS01	CHEMISTRY LAB	-	-	2	30	20	50	1
2.	CE201PES01	ENGINEERING MECHANICS LAB	-	-	2	30	20	50	1
3.	CS201PES02	COMPUTER PROGRAMMING LAB	-	-	2	30	20	50	1
		TOTAL	**-**	**-**	**6**	**90**	**60**	**150**	**3**
		GRAND TOTAL	**17**	**3**	**6**	**240**	**410**	**650**	**21**

Total Credits: 21 Total Contact Hours: 26 Total Marks:650

L: LECTURE, T: TUTORIAL, P: PRACTICAL, IA: INTERNAL ASSESSMENT, ESE: END SEMESTER EXAMINATION

*INTERNAL ASSESSMENT- Two Class Test of 15 Marks each will be conducted.

SCHEMEOF EXAMINATION B.Tech-I Year, Common to All Branches, Course-B, w.e.f. Session: 2020-21

S. No.	COURSE No.	SUBJECT	PERIODS			EVALUATION SCHEME			CREDITS
			L	T	P	IA	ESE	SUB-TOTAL	
THEORY									
1.	MA202TBS03	MATHEMATICS-II	3	1	-	30	70	100	4
2.	PH202TBS04	PHYSICS	3	1	-	30	70	100	4
3.	EC202TES04	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	3	1	-	30	70	100	4
4.	IT202TES05	INTRODUCTION TO INFORMATION TECHNOLOGIES	2	0	-	30	70	100	2
5.	EN202THS01	ENGLISH COMMUNICATION	3	0	-	30	70	100	3
		TOTAL	**14**	**3**	**-**	**150**	**350**	**500**	**17**
PRACTICALS									
1.	PH202PBS02	PHYSICS LAB	-	-	2	30	20	50	1
2.	ME202PES03	ENGINEERING GRAPHICS	1	-	3	30	20	50	3
3.	ME202PES04	WORKSHOP TECHNOLOGY & PRACTICES	1	-	2	30	20	50	2
4.	EC202PES05	BEE LAB	-	-	2	30	20	50	1
		TOTAL	**2**	**-**	**9**	**120**	**80**	**200**	**7**
		GRAND TOTAL	**16**	**3**	**9**	**270**	**430**	**700**	**24**

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	MA201TBS01	L	T	P	CT-1	CT-II	TOTAL	70	100	04
Subject:	MATHEMATICS-I	3	1	-	15	15	30			

Course Content

Calculus (Single Variable)

UNIT 1: Calculus: Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Asymptotes: definition, properties and problems. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L' Hospital's rule; Maxima and minima.

UNIT 2: Sequences and series: Convergence of sequence and series, tests for convergence, power series, and Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT-3: (A): Multi variable Calculus (Differentiation): Limit, continuity and partial derivatives, directional Derivatives, total Derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

(B): Multivariable Calculus (Integration): Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

UNIT-4 (A): Matrices (in case vector spaces is not to be taught): Algebra of matrices, Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley- Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

(B) Matrices (in case vector spaces is to be taught): Matrices, vectors: addition and scalar multiplication, matrix multiplication; linear systems of Equations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.

UNIT-5 (A): Vector spaces: Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank nullity theorem, composition of linear maps, Matrix associated with a linear map.

(B) Vector spaces: Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigenbasis. Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Textbooks/References:

1.G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11 Reprint, 2010.

4.N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

5.B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.

6.D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

7.V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra,

Affiliated East–West press, Reprint 2005.

8. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

SYLLABUS	**(SEMESTER-I)**	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CY201TBS02/ CY202TBS04	L	T	P	CT-1	CT-II	TOTAL	70	100	04
Subject:	CHEMISTRY	3	1	-	15	15	30			

Course Learning Objectives:

The objective of this Course is to:

To make aware and enrich the the students about the basic concept and understanding of chemical concepts of basic Chemistry.

Course Content:

UNIT-1: Concept of Quantum Energy and Spectroscopy: Quantization of Energy, Regions of spectrum. Electronic Spectroscopy: Electronic Transition, Woodward Fieser rules for calculating λ max of conjugated dienes & α, β-unsaturated carbonyl compound, various shifts in λ max and intensities. Infra-Red Spectroscopy: Conditions for Infra-Red Spectroscopy, Molecular vibrations & factors affecting Infra-Red frequencies.

UNIT-2: Chemical Bonding in Molecules: Introduction of chemical bonding, VSEPER Theory, V. B. Theory and Molecular Orbital Theory. Energy level diagrams of diatomic molecules and ions.

UNIT-3: Concept of Chirality, Enantiomers, Diastereomers, Meso-compounds and Racemic mixtures. Conformation of Acyclic hydrocarbons (Ethane, Propane & n-Butane) and cyclic hydrocarbon (Cyclohexane), Plane of symmetry, Centre of symmetry, Absolute and Relative Configuration (R &S, D & L and E & Z).

UNIT -4: Reactivity of Organic Molecules, Factors influencing acidity, basicity and nucleophilicity of molecules, kinetic vs thermodynamic control of reactions.

UNIT -5: Strategy for Synthesis of Organic Compounds: Reaction intermediates: Stability of Free Radicle, Carbocation and Carbanion. Introduction to reaction involving Addition, Elimination, Substitution and Ring opening and Cyclization.

Textbooks/References:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.
3. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
4. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
5. A textbook of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
6. Applied Chemistry by H.D. Gesser, Springer Publishers
7. Textbook of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM
8. B. Siva Shankar, "Engineering Chemistry", Tata Mc Graw Hill Publishing Limited, 3rd Edition, 2015.
9. S. S. Dara, Mukkanti, "Text of Engineering Chemistry", S. Chand & Co, New Delhi, 12th Edition, 2006.
10. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials",

Wiley India, 5th Edition, 2013.
11.R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.

Course Outcomes:

At the end of the course the students will be able to understand and solve the practical problems of their higher Engineering classes on the basis of understanding of Chemistry developed in their B. Tech. I sem classes.

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CE201TES01 / CE202TES03	L	T	P	CT-1	CT-II	TOTAL	70	100	04
Subject:	ENGINEERING MECHANICS	3	1	-	15	15	30			

Course Learning Objectives:

- The concepts Force systems, free body diagrams, resultant of forces and equations of equilibrium, Supports and support reactions and calculation of Centroid
- The Concept of moment of inertia of plane figures, Laws and applications of friction
- The Analysis of the truss and determination of axial forces by Method of Joints
- Motion of a body and their relationships and application of D Alembert's principle in rectilinear and curvilinear motions

Course Content:

UNIT-1: Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems

UNIT-2: Friction covering, Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies. Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; Simple

Trusses; Zero force members.

UNIT-3: Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections.

UNIT-4: Virtual Work and Energy Method-Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency.
Review of particle dynamics- Rectilinear motion; Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse- momentum (linear, angular); Impact (Direct and oblique).

UNIT-5: Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

Textbooks/References:

1.Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2.F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, Dynamics, 9th Ed, Tata McGraw Hill
3. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
4. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,
5. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
6. Bansal R.K. (2010), A Text Book of Engineering Mechanics, Laxmi Publications
7.Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.
8. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

Course Outcomes- On successful completion of teaching-learning and evaluation activities, a student would be able to

- Identify and analyze the problems by applying the fundamental principles of engineering mechanics and to proceed to research, design and development of the mechanical systems.
- Construct free body diagrams and use appropriate equilibrium equations,

Calculate unknown forces in a plane by resolution of force and equilibrium equations

- Locate Centroid of composite figures and determine moment of plane figures
- Analyze the systems with friction
- Determine the axial forces in the members of determinate truss.
- Calculation of acceleration, velocity and displacement and forces
- Calculation of angular displacement, velocity and angular acceleration of rotational bodies

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CS201TES02 / CS202TES04	L	T	P	CT-1	CT-II	TOTAL	70	100	03
Subject:	COMPUTER PROGRAMMING	3	0	-	15	15	30			

Course Learning Objectives:

- To understand the basic of Idea of Algorithm.
- To understand the programing concept of Arithmetic expressions and Basic Algorithms
- To learn the Functions and Structure of array.

Course Content:

UNIT-1: Introduction to Programming Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) -Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

UNIT-2: Arithmetic expressions and precedence Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching Iteration and loops, Arrays (1-D, 2-D), Characterarrays and strings.

UNIT-3: Basic Algorithms Searching, concept of binary search etc, Basic Sorting Algorithms Bubble sort etc, Finding roots of equations, introduction of Algorithm complexity.

UNIT-4: Function

Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference binary search etc. Recursion functions Recursion, as a different way of solving problems. Example programs, such as, Finding Factorial, Fibonacci series, etc.

UNIT -5: Structure

Structures, Defining structures and Array of Structures Pointers Idea of pointers, defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

Textbooks/References:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill
3.Brian W. Kernighan and Dennis M. Ritchie, the C Programming Language, Prentice Hall of India.

Course Outcomes- At the end of the course students will be able to Develop the algorithm and programmers for various applications using Arithmetic expressions, arrays, pointers and Functions.

SYLLABUS	(SEMESTER-I)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	CM201TES03 / CM202TES05	L	T	P	CT-1	CT-II	TOTAL	70	100	03
Subject:	BASIC CIVIL & MECHANICAL ENGINEERING	3	0	-	15	15	30			

Course Learning Objectives:

- To study the properties and uses of basic civil engineering materials.
- To study the importance of NBC, IS Codes (materials), types of buildings and foundations, basic requirements of foundations.
- To study the basic types of surveys, linear and angular measurements, and GPS measurements
- To familiarize with the fundamentals of heat and work interactions, heat transfer mechanisms and energy conversion processes.
- To provide exposure to various engineering materials and processes of manufacturing.
- To impart basic knowledge of the interdisciplinary nature of engineering

systems.

Course Content:

UNIT 1: Civil Engineering Materials: Properties & Uses of Stones, Bricks, Cement, Aggregates, Steel, Concrete- quality of good concrete, strength, curing and grade of concrete, standard tests on concrete. IS Codes and classification

UNIT 2: National Building Code (NBC), Salient features, Classification of Building as per NBC(India), Site selection for buildings - Components of building, Foundations-Introduction, Types of Foundations & its Suitability, Basic requirements and purpose of foundation on different soils.
Brief description about: Brick & stone masonry, Plastering, Lintels; Doors & Windows, Beams & columns, Formwork, Roofs.

UNIT 3: Surveying: Objects, uses, Basic principle, Classification, Plans & Maps, Scales, Units of measurement, Conventional symbols, Different survey equipment.
Measurements – Linear & Angular, levelling, Determination of Area & Volume, Introduction to Triangulation and GPS

UNIT 4: Materials and Manufacturing, Introduction to engineering materials – metals, alloys, composites, smart materials, phase-change materials; Introduction to various processes of manufacturing – conventional machine tools – lathe and its types, shaping, milling and related operations – turning, threading, knurling, etc., unconventional methods.

UNIT 5: Automobile and Refrigeration and Air conditioning, Theoretical thermodynamic cycles and working principle of Petrol and Diesel Engines – Hybrid and Electric Vehicle - Turbines, Pumps, Compressors. Principle of vapour compression and absorption refrigeration system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner. Introduction to renewable energy utilization and technology.

Textbooks/References:

1. Punmia, B.C, Ashok Kumar Jain, Arun Kumar Jain, Basic Civil Engineering, Lakshmi Publishers, 2012.
2. Satheesh Gopi, Basic Civil Engineering, Pearson Publishers, 2009.
3. Rangwala, S.C, Building materials, Charotar Publishing House, Pvt. Limited, Edition 27, 2009.

4. Palanichamy, M.S, Basic Civil Engineering, Tata McGraw Hill, 2000.
5. Elements of Workshop Technology Vol. 1 – S.K. Hajra Choudhary, A.K. Hajra Choudhary – Media promoters & Publishers Pvt. Ltd.
6. Basic Automobile Engineering – R.B. Gupta, Satya Prakashan.
7. Shanmugam, G and Palanichamy, M S, Basic Civil and Mechanical Engineering, Tata McGraw Hill
8. National Building Code (NBC) – Bureau of Indian Standards
9.Bureau of Indian Standard Codes for Civil Engineering Materials

Course outcome:

At the end of the course, the students will be

1. Able to gain the knowledge on the basic civil engineering materials
2. Able to know the importance of NBC and relevance of IS Codes to Civil engineering materials, site selection of a building and its components and materials
3. Exposed to various types of surveys, linear and angular measurements and GPS measurements
4. Be able to relate with processes in various energy conversion devices involving heat and work.
5. Be able to identify and suggest various processes of manufacturing and materials involved.
6. Be able to appreciate the interdisciplinary existence between heat, work, fluid flow and manufacturing processes.

SYLLABUS	**(SEMESTER-I)**	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	LW201TMC01	L	T	P	CT-1	CT-II	TOTAL	--	--	--
Subject:	INDIAN CONSTITUTION	2	0	-	-	-	-			

Course Learning Objectives:

- To the importance of preamble of the constitution of India.
- To understand the fundamental rights and duty as a citizen of India.
- To understand the functioning of union and state government and their inter-relationship.

Course Content:

UNIT 1: Introduction: Constitution-meaning of the term, Sources and

constitutional theory, Features, Citizenship. Preamble.

UNIT 2: Fundamental Rights and Duties: Fundamental Rights, Fundamental Duties, Directive Principles of State Policy

UNIT 3: Union Government: Structure of Indian Union: Federalism, Centre-State relationship President: Role. Power and position, Prime Minister and council of ministers, Cabinet and Central Secretariat, Lok Sabha. Rajya Sabha

UNIT 4: State Government: Governor: Role and position, Chief Minister and council of ministers, State Secretariat

UNIT 5: Relationship between Centre and States: Distribution of Legislative Powers, Administrative Relations, Coordination between States

Textbooks/References:

1. Constitution of India, V.N. Shukla
2. The Constitutional Law of India, J.N. Pandey
3. Indian Constitutional Law. M.P. Jain.

Course Outcome: At the end of the course students will be able to:

- Describe the salient features of the Indian Constitution
- List the Fundamental Rights and Fundamental Duties of Indian citizens
- Describe the Directive Principles of State Policy and their significance

SYLLABUS	(SEMESTER-I)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	CY201PBS01 / CY202PBS02	L	T	P	IA	MSE	TOTAL	20	50	01
Subject:	CHEMISTRY LAB	0	0	2	30	-	30			

Course Learning Objectives:

The Lab sessions would help in learning:

- Application of iodometrically & titration in lab.
- Recognition of different chemical reaction.
- Advanced lab methods like Spectrophotometry and chromatography

Course Content:

Group-A:

1. Standardization of sodium thiosulphate solution by standard potassium dichromate solution.
2. To determine the Normality and Strength (g/L) of given Ferrous Ammonium Sulphate solution 'A' using standard Ferrous Ammonium Sulphate (N/30) solution 'B' taking KMnO4 solution as an intermediate.
3. To determine the concentration of hypo solution (Na2S2O3.5H2O) I odometrically with given Iodine (N/50) solution.
4. Find out the Temporary hardness of given water sample using 0.01M EDTA solution, buffer solution (pH-10) and EBT as an indicator.
5. To determine chloride ion in a given water sample by Argentometric method (Mohr's method)

Group-B:

6. Preparation of Urea Formaldehyde resin.
7. Acetylation of Primary Amine: Preparation of Acetanilide.
8. Base Catalyzed Aldol Condensation: Synthesis of dibenzalpropanone.
9. Cycloaddition Reaction: Diels-Alder reaction.
10. Preparation of aspirin and calculate its yield.

Group – C:

11. To calculate the λ_{max} of a given compound using UV-visible spectrophotometer.
12. To separate the metallic ions by paper chromatography.
13. To determine the surface tension of a liquid by stalagmometer.
14. To determine the percentage composition of the given mixture consisting of two liquids A and B (non- interacting system) by viscosity method.
15. To determine the relative viscosity of given liquids by Ostwald's viscometer.

Note: At least two Experiments from each group must be performed.

Course Outcomes- On completion of the course, the students will be able to handle the chemicals of synthesis as well as titration that will ultimately make them efficient and develop their future chemistry laboratory skills.

SYLLABUS	**(SEMESTER-I)**	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	CE2011ES01/ CE202PES04	L	T	P	IA	MSE	TOTAL	20	50	1
Subject:	ENGG MECHANICS LAB	-	-	2	30	--	30			

Course Learning objectives:

• To perform the practical giving basic understanding to fundamental principles of mechanics like parallelogram of forces, triangle of forces and polygon of forces by universal force table

• To perform the practical giving basic understanding to fundamental application of mechanics like screw jack, winch crab and simple wheel and axle

Course Content:

List of Experiments

1. Verification of law of parallelogram of forces.
2. Verification of law of triangle of forces.
3. Verification of law of polygon of forces by universal force table.
4. Verification of law of moment by parallel forces apparatus.
5. Practical verification of forces in the member of jib crane.
6. Practical verification of forces in the member of the truss.
7. Determination of coefficient of friction between two given surfaces by inclined plane method.
8. Determination of efficiency of simple screw jack.
9. Determination of efficiency of single purchase winch crab.
10. Determination of efficiency of double purchase winch crab.
11. Determination of efficiency of simple wheel and axle.

Course Outcome: At the end of the course students will be able to:

• Verify the fundamental principles of mechanics like parallelogram of forces, triangle of forces and polygon of forces by universal force table

• Analyze the friction coefficient between two surfaces

• Calculate the efficiency of screw jack, winch crab and wheel and axle

SYLLABUS	(SEMESTER-I)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	CS201PES02 / CS202PES05	L	T	P	IA	MSE	TOTAL	20	50	01
Subject:	COMPUTER PROGRAMMING LAB	-	-	2	30	--	30			

Course Learning Objectives:

- To learn the Branching and logical expressions and Loops
- To learn the Arrays and Function
- To understand the Numerical methods and Recursion

Course Content:

The laboratory should be preceded or followed by a tutorial to explain the approach or Algorithm to be implemented for the problem given.]

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical Integration):
ab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Course Outcomes- At the end of the course students will be able to
• Utilization of Branching and logical expressions and Loops, Arrays and Function and Numerical methods and Recursion for writing the programmes for various engineering applications

SYLLABUS	Periods/	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	MA202TBS03	L	T	P	CT-1	CT-II	TOTAL	70	100	4
Subject:	MATHEMATICS-II	3	1	-	15	15	30			

Course Content:

UNIT 1: First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT 2: Ordinary differential equations of higher orders (Prerequisite 2c, 4a) second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

UNIT 3: Partial Differential Equations – First order (Prerequisite 5a-b): First order partial differential equations, solutions of first order linear and non-linear PDEs.

UNIT 4: Partial Differential Equations– Higher order (Prerequisite 5b-c) Solution to homogenous and non- homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems).

UNIT 5: D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Separation of variables method to simple problems

in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables. Boundary-value problems: Solution of boundary- value problems for various linear PDEs in various geometries.

Textbooks/References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley &Sons, 2006.
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edition, Wiley India, 2009.
3. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
4. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
5. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
6. G.F. Simmons and S.G. Krantz, Differential Equations, Tata McGraw Hill, 2007.
7. S. J. Farlow, Partial Differential Equations for Scientists and Engineers, Dover Publications, 1993.
8. R. Haberman, Elementary Applied Partial Differential equations with Fourier Series and Boundary Value Problem, 4th Ed., Prentice Hall, 1998.
9. Ian Sneddon, Elements of Partial Differential Equations, McGraw Hill, 1964.
10. Manish Goyal and N.P. Bali, Transforms and Partial Differential Equations, University Science Press, Second Edition, 2010
11. Denian murry,defferential equations ,oxford publications

SYLLABUS	**(SEMESTER-II)**	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	PH201TBS02 / PH202TBS04	L	T	P	CT-1	CT-II	TOTAL	70	100	04
Subject:	PHYSICS	3	1	-	15	15	30			

Course Learning Objectives:

•To know the basic principles, effects and applications such as physical, optical parameters used for engineering applications.
•To learn about various laws and applications of electromagnetic theory.
•To know the basic structure, working principles and applications of lasers and optical fibre communication.
•To know the basics of semiconductor physics, semiconductor materials and devices and its characterization for advance technological applications
•To familiarize the basis of quantum theory and to make students to solve the physical problems for advancement of the technology.

Course Content:

UNIT 1: Optics: Interference and Diffraction

Introduction, Young's experiment theory of interference, Coherent and non-coherent sources, Fresnel's Bi- prism and Newton's ring experiment. Diffraction of light, Fresnel and Fraunhofer's diffraction, diffraction due to plane diffraction grating.

UNIT 2: Electromagnetic Theory

Coulomb's law electrostatics field and potential, electric flux, Gauss' law, Poisson's and Laplace's equation. Equation of continuity for charge conservation, Ampere's and Faraday's laws, Maxwell's Electromagnetic equations.

UNIT 3: Laser and Fiber optics

ntroduction, elementary idea of spontaneous and stimulated emission, active medium population inversion, Einstein's coefficients, Types of lasers and important applications of lasers.Introduction to optical fibers, basic principles of optical fiber, critical angle numerical aperture, maximum acceptance angle, classification of optical fiber.

UNIT 4: Semiconductor physics and Devices

Formation of energy in solids, Energy band gap of metals, insulators and semiconductors, classification of semiconductor: Intrinsic and Extrinsic semiconductors, Fermi levels in intrinsic and extrinsic semiconductors, Electrical conductivity in conductors and semiconductors, working of P-N junction diodes and bipolar junction transistor.

UNIT 5: Introduction to Quantum Mechanics

Introduction to Quantum Mechanics, photoelectric effect, Compton effect, wave-particle duality, uncertainty principle, wave function, De-Broglie waves, phase and Group velocity, Davisson and Germer experiment, Schrodinger wave equation, particle in a box (I-Dimensional)

Textbooks/References:

1. Applied physics-I and II By Navneet Gupta, Dhanpat Rai & Co.
2. Engg. Physics by S. K. Srivastava and R.A. Yadav, New Age Pub. New Delhi
3. Engg. Physics by Uma Mukherjee, Narosa Publication.
4. Engg. Physics by M.N. Avadhanulu, S. Chand Pub.
5. Electricity and Magnetism by Rangwala and Mahajan, Tata McGraw Hill. 1998
6. Concepts of Physics Part-II by H. C. Verma, Bharati Bhawan (P&D), 1998

7. Modern physics by Beiser, McGraw Hill Inc. New York, Publication 1995
8. Modern physics by Mani and Mehta, East-West Press Pvt.Ltd.1998
9. Introduction to Electrodynamics, David Griffith
10. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.(1995).
11. B.E.A. Saleh and M.C. Teich, Fundamentals of Photonics, John Wiley & Sons. Inc.2007).
12. S.M. Sze, Semiconductor Devices: physics and Technology, Wiley (2008)
13. Yariv and p.yeh, Photonics Optical Electronics in Modern Communications, Oxford University press, New York (2007)
14. P. Bhattacharya, Semiconductor Optoelectronic Devices, prentice Hall of India (1997)
15. Online course: "Semiconductor Optoelectronics" by M. R. Shenoy on NPTEL.
16. Online course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak on NPTEL.

Course Outcomes: At the end of the course, students will be able to:

- Student's ability to understand the basic principles and applications of physical optics for physical parameters measurements such as length, thickness, aperture size etc.
- Student's will be able to design, characterized the lasers and optical fibers and their effective utilization in optical communications, imaging etc.

SYLLABUS	**(SEMESTER-II)**	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	EC201TES01 / EC202TES04	L	T	P	CT-1	CT-II	TOTAL	70	100	04
Subject:	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	3	1	-	15	15	30			

Course Learning Objectives:

- To impart a basic knowledge of electrical quantities such as current, voltage, power, energy and. To provide working knowledge for the analysis of basic DC circuits used in electrical and electronic devices.
- To provide working knowledge for the analysis of basic AC circuits used in electrical and electronic devices and measuring instruments
- To explain the working principle, construction, applications of Transformer, DC machines and AC machines.
- To make students understand basics of Diodes and Transistors.
- To impart knowledge about basics of Digital Electronics

Course Content:

UNIT-1: DC circuits
Electrical circuit elements (R, L and C), voltage and current sources, Ohm's Law, Kirchoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits. Mesh & nodal analysis, Star- Delta transformation and circuits.

UNIT-2: AC circuits
Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections. Three-phase power measurement- Two- Wattmeter method.
Construction and working principle of single-phase wattmeter and energy meter. Introduction to Sensors and Transducers.

UNIT-3: Electrical machines
Construction, classification, ideal and practical transformer, equivalent circuit, losses in transformers, tests, voltage regulation and efficiency.
Construction, Working Principle, losses and efficiency of DC Machines and three phase Induction Machine, DC motor.

UNIT-4: Semiconductor devices And application (8 hours)
Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation. Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics.

UNIT 5: Digital Electronics (8 hours)
Binary Number System, Logic Gates, Combinational circuits, Boolean Algebra, De Morgan's Theorem, Half and Full Adders, Flip- Flops. Sequential circuits-Registers and Counters, A/D and D/A Conversion.

Suggested Text / Reference Books:

(i) D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
(ii) D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

(iii) B L Theraja and AK Theraja," A Textbook of Electrical Technology- Vol-I & II, S. CHAND &Co ltd, 2013.
(iv) E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
(v) Jacob Millman, Christos Halkias,, Chetan Parikh, "Millman's Integrated Electronics - Analog and Digital Circuit and Systems", 2nd Edition 2017
(vi) Robert L Boylestad, Louis Nashlsky," Electronics devices and circuit theory", Pearson 11th edition 2013
(vii) M. Morris Mano ," Digital Logic and Computer Design", Pearson, 2004.

Course Outcomes: At the end of the course students will be able to:

- To understand and revise concepts of DC circuits.
- To learn to solve single and three phase AC circuits and basics of sensors and measurements.
- To understand the theory, working principle and applications of Transformer and basic machines and analyse their parameters.
- To understand characteristics of diodes and transistors and to analyze basic circuits using diodes.
- To learn the basics of digital circuits and its importance.

SYLLAUS	**(SEMESTER-II)**	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	IT201TES02 / IT202TES05	L	T	P	CT-1	CT-II	TOTAL	70	100	02
Subject:	INTRODUCTION TO INFORMATION TECHNOLOGIES	2	0	-	15	15	30			

Course Learning Objectives:

1. To illustrate the concepts of cyber security and familiar and aware with various cybercrimes attack and their prevention.
2. To describe the different services model of Cloud Computing and understand Understanding of different evaluating computer model of cloud computing.
3. To relate theoretical concepts with problem solving approach in IoT and assess the comparative advantages and disadvantages of Virtualization technology.
4. To provides the basic knowledge of use appropriate storage and access structures. the student must be able to analyse familiar with the machine learning algorithms and applications of various data science.
5. To integrate classroom learning into an everyday communicative activity in distributed system. Familiar with various web services activity.

Course Content:

UNIT 1: Cyber Security

Fundamentals Security Concepts: Authentication, Authorization, Non-repudiation, Confidentiality, Integrity, availability. Cyber Crimes and Criminals: Definition of cyber-crime, types of cyber-crimes and types of cyber- criminals.

UNIT 2: Cloud Computing Fundamentals

Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT 3: Internet of Things

Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IOT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle.

UNIT 4: Data Science

Introduction and Importance of Data Science, Statistics, Information Visualisation, Data Mining, Data Structures, and Data Manipulation, Algorithms used in Machine Learning, Data Scientist Roles and Responsibilities. Data Acquisition and Data Science Life Cycle.

UNIT 5: Evaluation and Emergence of Web Services

Evaluation of Distributed Computing, Core Distributed Technologies, Challenges in Distributed System, and Introduction to web services, Web Services Architecture, Basic steps of implementing web services

Textbooks/References:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group
3. Cloud Computing Principles and Paradigm by Rajashekar Buyya, James Broberg, Andhrz M. Wiley 2011.
4. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti,

Universities Press, 2015, ISBN: 9788173719547.
5. Mining of Massive Datasets, by Leskovec, Rajaraman, and Ullman.
6. R. Nagappan, R.Scokzylas, R.P. Sriganesh, Developing Web Services, Wiley India

Course Outcomes:

1. Ability to learn about cybercrimes and how they are planned.
2. Ability to understand the cloud computing concepts and services model.
3. Ability to understand Internet of Things –Definition and Characteristics of IoT.
4. Explain how data is collected, managed and stored for data science. Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists
5. Understand the details of web services Evolution of Distributed Computing.

SYLLAUS	(SEMESTER-II)	Periods/ Week			Internal Assessment (IA)			ESE	Grand Total	Credits
Subject Code:	EN202THS01	L	T	P	CT-1	CT-II	TOTAL	70	100	03
Subject:	ENGLISH COMMUNICATION	3	0	-	15	15	30			

Course Learning Objectives

• To build up word power, to brush up the knowledge of English grammar, to develop good writing and speaking skills in the students

Course Content:

UNIT 1: Vocabulary Building

The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.

UNIT 2: Basic Writing Skills

Sentence Structures, Use of phrases and clauses in sentences, Importance of proper punctuation, Creating coherence, Organizing principles of paragraphs in documents, Techniques for writing precisely

UNIT 3: Identifying Common Errors in Writing

Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés

Unit 4: Nature and Style of sensible Writing

Describing, Defining, Classifying, Providing examples or evidence, Writing introduction and conclusion.

UNIT 5: Writing Practices

Comprehension, Précis Writing, Essay Writing. Oral Communication (This unit involves interactive practice sessions in Language Lab) Listening Comprehension Pronunciation, Intonation, Stress and Rhythm Common Everyday Situations: Conversations and Dialogues Communication at Workplace Interviews Formal Presentations.

Textbooks/References:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007 (iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
3. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
4.Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
5.Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcome:

At the end of the course students will be able learn a lot of new words. They also learnt the particularities and peculiarities of English grammar. As a result, they could speak and write English with the least possible error.

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	PH201PBS01/ PH202PBS02	L	T	P	IA	MSE	TOTAL	20	50	01
Subject:	PHYSICS LAB	-	-	2	30	--	30			

Course Learning Objectives:

•To learn and perform the various practical related to optical components characterization, semiconductor material and devices characterization and know their applications in advance areas such as communication, industries, defence, navigation etc.

Course Content:

LIST OF PRACTICALS:

1. To determine the wavelength of sodium light with help of Fresnel's Bi-prism.

2. To determine the refractive index and dispersive power of the material of prism with the help of spectrometer.

3. To determine the sodium light by Newton's ring method.
4. To determine the wavelength of sodium light by plane diffraction grating using spectrometer.
5. To demonstrate the diffraction pattern and determine the wavelength of different colours of mercury (white) light using plane diffraction grating and spectrometer.
6. To determine the wavelength and number of line per cm on a diffraction grating using semiconductor laser diode.
7. To determine the specific rotation of sugar solution with the help of polarimeter.
8. Determine the width of the single slit and diameter of circular aperture using Fraunhofer diffraction pattern produced by semiconductor laser diode.
9. To determine the energy band gap (Eg) of a semiconductor material using P-N junction diode.
10. To determine the e/m ratio by the Thomson's method.
11. To study the P-N junction diode characteristics, in forwarded and reverse bias conditions.
12. To study the Zener diode characteristics.
13. To study the characteristics and gain of Transistor in C-B and C-E mode.
14. Determine the Planck's constant.

Course Outcomes: On completion of the course, the students would be able to:

- Know about basic optical facts and phenomenon, characterization of optical components and devices
- To know the basic semiconductor materials and devices and their applications
- To know how the performance of semiconductor devices can be improves.

SYLLABUS	**(SEMESTER-II)**	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	ME201PES01/ ME202PES03	L	T	P	IA	MSE	TOTAL	20	50	3
Subject:	ENGINEERING GRAPHICS	1	0	3	30	--	30			

Course Learning Objectives:

- To learn the basic of Engineering Drawing and Orthographic Projections
- To learn the Sections and Sectional Views of Right Angular Solids
- To learn the Isometric Projections covering and overview of Computer Graphics

UNIT 1: Introduction Engineering Graphics and Engineering Curves: Principles of engineering graphics and their significance – drawing instruments and their use – conventions in drawing – lettering – BIS conventions. Dimensioning rules,

geometrical construction. Engineering Curves - Conic Sections, Special Curves- Cycloids, Epicycloids, Hypocycloids, Involutes and trochoid.

UNIT 2: Projection of Points, Straight lines and Planes: Principles of orthographic projections – conventions – first and third angle projections. Projections of points and lines inclined to both the planes. Projections of regular planes, inclined to both planes

UNIT 3: Projections Solids: Introduction, Type of solid, Projections of solids in simple position, Projection of solids with axes inclined to one of the reference planes and parallel to the other, Projections of solids with axes inclined to both H.P. and the V.P.

UNIT 4: Section of Solids and Development of Surfaces: Sectioning of regular solids - Section planes perpendicular to one plane and parallel or inclined to other plane - Development of surfaces of right, regular solids – development of prisms, cylinders, pyramids, cones and their parts.

UNIT 5: Isometric Projections and Orthographic Views: Principles of Isometric Projections-Isometric Scale- Isometric Views Conventions-Plane Figures, Simple and Compound Solids. Conversion of isometric views to orthographic views. Conversion of orthographic views to isometric projections, vice-versa. Introduction to perspective projection.

Computer Aided Drafting: Introduction to computer aided drafting package to make 2-D drawings. Demonstration purpose only - not to be included in examinations.

Textbooks/References:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, PearsonEducation
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4.Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5.CAD Software Theory and User Manuals

Course Outcomes:

1. At the end of the course, the student shall be able to
2. Draw engineering curves, orthographic projections of lines, planes and solids.
3.Draw sections of solids including cylinders, cones, prisms and pyramids.
4.Make development of surfaces, Orthographic and Isometric projections
5.Overview of Computer Graphics.

SYLLABUS	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credits
Subject Code:	ME201PES02 / ME202PES04	L	T	P	IA	MSE	TOTAL	20	50	2
Subject:	WORKSHOP TECHNOLOGY & PRACTICES	1	0	2	30	--	30			

Course Learning Objectives:

- To impart student knowledge on various hand tools for usage in engineering applications.
- Be able to use analytical skills for the production of components.
- Design and model different prototypes using carpentry, sheet metal and welding.
- Make electrical connections for daily applications.
- To make student aware of safety rules in working environments.

Course Content:

Lectures & videos:

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods (3 lectures)
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools
4. Electrical &Electronics
5. Carpentry
6. Plastic moulding, glass cutting
7. Metal casting
8. Welding (arc welding & gas welding), brazing

Textbooks/References:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishersprivate limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008. (iv)Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
4. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata Mc-Graw Hill House, 2017.

Course Outcomes: At the end of the course students will be able to:

- Make half lap joint, Dovetail joint and Mortise &Tenon joint
- Produce Lap joint, Tee joint and Butt joint using Gas welding
- Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools
- Make connections for controlling one lamp by a single switch, controlling two lamps by a single switch and stair case wiring

SY LABUS oL	(SEMESTER-II)	Periods/ Week			INTERNAL ASSESSMENT (IA)			ESE	Grand total	Credit
Subject Corde:	EC201PES03/ EC202PES05	L	T	P	IA	MSE	TOTAL			
s e *Subject:* L	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB	-	-	2	30	--	30	20	50	1

Course Learning Objectives:

- To understand basic electrical wiring, measurements, errors and method.
- To practically provide the concept of different theorems.
- To have actually hands-on on machines like transformers, DC and AC machines to get better understanding.
- To get experimental knowledge of Diodes and Transistors
- To make students learn Digital logic design.

Course Content:

List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope).
3. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and Verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
4. Transformers: Polarity test, OC & SC tests. Loading of a transformer: measurement of primary and secondary voltages and currents and power.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), and single-phase induction machine.

6. Study of Diodes and transistors characteristics.
7. Study of full-wave and half-wave rectifier.
8. Verification of De Morgan's theorems.
9. Study of Logic gates.
10. Study of half and full adder.

Course Outcomes: At the end of the course students will be able to:

- Acquire knowledge about different types of meters and take readings and Construct circuits and measure different electrical quantities.
- Analyze Single Phase and Three phase AC Circuits, the representation of alternating quantities and determining the power in these circuits
- Work on machines like transformers
- Acquire knowledge about different types of diodes and transistors
- Design and understand digital logic circuits

Scheme & Syllabus

(2nd Year to 4th Year)

B.Tech.

(Chemical Engineering)

SCHEME FOR EXAMINATION (Effective from Session 2021-22)
B.TECH. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING
SECOND YEAR, THIRD SEMESTER (CBCS-NEW)

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme			Credits
						Sessional			
	THEORY		L	T	P	IA	ESE	TOTAL	
01.	CH203TBS05	Biology	3	0	0	30	70	100	3
02.	CH203TBS06	Mathematics-III	3	1	0	30	70	100	4
03.	CH203TPC01	Material and Energy Balance Calculations	3	1	0	30	70	100	4
04.	CH203TPC02	Fluid Mechanics	3	1	0	30	70	100	4
05.	CH203TPC03	Thermodynamics-I	3	0	0	30	70	100	3
	PRACTICAL								
01.	CH203PPC01	Chemical Engineering Lab-I	0	0	3	30	20	50	1.5
02.	CH203PPC02	Fluid Mechanics Lab	0	0	3	30	20	50	1.5
		Total	17	3	6			600	21

IA - Internal Assessment
ESE - End Semester Examination
Total Credits : 21
Total Marks - 600
Total Periods / week - 26

CH204TBS05 **Biology** **[L:3, T:0, P:0]**

Objectives

Students will be introduced to the basics of biology such as cell structure and functions, inheritance & evolution, basic concepts of genetics, and an introduction to microbiology

Contents:

1. Basics: Diversity of life, prokaryotes and eukaryotes, basic cell constituents and macromolecules.
2. Biochemistry: Metabolism (Catabolism and Anabolism) and Bioenergetics.
3. Genetics: Basic principles of Mendel, molecular genetics, structure and function of genes and chromosomes, Transcription and Translation, gene expression and regulation.
4. Cell Biology: Macromolecules, membranes, organelles, cytoskeleton, signalling, cell division, differentiation, and motility.
5. Microbiology: host-microbe interactions, physiology, ecology, diversity, and virology.

Text Book

1. Gardner, Simmons & Snustad "Principles of Genetics" Student Edition, Wiley publication, 2006.
2. P.K. Gupta, "Principles of Genetics", Rastogi Publication, 2018-19.
3. Prescott's, "Microbiology"Joanne Willey Publication.
4. David L. Nelson and Michael M. Cox, "PRINCIPLES OF BIOCHEMISTRY", W.H. Freeman & Company, 2008
5. Gerald Karp, Janet Iwasa, Wallace Marshall, "Karp's Cell Biology" Global Edition, 2018

Course Outcomes

Students will get insight into biology as a science, outlining the diversity, organization and fundamental principles of living systems.

CH203TBS06 **Mathematics-III** **[L:3, T:1,P:0]**

Course Objective: Basic concepts of statistics, curve fittings, correlation coefficient, probability, distribution and sampling methods.

Unit I: Introduction to statistics, mathematical statistics, variable, frequency distribution, exclusive and inclusive class intervals, type of series, graphical representation: histogram, frequency polygon, ogive measure of central tendency various types of averages, Mean median mode for grouped and ungrouped data, geometric mean, harmonic mean, measure of dispersion Skegness and Kurtosis.

Unit II: Curve fittings by method of least square- straight line parabola correlation-scatter cliagrem's Karl Pearson's coefficient of correlation. Limits for correlation coefficient, rank correction. Regression linear regression, equation to the line of regression. Regression coefficient, angle between two lines of regression.

Unit III: Theory of probability-Mathematical and statistical definition of probability sample space. Finite sample space sample point, events theorem of total probability. Sample and compound event. Conditional probability, theorem of compound probability, Baye's theorem, use of binomial theorem.

Unit IV: Theoretical distribution- Binominal distributions mean, standard deviation and Pearson's and coefficient. Poisson distribution, mean, variance normal distribution.

Unit V: Random and simple sampling-mean, and standard deviation in simple sampling of attribute, test of significant for large sample test of significance based on Chi square, T, F and Z distribution degree of freedom, condition for applying.

Text Books:

1. M. Roy, "Mathematical Statistics"
2. Biswal, "Probability & Statistics", PHI.
3. A.A.AFTI, "Statistics analysis"
4. S. C. Gupta and Kapoor, "Fundamental of Mathematical Statistics"

Course Outcome: Students should be able to solve statistics Problems, problem based on correlation, regression and curve fittings, probability problems, problems relating to mean, standard deviation.

CH203TPC01 Material and Energy Balance Calculations [L:3, T:1, P:0]

Objectives

The course will serve as a basis for all further chemical engineering courses that are part of the curriculum.

Contents:

1. Introductory concepts of units, physical quantities in chemical engineering, Dimensionless groups, "basis" of calculations
2. Gases, Vapours and Liquids: Equations of state, Vapour pressure, Clausius Clapeyron equation, Cox chart, Duhring's plot, Raoult's law.
3. Humidity and Saturation, humid heat, humid volume, dew point, humidity chart and its use.
4. Material Balances with recycle, bypass and purge.
5. Material Balance: With chemical reaction, Concept of stoichiometry and mole balances, examples, including combustion.
6. Material Balance: Introduction, solving material balance problems without chemical reaction.
7. Energy balance: open and closed system, heat capacity, calculation of enthalpy changes.
8. Energy balances with chemical reaction: Heat of reaction, Heat of combustion.

Suggested Text Books

1. S. N. Saha, "Chemical Process Engineering Calculation", DhanpatRai Publication Co.
(Pvt.) Ltd., New Delhi
2. Bhatt, B. I., Vora, S. M., "Stoichiometry", Fourth Edition, Tata McGraw Hill Publishing
Company Ltd, 2004.

Suggested References Books

1. Felder, R. M.; Rousseau, R. W., "Elementary Principles of Chemical Processes", Third Edition, John Wiley & Sons, 2000
2. Hougen, O. A., Watson, K. M., Ragatz, R. A., "Chemical Process Principles, Part I Material & Energy Balances", Second Edition, CBS Publishers& Distributors, 2004.
3. Himmelblau, D. M., Riggs, J. B. "Basic Principles and Calculations in Chemical Engineering", Eighth Ed., Pearson India Education Services, 2015.
4. Venkataramani, V., Anantharaman, N., Begum, K. M. Meera Sheriffa, "Process Calculations", Second Edit ion, Prentice Hall of India.
5. Sikdar, D. C., "Chemical Process Calculations", Prentice Hall of India.

Course Outcomes

Students completing the course will

- Develop mastery over process calculations relevant to Chemical Engineering Processes
- Be able to handle elementary flow-sheeting, material and energy balance calculations
- Be able to solve problems based on without and with chemical reactions, and involving concepts like recycle, bypass and purge.
- Be familiar with equations of state and properties of gases and liquids, including phase transition.

CH203TPC02 **Fluid Mechanics** **[L:3, T:1, P:0]**

Objectives:

The objective of this course is to introduce the mechanics of fluids (fluid statics and fluid dynamics), relevant to Chemical Engineering operations. The course will introduce students to forces on fluids, hydrostatic forces on submerged bodies, Eulerian and Lagrangian descriptions of flow, flow visualization, integral analysis involving mass and momentum balances, Bernoulli equation, flow through pipes and ducts, flow measurement and instruments, flow transportation - pumps, blowers and compressors, conservation of mass, linear and angular momentum in differential form, Navier-Stokes equation, viscous flows, skin and form friction, potential flows and boundary layer theory. Turbulence and turbulent flows will be introduced.

Contents:

1. Introduction to fluids, Types of fluids, Concept of viscosity, Forces on fluids, Normal and shear stresses.
2. Fluid statics –Hydrostatic equilibrium, pressure distribution, Manometry, Forces on submerged bodies, Buoyancy.
3. Kinematics of fluid flow- Eulerian and Lagrangian descriptions, Flow visualization, Streamfunction, Vorticity and Circulation.
4. System and control volume approaches, Reynolds transport theorem, Integral balances – mass and momentum, Euler's equation of motion, Bernoulli equation and applications.
5. Friction factor, Laminar Flow for Newtonian and Non Newtonian fluid, Turbulent flow through pipes and close channels and its characteristic equations.
6. Head loss in pipe flow, Friction losses due to sudden changes in velocity or direction of flow, expansion, contraction, Effect of fittings.
7. Flow measurement, variable head meters, variable area meter, insertion meter.
8. Transportation of fluids - pumps, blowers, compressors selection and design of pumps.
9. Differential analysis: mass and momentum balances, Navier-Stokes equation, Unidirectional flow, Viscous flow, Stokes law, Skin drag and pressure drag.
10. Potential flow, Potential function, Solution of Laplace equation.
11. Boundary layer theory, Blasius solution, Boundary layer separation.

Suggested Text Books:

1.M. Whit e, Fluid Mechanics, 8 th Edition, Tata-McGraw Hill, 2016.
2. V. Gupta and S. K. Gupta, Fundamentals of Fluid Mechanics, 2nd Edition, New Age International 2011.

3.W. L. McCabe, J. C. Smith and P. Harriot, Unit Operations of Chemical Engineering, 7 Edition, McGraw-Hill International Ed it ion 2005.
4.O. Wilkes, Fluid Mechanics for Chemical Engineers, Prentice Hall of India, 2005.
5.R. W. Fox, P. J. Pritchard and A. T. McDonald, Introduction to Fluid Mechanics, 7 Edition, Wiley-India 2010.
6.R. Welty, C. E. Wicks, R. E. Wilson, G. Rorrer, Fundamentals of Momentum, Heat and Mass Transfer, 4th Ed.,Wiley (2007).

Suggested References Books:

1. B. R. Munson, D. F. Young, T. H. Okiishi and W. W. Huebsch, 6 th Ed it ion, Wiley-India 2010.
2. R. L. Panton, Incompressible Flow, 3rd Edition, Wiley-India 2005.
3. R. B. Bird, W. E. Stewart and E. N. Light foot, Transport Phenomena, 2 Edit ion, Wiley India 2002.

Course Outcomes:

Students should be able to calculate

- Velocity profiles by simplification of equations of motion in simple 1-D flows
- Boundary layer thicknesses, friction factor, pressure drop, power requirements in single phase flow in pipes
- Two phase gas/liquid pressure drop
- Power requirements, NPSH requirements of pumps

CH203TPC03 **Thermodynamics –I** **[L:3, T:0, P:0]**

Objectives:

Principles and application of first and second law of thermodynamics, and phase equilibria.

Contents:

1. Introduction- scope of thermodynamics, Dimensions and Units, Temperature, Pressure, Work, Energy, Heat.
2. Energy conservation & first law of thermodynamics; State functions; Equilibrium; Phase Rule; Reversible process; Constant P,V, T processes; Mass and energy balances for open systems .
3. Phases, phase transitions, PVT behavior; description of materials – Ideal gas law, van der Waals, virial and cubic equations of state; Reduced conditions & corresponding states theories; correlations in description of material properties and behavior.
4. Heat effects-latent heat, sensible heat, standard heats of formation, reaction and combustion.
5. Statements of the second law; Heat engines, Carnot's theorem,; Thermodynamic Temperature Scales; Entropy; Entropy changes of an ideal gas; Mathematical statement of the second law; Entropy balance for open systems; Calculation of ideal work, Lost work.
6. Thermodynamic property of fluids, Maxwell relations, 2-phase systems, graphs and tables of thermodynamic properties.
7. Application of thermodynamics to flow processes-pumps, compressors and turbines.
8. Thermodynamic analysis of steam power plants; Rankine cycle; internal combustion engine, Otto engine; Diesel engine; Jet engine.
9. The Carnot refrigerator; Vapor-compression cycle; Absorption refrigeration; Heat pump, Liquefaction processes.
10. Third Law of Thermodynamics: Definition and applications.

Suggested Text Books

1. J.M. Smith, H.C. Van Ness and M.M. Abbott, "Introduction to Chemical Engineering
Thermodynamics", 7th edition, McGraw-Hill International Edition, 2005.
2. Y.V.C.Rao, "Chemical Engineering Thermodynamics", University Press, Hyderabad, 1997.
3. K V Narayanan, "A Textbook of Chemical Engineering Thermodynamics", Prentice Hall Of India, New Delhi 2011

Suggested References Books:

1. R.C. Srivastava, "Thermodynamics a core course", 3rd edition, PHI publication, India, 2007.

Course Outcomes

Course outcomes Students should be able to

- Apply mass and energy balances to closed and open systems
- Evaluate the properties of non-ideal gases
- Solve problems involving liquefaction, refrigeration and different power cycles.

SCHEME FOR EXAMINATION (Effective from Session 2021-22)
B.TECH. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING
SECOND YEAR, FOURTH SEMESTER (CBCS-NEW)

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme			Credits
						Sessional			
	THEORY		L	T	P	IA	ESE	TOTAL	
01.	CH204THS02	Business Communication and Presentation Skill	3	0	0	30	70	100	3
02.	CH204TBS07	Numerical Methods in Chemical Engineering	3	0	0	30	70	100	3
03.	CH204TPC04	Inorganic Chemical Technology	3	0	0	30	70	100	3
04.	CH204TPC05	Particle and Fluid Particle-Processing	3	1	0	30	70	100	4
05.	CH204TPC06	Process Instrumentation	3	1	0	30	70	100	4
06.	CH203TPC07	Thermodynamics-II	3	1	0	30	70	100	4
	PRACTICAL								
01.	CH204PBS03	Numerical Methods in Chemical Engineering lab	0	0	2	30	20	50	1
02.	CH204PPC04	Particle and Fluid Particle-Processing lab	0	0	3	30	20	50	1.5
03.	CH204PPC05	Process Instrumentation Lab	0	0	3	30	20	50	1.5
		Total	15	2	8			400	21

IA – Internal Assessment ESE - End Semester Examination Total Credits : 21

Total Marks – 650 Total Periods / week - 25

CH204THS02 Business Communication and Presentation Skill [L:3, T:0, P:0]

Objectives

To develop the communication skills like writing technical letters, reports and presentation skills.

Contents:

Unit I: Business communication covering, Role of communication in information age; concept and meaning of communication; skills necessary for technical communication; Communications in a technical organization; Barriers to the process of communication.

Unit II: Style and organization in technical communication covering, Listening, speaking, reading and writing as skills; Objectivity, clarity, precision as defining features of technical communication; Various types of business writing: Letters, reports, notes, memos; Language and format of various types of business letters; Language and style of reports; Report writing strategies; Analysis of a sample report

Unit III: Communication and personality development covering, Psychological aspects of communication, cognition as a part of communication; Emotional Intelligence; Politeness and Etiquette in communication; Cultural factors that influence communication; Mannerisms to be avoided in communication; Language and persuasion; Language and conflict resolution.

Unit IV: Language Laboratory emphasizing Listening and comprehension skills; Reading Skills; Sound Structure of English and intonation patterns;

Unit V: Oral Presentation and professional speaking covering, Basics of English pronunciation; Elements of effective presentation; Body Language and use of voice during presentation; Connecting with the audience during presentation; projecting a positive image while speaking; Planning and preparing a model presentation; organizing the presentation to suit the audience and context; Basics of public speaking; Preparing for a speech;

Text books:

1. Fred Luthans, Organizational Behaviour,McGraw Hill
2. Lesikar and petit, Report writing for Business
3. M. Ashraf Rizvi, Effective Technical Communication, McGraw Hill
4. Wallace and masters, Personal Development for Life and Work, Thomson Learning

Reference books:

1. Farhathullah, T. M. Communication skills for Technical Students
2. Michael Muckian, John Woods, The Business letters Handbook
3. Herta A. Murphy, Effective Business Communication
4. MLA Handbook for Writers of Research Papers

Course Outcomes

Students should be able to

- Communicate properly.
- Write technical letters and reports.

CH204TBS07 Numerical Methods in Chemical Engineering [L:3, T:0,P:0]

Course Objective: To introduce students to numerical methods used to solve engineering problems, in particular chemical engineering problems, using numerical methods and computer programming. Fundamentals of numerical methods/algorithms to solve systems of different mathematical equations (e.g. linear/ non-linear algebraic equations, ordinary differential equations), will be introduced. The course would enable students to write their own computer programs using programming languages like C and commercial software like Matlab. Hands-on experience will be provided to apply these computer programs to solve problems in different areas of chemical engineering e.g. fluid flow, heat and mass transfer, chemical reaction engineering etc. Practical to involved solving actual chemical engineering problems through computer programming and coding.

UNIT–I Introduction of Errors and their Analysis, types of errors, numerical problems on error analysis, curve fitting: method of least squares, fittings of straight line and parabola and by method of moments.

UNIT–II Numerical Solution of Algebraic and Transcendental Equations: Secant Method, Regula-falsi Method, Newton Raphson Method, Solution of a system of simultaneous linear algebraic Equations Direct method: Gauss elimination Method, Iterative methods, Gauss Seidel Iterative method.

UNIT–III The Calculus of Finite Differences: Finite differences, Difference formula, operators and relation between operators. Inverse Operator, Interpolation with equal intervals: - Newton's forward and backward interpolation formula. Interpolation with Unequal intervals: - Lagrange's interpolation.

UNIT–IV Numerical Differentiation and Integration: Numerical Differentiation Newton's forward and Backward difference interpolation formula. Numerical Integration: Trapezoidol rule, simpson is (1/3)rd and (3/8)th rule, Boole's rule, Weddle rule.

UNIT-V Numerical solution of ordinary differential equation: Taylor series method, Euler's method, Modified Euler method Runge's method Runge Kutta method.

Books Recommended:

1. JAIN & IYNGAR Numerical Methods for Scientific and Engineering Computations.
2. RAO G.S. Numerical Anlysis.
3. Grewal B S Numerical Methods in Engineering and Science.
4. Das K K Advance Engineering Methods.
5. Rajaraman V Computer Oriented Numerical Methods.

Course Outcomes: Students will be able to solve chemical engineering problems involving Linear and non-linear equations and solve ordinary and partial differential equations using programming languages like C and software like MATLAB.

CH204TPC07 **Thermodynamics –II** **[L:3, T:1, P:0]**

Pre-requisites: Thermodynamics-I

Objectives

To introduce the concepts of fugacity, activity coefficient, vapour-liquid equilibrium and reaction equilibrium.

Contents:

1. Review of first and second law of thermodynamics.
2. Solution Thermodynamics: fundamental property relationships, free energy and chemical potential, partial properties, definition of fugacity and fugacity coefficient of pure species and species in solution, the ideal solution and excess properties.
3. Liquid phase properties from VLE, Models for excess Gibbs energy, heat effects and property change on mixing.
4. Vapor-liquid equilibrium: phase rule, simple models for VLE; VLE by modified Raoult's law; VLE from K-value correlations; Flash calculations.
5. Ideal solutions, activity and activity coefficient, Wilson, NRTL, UNIFAC and UNIQUAC models.
6. Liquid-Liquid Equilibria; Vapor-Liquid-Liquid Equilibria; Solid-Liquid Equilibria; Solid-Gas equilibria.
7. Chemical reaction equilibria: equilibrium criterion, equilibrium constant, evaluation of equilibrium constant at different temperatures, equilibrium conversion of single reactions, multi reaction equilibria.

Suggested Text Books:

1. J.M. Smith, H.C. Van Ness and M.M. Abbott, "Introduction to Chemical Engineering Thermodynamics", 7th edition, McGraw-Hill International Edition, 2005.
2. Y.V.C.Rao, "Chemical Engineering Thermodynamics", University Press, Hyderabad, 1997.
3. K V Narayanan, "A Textbook of Chemical Engineering Thermodynamics", Prentice Hall Of India, New Delhi 2011

Suggested References Books:

1. R.C. Srivastava, "Thermodynamics a core course", 3rd edition, PHI publication, India, 2007.

Course Outcomes:

Students should be able to understand various law of Thermodynamics, Vapor-Liquid equilibria, Liquid-Liquid equilibria and Chemical reaction equilibria.

CH204TPC05 Particle and Fluid Particle-Processing [L:3, T:1, P:0]

Pre-requisites: Fluid Mechanics

Objectives:

Objective of this course is to introduce students to the numerous industrial operations dealing with the particulate solids, their handling in various unit operations, and those in which particle fluid interactions are important. The course addresses fundamentals of fluid-particle mechanics, such as the notion of drag, and builds on those fundamentals to develop design concepts for various industrial processes like packed bed operation, fluidized operations, sedimentation, filtration, separation of solids and fluids, etc. Industrial applications are discussed. The course is concluded with an introduction to colloidal systems, soft materials and nanoparticles. Applications of these novel systems are discussed.

Contents:

1. Introduction: Relevance of fluid and particle mechanics, and mechanical operations, in chemical engineering processes.
2. Solid particle characterization: Particle size, shape and their distribution, Screen analysis, standard screens; Relationship among shape factors and particle dimensions; Specific surface area; Measurement of surface area.
3. Mixing and storage of Solids: Types of important mixers like kneaders, dispersers, masticaters, roll mills, muller mixer, pug mixer, blender, screw mixer etc., mixing index; Types of storage equipments, Bin, Silo, Hoper, etc.
4. Transport of fluid-solid systems: mechanical conveying, pneumatic and hydraulic conveying.
5. Size reduction: Major equipment's- Crushers, grinders, ultrafine grinders, laws of communition, Close circuit and open circuit grinding.
6. Mechanical separations: Industrial screen; their capacity and effectiveness.
7. Sedimentation: Elutraition, Classification and sedimentation, Free Settling, hindered settling, flow of solids through fluid, Stoke's law, Richardson-Zaki equation, design of settling tanks.
8. Centrifugal separation, design of cyclones and hydrocyclones.
9. Separation of solids from fluids: Introduction, filter bags, venture scrubber, electrostatic Precipitator.
10. Filtration: cake filtration, Concepts, plate and frame filter, leaf filter, rotary drum filter, etc.
11. Fluidization: Fluidized bed, minimum fluidization velocity, pressure drop etc. Types of fluidization: Particulate fluidization, Bubbling fluidization, Applications of fluidization.
12. Packed bed: Void fraction, superficial velocity, channelling, Ergun

equation and its derivation, Kozeny Carman equation, Darcy's law and permeability, Blaine's apparatus.

13. Introduction to nanoparticles: Properties, characterization, synthesis methods, applications.

Suggested Text Books:

1. McCabe, W., Smith, J. and Harriott, P. Unit Operations of Chemical Engineering, 6th edition, McGraw Hill.

2. Coulson and Richardson's Chemical Engineering, Vol. 2, Butterworth-Heinemann, 5th edition 2002.

Suggested References Books

1. Rhodes, M. J., "Introduction to Particle Technology", 2nd edition, John Wiley, Chichester; New York, 2008.

2. Allen, T., "Powder Sampling and Particle Size Determination", Elsevier, 2003.

3. Masuda, H., Higashitani, K., Yoshida, H., "Powder Technology Handbook",CRC, Taylor and Francis, 2006.

4. Vollath, D. Nanomaterials: An Introduction to Synthesis, Properties and Applications, 2nd Ed., Wiley, 2013.

Course Outcomes:

Students will be able to

- Calculate drag force and terminal settling velocity for single particles
- Calculate pressure drop in fixed and fluidized beds
- Know the significance and usage of different particulate characterization parameters, and equipment to estimate them
- Describe Size reduction energy requirements, estimate performance of equipment, selection and sizing of equipment.
- Analyze filtration data and select systems based on requirements, estimate filtration area for given requirements, understand filter aids and their usage

CH204TPC06 **Process Instrumentation** **[L:3, T:1, P:0]**

Objectives:

Objective of the course is to introduce the basics of instrumentation and process control through a hands-on practical experience. Principles of operation of different measuring devices for temperature, level, pressure, flow, pH, humidity, density, and viscosity will be introduced to impart knowledge of transmitters, transducers, converters, control valves, digital and analog components related to PLC, DCS, SCADA systems.

Contents:

1. Basics of control system components, signals and standards
2. Pressure measuring instruments/sensors
3. Level measurement
4. Flow measuring instruments
5. Temperature measuring devices
6. Humidity, density, viscosity and pH measuring devices
7. Pressure controllers: regulators, safety valves
8. Flow control actuators: different types of valves
9. Electrical and pneumatic signal conditioning and transmission
10. Computer process control, PLC, DCS, SCADA
11. Instrumentation of process equipment

Suggested Text Books:

1. William C. Dunn, Fundamentals of Industrial Instrumentation and Process Control, McGrawHill (2005).
2. S.K. Singh, Industrial Instrumentation and Control, 3rd edition, McGraw-Hill (2008).

Suggested References Books:

1. Seborg, D.E., Edgar, T.F., Mellichamp, D.A.,"Process Dynamics and Control", 2nd edition, John Wiley (2003).
2. Stephanopoulos, G.,"Chemical Process Control: An Introduction to Theory and Practice",Pearson Education (1984).

Course Outcomes:

Students will be well-familiar with instrumentation and automation as relevant to modern chemical plant operation.

SCHEME FOR EXAMINATION (Effective from session 2022-23) B.TECH. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERINGTHIRD YEAR, FIFTH SEMESTER (AICTE-NEW)

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme			Credits
	THEORY					Sessional			
			L	T	P	IA	ESE	TOTAL	
01.	CH305TPC07	Heat Transfer	3	1	0	30	70	100	4
02.	CH305TPC08	Mass Transfer-I	3	1	0	30	70	100	4
03.	CH305TPC09	Chemical Reaction Engineering-I	3	0	0	30	70	100	3
04.	CH305TPC10	Process Equipment Design-I	3	0	0	30	70	100	3
05.	CH305TPE1X		3	0	0	30	70	100	3
06.	CH305TPE2X		3	0	0	30	70	100	3
	PRACTICAL								
01.	CH305PPC05	Heat Transfer Lab	0	0	3	30	20	50	1.5
02.	CH305PPC06	Chemical Reaction Engineering Lab	0	0	3	30	20	50	1.5
03.	CH305PPC07	Minor Project-I	0	0	2	30	20	50	1
		Total	18	2	8	270	480	750	24

IA – Internal Assessment

ESE - End Semester Examination

Total Credits – 24

Total Marks – 750

Total Periods / week - 28

DEPARTMENT OF CHEMICAL ENGINEERING

List of Professional Elective Courses (Fifth and Sixth Semester)

S.No.	Semester	Course No.	Subjects
01.	V	CH305TPE11	Engineering Materials
02.		CH305TPE12	Polymer Technology
01.	V	CH305TPE21	Inorganic Chemical Technology
02.		CH305TPE22	Fuel Combustion Energy Technology
01.	VI	CH306TPE31	Organic Chemical Technology
02.		CH306TPE32	Fluidization Engineering

CH305TPC07 **Heat Transfer** **[L:3, T:1, P:0]**

Objectives:

- To provide a fundamental understanding of heat transfer in the mode of conduction, convection and radiation.
- To understand the fundamental laws and their correlation.
- To understand basic knowledge of various heat transfer equipments.

Contents:

Unit-I: Introduction to three modes of heat transfer, Derivation of heat balance equation- Steady one dimensional solution for conduction heat transfer in Cartesian, cylindrical and spherical geometry, concept of conduction and film resistances, critical insulation thickness, lumped system approximation and Biot number, approximate solution to unsteady conduction heat transfer by the use of Heissler charts.

Unit-II: Heat convection, boundary layers, Forced convection, Natural convection, Dimensionless parameters for forced and free convection heat transfer, Correlations for forced and free convection, Approximate solutions to laminar boundary layer equations (momentum and energy), Estimating heat transfer rates in laminar and turbulent flow situations using appropriate correlations for free and forced convection.

Unit-III: Interaction of radiation with materials, definitions of radiative properties, Stefan Boltzmann's law, black and gray body radiation, Calculation of radiation heat transfer between surfaces using radiative properties, view factors and the radiosity method.

Unit-IV: Heat Transfer Equipments: Types of heat exchangers, General design of parallel and counter-current, Double pipe and Shell and Tube heat exchanger, Analysis and design of heat exchangers using both LMTD and ε- NTU methods, Similarity between heat and mass transfer.

Unit-V: Heat Transfer with phase change: Evaporation- Types of evaporators and fields of their applications, Single and multiple effect evaporators: their design and operation, Vapour recompression, Heat transfer from condensing vapours, Heat transfer to boiling liquids. Boiling and Condensation heat transfer, Pool boiling curve

Suggested Text Books:

1. Fundamentals of Momentum, Heat and Mass Transfer by J. R. Welty, C. E. Wicks, R. E. Wilson and G. L. Rorrer, John Wiley & Sons.

2. Unit Operations of Chemical Engineering by W. L. McCabe, J. C. Smith and P. Harriot, McGraw Hill Education.
3. Heat Transfer by J. P. Holman, S. Bhattacharya, McGraw Hill Education.
4. Process Heat Transfer by D. Q. Kern, Tata McGraw-Hill Publishing Company Limited.

Course Outcome:

Students would be able to

- Analyze the steady state and unsteady state heat transfer by conduction.
- Calculate heat transfer coefficients for forced and natural convection.
- Explain and calculate the heat transfer by radiation.
- Design and analyze the double pipe and shell and tube heat exchanger performance for co-current and counter-current flows.
- Explain the concepts of heat transfer with phase change.

CH305TPC08 **Mass Transfer-I** **[L:3, T:1, P:0]**

Objectives:

- To provide the understanding of mass transfer operations and equipments.
- To impart the understanding of separation processes such as diffusion, distillation and absorption.

Contents:

Unit-I: Constitutive laws of diffusion; unsteady state diffusion, molecular diffusion in gases and liquids, Diffusion velocities, Convective mass transfer, interphase mass transfer and mass transfer coefficients, mass transfer correlations.

Unit-II: Phase Equilibria: Vapor-liquid equilibrium curves and boiling point diagram, Volatility, Solubility of gases, Enthalpy-concentration diagrams. Equilibrium Stage Operations Principles, Determination of number of ideal stages for two-component systems by graphical and absorption factor methods.

Unit-III: Flash distillation, differential distillation, steam distillation, Azeotropic distillation and Extractive distillation, Continuous distillation with rectification, Reflux ratio, Minimum reflux ratio, calculation of number of plats – Lewis sorel method, McCabe Thiele method.

Unit-IV: Fenske equation, Optimum reflux ratio, Analysis of fractionating column by enthalpy concentration diagram method, Plate efficiencies, Packed Column, Height Equivalent to Theoretical Plate.

Unit-V: Gas Absorption: Design of packed towers, Principles of absorption, Rate of absorption, Two film theory, Overall coefficients, HTU method, Interrelation between heat transfer, momentum transfer and mass transfer.

Suggested Text Books:

1. Principles of Mass Transfer and Separation Processes by B. K. Dutta, PHI Learning Private Limited.
2. Mass Transfer Operations by R. E. Treybal, McGraw Hill.
3. Diffusion - Mass Transfer in Fluid Systems by E.L. Cussler, Cambridge University Press.
4. Principles of Unit Operations by A. S. Foust, A. L. Wenzel, C. W. Clump, L. Maus and L. B. Anderson, John Wiley & Sons.

Course Outcome:

Students would be able to

1. Identify the concepts of phase equilibrium in mass transfer related problems.
2. Solve problems related to distillation, diffusion and absorption and mass

transfer equipment.

3. Design plate /packed column for mass transfer operations.

CH305TPC09 **Chemical Reaction Engineering-I** **[L:3, T:0, P:0]**

Objectives:
To impart the knowledge of the kinetics and thermodynamics of single and multiple reaction and the effect of temperature and pressure on reaction systems.

Contents:
Unit-I: Kinetics of Homogeneous Reactions: Kinetics and thermodynamics of chemical reactions, Kinetics of homogenous reactions rate theories, Analysis of rate equations.

Unit-II: Interpretation of Batch Reactor Data: Irreversible reactions, Total pressure method of kinetic studies, Analysis of complex rate equations, Complex reactions, Chain reactions, Variable volume reactions, Rate constants and equilibrium.

Unit-III: Ideal Reactor for Single Reaction: Ideal batch reactors, Steady state mixed flow reactor, Steady state plug flow reactor, Size comparison of single reactors, Multiple-reactor system.

Unit-IV: Design for Multiple Reaction: Introduction to multiple reaction, Qualitative treatment of product distribution and reactor size for parallel reactions, Reversible first order reactions in series, Favorable contacting patterns for irreversible reactions in series (First order &followed by first order).

Unit-V: Temperature and Pressure Effects: Single reaction, General graphical design procedure, Optimum temperature progression, Heat effects- adiabatic and non-adiabatic operations, van Heerden relationship.
Multiple reactions: Temperature and vessel size for maximum production.

Suggested Text Books:
1. Chemical Reaction Engineering by O. Levenspiel, John Wiley & Sons.
2. Elements of Chemical Reaction Engineering by H. S. Fogler, Prentice Hall.
3. Chemical and Catalytic Reaction Engineering by J. J. Carberry, Dover Publications.
4. Chemical Reactor Analysis and Design by G. F. Froment, K. B. Bischoff and J. D. Wilde, Wiley.

Reference Book:
Reaction Kinetics for Chemical Engineers by S. M. Walas, Butterworths Publishers.

Course Outcome:

Students would be able to

- Develop rate of reaction for homogeneous reactions. Interpret batch reactor data and design ideal reactors for single and multiple reaction
- Describe different aspects of design for multiple reactions.
- Explain the effect of temperature and pressure on reaction rate.

CH305TPC10 **Process Equipment Design-I** **[L:3, T:0, P:0]**

Objectives:

To understand the chemical engineering principles applicable to mechanical process design for various process equipment and standard codes for design of chemical plant equipment.

Contents:

Pressure and Storage Vessels: Design of pressure and storage vessels and their supports. End closures, Flat plates, Flanged, Dished, Hemispherical, Ellipsoidal and conical ends.

Suggested Text Books:

1. Introduction to Chemical Equipment Design (Mechanical Aspects) by B.C. Bhattacharya, Chemical Engineering Education Development Center.
2. Process Equipment Design by L.E. Brownell and E.H. Young.
3. Design of Process Equipment Design by M.V. Joshi and V.V. Mahajan, MacMillan, India
4. Chemical Engineering by J. M. Coulson and J. F. Richardson, Vol-I, MacMillan, Newyork.
5. Process Equipment Design by S.D. Dawande, Dennet & Co.

Reference Books:

1. Perry's Chemical Engineers' Handbook by D. W. Green and R. H. Perry, McGraw Hill Publication.
2. IS Codes.

Course Outcome:

Students would be able to

1. Design pressure and storage vessels and their supports.
2. Evaluate the parameters of equipment design and important steps involved in design.

CH305TPE11 **Engineering Materials** **[L:3, T:0, P:0]**

Objectives:

To provide the understanding of material selections for construction to execute a task for a particular application, its properties and behavior at different circumstances. Properties, behavior and maintenance of various engineering materials.

Contents:

Unit-I: Crystalline and Non-Crystalline Materials: Crystalline state, Atomic bonding, Bravias lattices, Miller indices, Structure of some common inorganic compounds, Structural imperfections. Economic, environmental and social issues of material usage.

Unit-II: Mechanical properties of materials and their variation with temperature, importance and limitations of these properties on material selection for a particular application. Failure of materials: Failure of materials under service conditions.

Unit-III: Corrosion: Mechanism of corrosion, Types of corrosion, Factors influencing corrosion, Methods of corrosion control, Inhibition and other precautionary measures.

Unit-IV: Non-Ferrous Metals: Copper, Brasses, Bronze, and Aluminum, their mechanical properties, Workability and applications, Corrosion resistance. Non-metallic materials of construction.

Unit-V: Phase diagram: Phase rules, Equilibrium phase diagram, cooling curves and their relations to properties of metals and alloys, Iron-carbon equilibrium diagram. Response of materials to chemical environment.

Suggested Text Books:

1. Introduction to Materials Science for Engineers by James F. Shackelford, Pearson.
2. Elements of Materials Science and Engineering by L.H.Van Vlack, Pearson.
3. Materials Science and Engineering by V. Raghavan, PHI Learning Private Limited.
4. Materials Science for Engineers by L. H. VanVlack, Addison-Wesley Publishing Co.
5. Chemistry of Engineering Materials by A. M. Sikkander and T. N. Balu, Raj Publications.
6. Corrosion, Prevention and Control by K.S. Rajagopalan, Scientific Surveys

Limited.
7. Corrosion Engineering by M. G. Fontana, McGraw Hill Education.

Reference Book:

Perry's Chemical Engineers' Handbook by D. W. Green and R. H. Perry, McGraw Hill Publication.

Course Outcome:

Students would be able to

- Explain different types of materials and their mechanical properties and limitations.
- Explain types of corrosion and various methods to control them.
- Describe phase diagram and its significance.

CH305TPE12 **Polymer Technology** **[L:3, T:0, P:0]**

Objectives:

To develop the abilities required for production, processing, properties testing and Environmental effects of polymers and its manufacturing Industries.

Contents:

Unit-I: Introduction to Polymer Science: Classification of polymer and functionality, Polymerization, Polymer structure, Molecular weight distribution and thermal transition types.

Unit-II: Polymer Synthesis: Step and Chain growth polymerization and its kinetics, Copolymerization and its kinetics, Reaction mechanism of synthetic Polymer.

Unit-III: Conformation, Solution and Molecular Weight: Thermodynamics of polymer solution, Flory Huggins theory, Process of polymer dissolution, Nature of polymer molecules in solution, Measurement of molecular weight, Osmometry, Light scattering, GPC, and Viscosity of dilute polymer solution.

Unit-IV: Solid State Properties : Amorphous state, Glass transition temperature, Glassy solid and glass transition, The crystalline state, Crystal melting temperature, Degree of crystallinity & its effect on properties of polymer.

Unit-V: Polymer Degradation & the Environmental Effect: Polymer stability and types of degradation. The management of plastics and its effect on environment, biodegradation.

Suggested Text Books:

1. Polymer Science & Technology by J. R. Fried, Prentice Hall.
2. Outlines of Polymer Technology: Manufacture of Polymers by R. Sinha, PHI Learning Private Limited

Course Outcome:

Students would be able to

1. Describe types of polymerization and synthesis
2. Explain kinetics and thermodynamics of polymerization.
3. Apply mechanisms of polymer degradation and environmental effect.

CH305TPE21 Inorganic Chemical Technology [L:3, T:0, P:0]

Contents:

Unit-I: Sulfur and Sulfur Chemicals: Sulfur, Sulfuric acid, SCSA, DCDA processes, Sodium thiosulfate, Alums. Marine Chemical Industries : Common salt, Chemicals from sea bittern.

Unit-II: Industrial Gases and Selected Inorganic Chemicals : Manufacture and use of Hydrogen, Carbon dioxide, Acetylene, Oxygen, Nitrogen and inert gases, Inorganic chemicals: Barium, boron, chromium, lithium, manganese.

Unit-III: Fertilizers: Status of industry, Grading and classification of fertilizers, Raw materials, Hydrogen production, Fixation of nitrogen, Synthesis, Ammonia based fertilizers, Phosphoric acid, Phosphatic and other fertilizers: SSP, TSP, UAP, DAP and nitro-phosphate, Potash fertilizers, NPK, Corrosion problems and Materials of construction, Bio-fertilizers.

Unit-IV: Soda Ash: Manufacturing, Special materials of construction, Solvay and modified Solvay process, Environmental consideration, Corrosion problems and materials of construction. Chlor Alkali Industry: Electrochemistry of brine electrolysis, Current efficiency, Energy efficiency, Diaphragm cells, Mercury cells, Mercury pollution and control, Caustic soda, Chlorine, Hydrochloric acid, Corrosion problems and materials of construction

Unit-V: Cement, Glass and Refractory: Manufacturing, Environmental consideration, Corrosion problems, Engineering problems and materials of construction.

Suggested Text Books:

1. R.N. Shreve & I. A. Brink, "Chemical Process Industries"
2. Chem. Tech. I, II, III, IV- IIT. Madras
3. Dryden Co. M. G. Rao and M. Sitting, "Outlines of Chemical Technology".

CH306TPE32 Fluidization Engineering [L:3, T:0, P:0]

Objectives

To impart the fundamental knowledge of Fluidization and understand the different aspects of fluidized bed systems applied in various industries.

Contents:

Unit-I: Phenomenon of Fluidization, Advantages and disadvantages of fluidization compared to conventional processes, Classification of various industrial beds, Industrial applications of fluidized beds in mineral processing, coal and biomass gasification & combustion FCC petroleum refining, pharmaceuticals, cement and other solid handling systems, Fluidized Bed Drying.

Unit-II: Gross behavior of fluidized beds-Minimum fluidizing velocity and pressure drops; Voidage, Design of distributors, Effect of temperature and pressure on fluidized bed, Elutriation and entrainment Transport disengaging height.

Unit-III: Bubbles in dense beds-Davidson Model, stream of bubbles, Bubbling bed models, Geldart classification, Different regimes of Fluidization, Davidson's model, Variation of Bubbling bed and Circulating Fluidized beds.

Unit-IV: Emulsion phase, Turn-over rate of solids, Residence Time Distribution of Solids, Diffusion model of solids movement, Interchange coefficient of solid into and out of wake.

Unit-V: Flow Pattern of Gas through fluidized beds, diffusion model for gas flow; two region models, evaluation of interchange coefficients, Heat and Mass transfer in Fluidized Beds.

Suggested Text Books:

Fluidization Engineering by D. Kunii and O. Levenpiel, Butterworth-Heinemann, Elsevier.

Reference Book:

- Fluidization by J. F. Davidson and D. Harrison, Academic Press.
- Fluidization and Fluid Particles Systems by F.A. Zenz and D. F. Othmer, Reinhold Publishing.
- Handbook of Fluidization and Fluid-Particle Systems, by W. C. Yang, CRC Press.

Course Outcome:

Students would be able to

- Describe fluidization and its recommendation in various industries exploiting its various advantages evaluating the heat and mass transfer aspects.
- Apply model equations for fluidized beds for application in various industries.

SCHEME FOR EXAMINATION (Effective from session 2022-23) B.TECH. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERINGTHIRD YEAR, SIXTH SEMESTER (AICTE-NEW)

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme			Credits
						Sessional			
	THEORY		L	T	P	IA	ESE	TOTAL	
01.	CH306TPC11	Mass Transfer-II	3	1	0	30	70	100	4
02.	CH306TPC12	Process Dynamics and Control	3	1	0	30	70	100	4
03.	CH306TPC13	Chemical Reaction Engineering-II	3	1	0	30	70	100	4
04.	CH306TPE3X		3	0	0	30	70	100	3
05.		To be selected by Students	3	0	0	30	70	100	3
06.	CH306TMC02	Essence of Indian Knowledge Tradition	3	0	0	0	0	0	0
	PRACTICAL								
01.	CH306PPC08	Mass Transfer Lab	0	0	3	30	20	50	1.5
02.	CH306PPC09	Process Dynamics and Control Lab	0	0	3	30	20	50	1.5
03.	CH306PPC10	Minor Project-II	0	0	2	30	20	50	1
		Total	18	3	8	240	410	650	22

IA – Internal Assessment

ESE - End Semester Examination

Total Credits – 22

Total Marks – 650

Total Periods / week - 29

DEPARTMENT OF CHEMICAL ENGINEERING

List of Professional Elective Courses (Fifth and Sixth Semester)

S.No.	Semester	Course No.	Subjects
01.	V	CH305TPE11	Engineering Materials
02.		CH305TPE12	Polymer Technology
01.	V	CH305TPE21	Inorganic Chemical Technology
02.		CH305TPE22	Fuel Combustion Energy Technology
01.	VI	CH306TPE31	Organic Chemical Technology
02.		CH306TPE32	Fluidization Engineering

CH306TPC12 **Process Dynamics and Control** **[L:3, T:1, P:0]**

Objectives

1. To provide fundamental knowledge on process control strategies.
2. To impart knowledge on a theoretical analysis of open loop and closed loop systems.

Contents:

Unit-I: Process Control : Importance of process control in chemical plants and systems, Various types of Control systems viz. open loop and closed loop control, feedback and feed forward control, servo and regulator control; Importance of dynamic behavior of processes in process control, Physical and block diagram representation of control system, Use of Laplace transformation in analysis of control systems.

Unit-II: Simple System Analysis: Laplace transformation and transfer function, Block diagrams, Linearization, First and higher order systems, interacting and non-interacting systems, Distributed and lumped parameters systems, Dead time.

Unit-III: Linear Open Loop Systems: Response of first order, second order and higher order systems, Linearization of non-linear systems, Transportation lag. Linear Closed Loop Systems: Study of various control system and their components viz. controllers, final control elements, Measuring instruments, Closed loop transfer functions, Transient response of simple control system, Stability criterion and analysis.

Unit-IV: Root Locus, Stability Criterion and Transient Response: Transient response analysis form root locus, Application of root locus to control system, Routh stability criterion.

Unit-V: Frequency Response Analysis: Design of control system by frequency response, Closed loop response by frequency response, Frequency response technique: Phase margin and gain margin, Bode stability criterion; Nyquyist stability criterion, Controller tuning: Ziegler-Nichols method, Cohen-Coon method, Introduction to advanced controllers: cascade control, feed forward control.

Suggested Text Books:

1. Process Systems Analysis and Control by D.R. Coughanowr and S. LeBlanc,

McGraw-Hill.
2. Process Dynamics and Control by D.E. Seborg, T.F. Edgar and D.A. Mellichamp, John Wiley.
3. Chemical Process Control: An Introduction to Theory and Practice by G. Stephanopoulos, Pearson Education.

Course Outcome:

Students would be able to

1. Evaluate dynamic behavior of first and second order system.
2. Determine the process stability in Laplace domain.
3. Analyze open-loop systems and linear closed loop systems.
4. Develop working knowledge of control system by frequency response.

CH306TPC11 **Mass Transfer-II** **[L:3, T:1, P:0]**

Objectives:

1. To provide basic knowledge of fundamental mass transfer operations and mechanisms.
2. To understand the mass transfer in LLE, leaching, drying, crystallization, adsorption and humidification operation.

Contents:

Unit-I: Humidification Operations: Definitions, Humidity chart and its use in measurement of humidity and calculations of humidification operations, Adiabatic humidification, Design of Cooling Towers.

Unit-II: Leaching: Equipment, Principles of leaching, Calculation of number of ideal stages, Stage efficiency

Unit-III: Liquid- Liquid Extraction: Equipment, Principles of extraction, Panchon-Savorit method, Counter-current extraction using reflux application of McCabe method, Extraction in packed and spray column.

Unit-IV: Crystallization: Principles, yield of crystals, Super solubility curve, Crystal growth, Equipment and application of principles to design.
Adsorption: Fixed bed absorbers, break through; Ion-Exchange.

Unit-V: Drying: Equipment, Principles, Mechanism and theory of drying, Calculation of drying time.

Suggested Text Books:

1. Principles of Mass Transfer and Separation Processes by B. K. Dutta, PHI Learning Private Limited.
2. Mass Transfer Operations by R. E. Treybal, McGraw Hill.
3. Diffusion - Mass Transfer in Fluid Systems by E.L. Cussler, Cambridge University Press.
4. Principles of Unit Operations by A. S. Foust, A. L. Wenzel, C. W. Clump, L. Maus and L. B. Anderson, John Wiley & Sons.

Course Outcome:

Students would be able to

1. Explain the basics of Mass Transfer and related laws.
2. Identification of mechanisms of mass transfer, Formulation of rate equations.
3. Solve problems related to drying, leaching and crystallization.

CH306TPE31 Organic Chemical Technology [L:3, T:0, P:0]

Objectives:
To study process technologies of various organic process industries such as oil, soap, polymer and cellulose.

Contents:
Unit-I: Oils & Fats : Status and scope, Major oils seeds production in India, Expression, Solvent extraction, Energy & solvent requirements, Mineral, seeds and other oil bearing materials, Hydrogenation of oils, Corrosion problems and materials of construction of equipments.

Unit-II: Soaps & Detergents: Raw materials, Manufacture of detergents, Active detergent matter, Biodegradability, Fat splitting, Purification of fatty acids, Soap manufacture, Total fatty matters (TFM), Glycerin manufacture, Materials of construction.

Unit-III: Cane Sugar: Cane production & varieties, Manufacturing equipment &technology, Cane sugar refining, Bagasses utilization, Energy requirements and conservation, Environmental considerations, Khandsari technology, Molasses based industries, Materials of construction.

Unit-IV: Polymers: Status and scope, Applications, Classification of polymers, Degree and modes of polymerization, Molecular weight and it distribution, Selected industrial polymerization including plastics, Synthetic rubber and polymeric foams, Synthetic fibres. Penicillin: Manufacturing process, Scope and applications.

Unit-V: Regenerated Cellulose: Growth of industry, Raw materials, Pretreatment, Pulping, Manufacture of paper, Recovery of chemicals, Environmental considerations, viscose rayon.
Varnishes and Paints: Scope and applications, Types of coatings, General manufacturing procedure, Environmental considerations.

Suggested Text Books:
Shreve's Chemical Process Industries by G. T. Austin, Tata McGraw Hill Publications.
Dryden's Outlines of Chemical Technology by M. G. Rao and M. Sittig, East-West Press.
Reference Book:
Handbook of Oil & Colour, Chemists Association OCCA.

Course Outcome:

Students would be able to

- Describe the processes involved in manufacturing of various organic chemicals.
- Make the process flow diagrams.
- Analyze important process parameters such as raw materials, MOC etc. and major engineering problems associated with production of such chemicals.

CH306TPC13 Chemical Reaction Engineering-II [L:3, T:1, P:0]

Objectives:

Graduates shall be able to (a) understand fundamental principles and experimental techniques of heterogeneous reaction systems; (b) apply principles of transfer operation in kinetics studies of heterogeneous reaction systems; (c) analyze the rate controlling step in heterogeneous reaction systems; (d) evaluate the catalytic activity and selectivity influenced by the physical and surface properties of the catalyst.

Contents:

Unit-I: Basics of Non-Ideal Flow: Age distribution of fluid, the RTD, Conversion in nonideal flow reactors, Models for non-ideal flow- dispersion model, Chemical reaction and dispersion, Tank in series model.

Unit-II: Mixing of Fluids: Self mixing of single fluid, degree of segregation, Early and latemixing, Mixing of two miscible fluids.

Unit-III: Fluid Particle Reactions: Un-reacted core model: Diffusion through gas film and ash layer control, Chemical reaction control, Rate of reaction for shrinking spherical particles, Determination of rate controlling step.

Unit-IV: Fluid-Fluid Reactions: Kinetic regimes for mass transfer and reaction, Rate equations for various regimes, Film conversion parameter, Application to design, Reactive and extractive reactions.

Unit-V: Catalysis: Heterogeneous catalysts, General characteristics, Adsorption on solid surface, Physical properties of catalysts, Preparation of catalyst, Steps in catalytic reactions synthesizing the rate law.

Suggested Text Books:

1. Chemical Engineering Kinetics by .M. Smith
2. Chemical Reaction Engineering by Octave Levenspiel
3. Chemical Reaction Engineering by H. Scott Fogler
4. Principles of Reaction Engineering by S.D. Dawande, Central Techno Publications
5. Chemical Engineering by J. M. Coulson and Richardson, Volume IV.

Course Outcome:

Students would be able to

(a) Explain the concepts of reactor design and reaction kinetics.

(b) Interpret reactor data,

(c) Identify ideal reactors and explain various aspects of design for single reactions.

(d) Explain various aspects of design for multiple reactions.

(e) Analyze effects of temperature and pressure on conversion.

CH305TPE22 Fuel Combustion Energy Technology [L:3, T:0, P:0]

Objectives:

To understand the basics of various types of solid, liquid and gaseous fuels, basic principles of their combustion processes, its appliances, the fundamentals of the applied sciences dealing with various types of conventional and non-conventional energy resources.

Contents:

Unit-I: Solid Fuel : Classification of fuel, Origin, Composition, Characteristics and analysis of coal washing & storage of coal, Physical & chemical processing of coal, Various classification systems of coal briquetting, Carbonization, Gasification of coal. Liquid fuels: Origin, composition, characteristics and classification of crude oil, crude oil processing cracking and reforming, storage and handling of liquid fuel.

Gaseous fuel: Classification of gaseous fuel, Natural gas, Coal gas, Coke oven and blast furnace gas, producer gas, water and Carburetted water gas

Unit-II: Fuel Combustion Calculation: Fundamentals of various combustion calculations with numerical examples.

Unit-III: Combustion Process: General Principles of combustion, Flame, Draught, Limits of In flammability, Types of combustion Process- Surface, Submerged, Pulsating, Slow combustion.

Unit-IV: Energy Conservation: Energy consumption pattern in various sectors, various ways of energy conservation in various process industries including petroleum.

Unit-V: Non – Conventional Energy Technologies : General principles with applications and technology of Biomass Energy, Solar Energy, Geothermal Energy, Wind Energy, Nuclear Energy, Hydal, Tidal and Ocean Energy.

Suggested Text Books:

Elements of Fuel Combustion & Energy Engineering by S.N. Saha, Dhanpat Rai Publication Co. Pvt. Ltd. New Delhi.

Fuels and Combustion by S. Sarkar, Orient Longman, Hyderabad.

Course Outcome:

Students would be able to

- Analyze solid, liquid, gaseous fuels and their characterization.
- Compute fuel combustion calculation in industries with

recommendation of better combustion processes in relation to better efficiency and pollution control technologies.

- Study and recommend the various energy conservation routes in various industries.
- Study and recommend the alternative sources of energies including the renewable energies in view of energy conservation to utilize them effectively.

CH306TOE01 Industrial Utilities and Safety [L:3, T:0, P:0]

Objectives:
To understand the basic knowledge about various process utilities applied in the chemical process industry and problems related to hazards & safety.

Contents:
Unit-I: Introduction: Role and types of process utilities in process industries. Heat Transfer Media: Characteristics properties, Classification, Selection and their industrial application.

Unit-II: Steam System: Generation and application in chemical process plants, Design of efficient steam heating systems, Condensate utilization, Flash steam. Steam Traps: Types and characteristics.

Unit-III: Water: Characteristic and conditioning for process industries e.g., steam piping, boiler feed, cooling etc., Recycling of process water.

Unit-IV: Introduction to process safety: Accidents and loss statistics, Nature of the accidents / hazardous process.
Toxicology: Toxic material and biological response, Dose responses relationship and models, Threshold dose and its definition, Material safety data sheets and industrial hygiene evaluation.
Safety Devices: Personal safety devices and general hygiene management, Storage and ventilation.

Unit-V: Fire and Explosion: Definition, Flammability characteristics and explosion, Design to prevent fires and explosions by inverting, purring, ventilation, sprinkler systems, Static electricity controls, Relief and relief sizing in vapour/gas, Liquid and runway reaction services.

Suggested Text Books:
1. High Temperature Heat Carrier by A. V. Chechetckin, Pergammon Press.
2. Efficient use of Steam by P. M. Goodal, Guilford
3. Chemical Process Safety: Fundamentals with applications by A. Crowl Daniel and F.L.Joseph, PHI Publications.

Reference Book:
1. Handbook of Heat Transfer Media by P. L. Geiringer, Van Nostrand Reinhold Inc.,U.S.
Course Outcome:
Students would be able to

1. Evaluate the requirements of process utilities in process industries.
2. Calculate the steam requirement and its applications as utility.
3. Explain fire and explosion and its prevention methods.

CH306TMC02 Essence of Indian Knowledge Tradition [L:3, T:0, P:0]

Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life styles of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

Content:

- Basic Structure of Indian Knowledge System.
- Modern Science and Indian Knowledge System.
- Yoga and Holistic Health care.
- Case Studies.

Suggested Text/Reference Books:

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amakuam
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
7. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi, 2016
8. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
9. P R Sharma (English translation), Shodashang Hridayam

Course Outcomes:

Ability to understand, connect up and explain basics of Indian Traditional knowledge modern scientific perspective.

SCHEME FOR EXAMINATION (Effective from Session 2021-22) B.TECH. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERINGFINAL YEAR, SEVENTH SEMESTER (AICTE)

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme			Credits
	THEORY					Sessional			
			L	T	P	IA	ESE	TOTAL	
01.	CH07TPC14	Process Equipment Design - II	3	1	0	30	70	100	4
02.	CH07TPC15	Chemical Reaction Engineering - II	3	1	0	30	70	100	4
03.	CH07TPC16	New Separation Processes	3	1	0	30	70	100	4
04.	CH07TPE4X		3	0	0	30	70	100	3
05.	CH07TOE3X		3	0	0	30	70	100	3
	PRACTICAL								
01.	CH07PPC11	Minor Project	0	0	3	30	20	50	1.5
02.	CH07PPC12	Seminar	0	0	3	30	20	50	1.5
		Total	15	3	6			600	21

IA – Internal Assessment
ESE - End Semester Examination
Total Credits : 21
Total Marks – 600
Total Periods / week - 24

DEPARTMENT OF CHEMICAL ENGINEERING

List of Professional Elective Courses (Seventh and Eighth semester) (AICTE)

S. No.	Semester	Course No.	Subject
01.	VII	CH07TPE41	Petroleum Refinery Engineering
02.		CH07TPE42	Polymer Technology-I
03.		CH07TPE43	Transport Phenomena
04.	VIII	CH08TPE51	Petrochemical Technology
05.		CH08TPE52	Polymer Technology-II
06.		CH08TPE53	Design and Development of Catalyst

List of Open Elective Courses (Seventh and Eighth semester) (AICTE)

S. No.	Semester	Course No.	Subject
01.	VII	CH07TOE31	Project Engineering Economics & Management
02.		CH07TOE32	Water Conservation & Management
03.	VIII	CH08TOE41	Optimization Techniques
04.		CH08TOE42	Process Modelling & Simulation

CH07TPC14 Process Equipment Design - II [L:3, T:1, P:0]

Objectives:

This course enables students to integrate all the subjects that they have learnt and design plant/processes from Chemical Engineering Principles. Graduates shall be able to: (a) Understand the Chemical Engineering Principles applicable to design Chemical Engineering equipment's; (b) apply standard codes for design of chemical plant equipment; (c) analyse the specifications for process equipment; (d) design process equipment's and its accessories.

Contents:

Design of Heat Transfer Equipment's: Double Pipe Heat Exchanger, Shell and Tube Heat Exchanger, Vertical & Horizontal Condensers and Evaporators.

The candidates will be allowed to use the following reference book in the examination hall:

1. Hand book of Chemical Engineering J. H. Perry
2. Tubular Heat Exchange Manufacture Association Manual
3. Kern
3. ISI Codes.

Candidates have to bring their own copies of the above books and they will be not supplied by the university or the examination centers.

Suggested Text Books:

1. Process Heat Transfer by D. Q. Kern
2. Heat Transmission by McAdams
3. Unit Operations of Chemical Engineering by McCabe Warren, L Smith Julian and Harriot Peter, Fifth Edition, McGraw Hill Inc.
4. Chemical Engineering by J. M. Coulson and Richardson, Volume-1

Course Outcomes:

Students should be able to design, calculate size/power/internals, etc required for all the process equipment in the PFD together with necessary instrumentation, safety aspects. Students should be able to calculate costs of equipment. Students should be able to perform a techno economic feasibility of the selected process.

CH07TPC15 Chemical Reaction Engineering – II [L:3, T:1, P:0]

Objectives:

Graduates shall be able to (a) understand fundamental principles and experimental techniques of heterogeneous reaction systems; (b) apply principles of transfer operation in kinetics studies of heterogeneous reaction systems; (c) analyze the rate controlling step in heterogeneous reaction systems; (d) evaluate the catalytic activity and selectivity influenced by the physical and surface properties of the catalyst.

Contents:

Unit-I: Basics of Non-Ideal Flow: Age distribution of fluid, the RTD, Conversion in nonideal flow reactors, Models for non-ideal flow- dispersion model, Chemical reaction and dispersion, Tank in series model.

Unit-II: Mixing of Fluids: Self mixing of single fluid, degree of segregation, Early and late mixing, Mixing of two miscible fluids.

Unit-III: Fluid Particle Reactions: Un-reacted core model: Diffusion through gas film and ash layer control, Chemical reaction control, Rate of reaction for shrinking spherical particles, Determination of rate controlling step.

Unit-IV: Fluid-Fluid Reactions: Kinetic regimes for mass transfer and reaction, Rate equations for various regimes, Film conversion parameter, Application to design, Reactive and extractive reactions.

Unit-V: Catalysis: Heterogeneous catalysts, General characteristics, Adsorption on solid surface, Physical properties of catalysts, Preparation of catalyst, Steps in catalytic reactions, synthesizing the rate law.

Suggested Text Books:

1. Chemical Engineering Kinetics by J.M. Smith
2. Chemical Reaction Engineering by Octave Levenspiel
3. Chemical Reaction Engineering by H. Scott Fogler
4. Principles of Reaction Engineering by S.D. Dawande, CTP.
5. Chemical Engineering by J. M. Coulson and Richardson, Volume IV.

Course Outcomes:

Students would be able to (a) explain the concepts of reactor design and reaction kinetics; (b) interpret reactor data; (c) identify ideal reactors and explain various aspects of design for single reactions; (d) explain various aspects of design for multiple reactions, (e) analyze effects of temperature and pressure on conversion.

CH07TPC16 **New Separation Processes** **[L:3, T:1, P:0]**

Objectives:

This is a course further built up on and in continuation with Chemical Engineering operations. It forms the basis Chemical Engineering principles and hence it is required in almost all the courses and throughout the professional career of a Chemical Engineer.

Contents:

Unit-I: Overview of Separation Processes: Basic concepts of separation processes; Physico-chemical properties and other factors controlling separation; Limitations of Conventional separation processes and new separation processes; Equilibrium and rate governed separation processes and their characteristics.

Unit-II: Membrane based Separation Processes: Principle of membrane separations process, advantages and disadvantages; classification, membrane materials, general methods of preparation and characterization of membranes; Membrane modules, Concentration polarization.

Unit-III: Porous Membrane Based Processes: Reverse osmosis, Ultrafiltration, Microfiltration, Nano-filtration, Dialysis, Ion-selective membranes and electro-dialysis; Industrial applications of porous membrane-based processes.

Unit-IV: Non-porous Membrane Based Processes: Gas separation, Pervaporation, Liquid Membranes and their Industrial Applications, Medical Applications of Membranes, Miscellaneous Membrane Processes, Membrane Distillation, Membrane Reactors.

Unit-V: Other Non-conventional Separation Processes: Foam and Bubble Fractionation, Pressure and Temperature Swing Adsorption, Cloud Point Extraction, Centrifugal Separation Processes, Super Critical Fluid Extraction.

Suggested Text Books:

1. Separation Process Principles by J.D. Seader and E.J. Henley, John Wiley & Sons, Inc
2. Separation Processes by C. J. King, McGraw-Hill, Inc.
3. Membrane Separation Processes by K. Nath, PHI, New Delhi
4. Membrane Technology and Applications by R.W. Baker, , John Wiley and Sons UK
5. Handbook of Industrial Membrane Technology by M.C. Porter, Crest Publishing House.

Course Outcomes:

Explain membrane processes in terms of the membrane, feed, sweep, retentate, permeate, and solute membrane interactions. Distinguish among microfiltration, ultrafiltration, nanofiltration, virus filtration, sterile filtration, filter-aid filtration, and reverse osmosis in terms of average pore size. Explain common idealized flow patterns in membrane modules.

CH07TPE41 Petroleum Refinery Engineering [L:3, T:0, P:0]

Objectives:

To impart knowledge of petroleum refining, hydrocarbon processing, and derived petrochemicals.

Contents:

Unit-I: Petroleum Crude and Refining: Formation of petroleum crude, Origin & occurrence composition, Classification & physical properties of petroleum crude, Conversion of organic matter into petroleum crude, Different sources of petroleum oil, refining of petroleum crude, Type of refineries, Planning for operation of oil refinery.

Unit-II: Physical Properties and Testing Methods of Petroleum Products: Physico-chemical properties of various petroleum products as per API / ASTM / BIS specifications.

Unit-III: Crude Processing: Treatment of crude, atmospheric and vacuum distillation crude, Distillation & equilibrium, Degree of separation, Type of trays of distillation column & its efficiencies, Types of distillation in petroleum industries.

Unit-IV: Cracking & Reforming Operation: Cracking, Type of cracking, Thermal cracking reaction, Dubbs process & tube still process of thermal cracking, Vis breaking, Delayed coking & fluidized coking, Catalytic cracking, Fixed & moving bed catalytic cracking, Thermal reforming, Catalytic reforming processes.

Unit-V: Chemical Treatment & Refining Operation: Chemical treatment of petroleum products, Caustic soda treatment, Treatment with H_2SO_4 & H_2, Mercaptan removal & oxidation process, Sulphur removal from petroleum products-Doctor's treatment, hydro de-sulphurization, dewaxing and refining of lubricating oils.

Suggested Text Books:

1. Petroleum Refinery Engineering by W.L. Nelson
2. Petroleum Refining by Gary and Handwarke, Marcel Dekker
3. Petroleum Refining & Petrochemicals by N.K. Sinha, Umesh Publications New Delhi.
4. Petroleum Refining Technology by I.D. Mall, CBS Publishers & Distributors

Pvt. Ltd. New Delhi.

Course Outcomes:

Students would be able to (a) explain petroleum refining and thermal cracking processes; (b) detail catalytic cracking and catalytic reforming processes; (c) produce fuels such as aviation gasoline, motor fuel, kerosene, jet fuel; (d) manufacture lubricating oil; (e) store and transport petroleum products.

CH07TPE42 Polymer Technology - I [L:3, T:0, P:0]

Objectives:

To deal with identification and characterization of raw material for ensuring the quality of polymer product along with different techniques of processing. 2. To develop the skills required for working in production, processing, testing, marketing and sales department of plastics, rubbers and fibres manufacturing Industries.

Contents:

Unit-I: Introduction to Polymer Science: Classification of polymer and functionality, Polymerization, Polymer structure, Molecular weight distribution, Number average, Weight average, z-average Molecular weight, Chemical structure and thermal transition types, Mechanism of polymerization.

Unit-II: Polymer Synthesis: Step growth polymerization and its kinetics, Molecular weight of step growth polymerization, Chain growth polymerization and its kinetics, Copolymerization and its kinetics, Polymerization techniques, Reaction of synthetic Polymer, Chemical structure determination.

Unit-III: Conformation, Solution and Molecular Weight: Thermodynamics of polymer solution, Flory Huggins theory, Polymer conformation and chain dimensions, Process of polymer dissolution, Nature of polymer molecules in solution, Measurement of molecular weight, Osmometry, Light scattering, GPC, Viscosity of dilute polymer solution.

Unit-IV: Solid State Properties: Amorphous state, Glass transition temperature, Glassy solid and glass transition, The crystalline state, Crystal melting temperature, Degree of crystallinity & its effect on properties of polymer, Mechanical properties and methods of its testing.

Unit-V: Polymer Degradation & the Environmental Effect: Polymer degradation and stability, Types of degradation, Thermal degradation, Mechanical degradation, Photo degradation, Degradation by high energy radiation, Hydraulic degradation, The management of plastic in environment, biodegradation.

Suggested Text Books:

1. Polymer Science and Technology by Fried

2. Outlines of Polymer Technology by Sinha, PHI
3. Polymer Science by V.R. Gowariker, New age International Ltd

Course Outcomes:

Students would be able to (a) select appropriate techniques of polymerization; (b) produce plastics using appropriate reactions and unit operations steps; (c) produce rubbers using appropriate reactions and unit operations steps; (d) produce fibres using appropriate reactions and unit operations steps; (e) apply different polymer processing techniques.

CH07TPE43 Transport Phenomena [L:3, T:0, P:0]

Objectives:

To impart knowledge about individual and simultaneous momentum, heat and mass transfer, model development along with appropriate boundary conditions.

Contents:

Unit-I: Introduction to Transport Phenomena: Similarity between momentum, heat and mass transfer, The continuum hypothesis, Basic laws of fluid motion, Newton's second law of motion, Principle of balance between momentum, Heat and mass transfer, Principles of conservation of momentum, mass and energy.

Unit-II: Momentum Transport Phenomena: Momentum transport in laminar flow: Newton's law of viscosity, Science of rheology, Prediction of viscosity and its dependence on temperature, pressure and composition, Boundary conditions, Shell balance approach for stress distribution and velocity profiles, Introduction to time derivatives and vector analysis, Equation of continuity and equation of motion and their application in fluid flow problems.

Unit-III: Unsteady State Momentum Transport: Flow near a wall suddenly set in motion, Momentum transport phenomena in turbulent flow, Definitions of friction factors, friction factor for flow in tubes, around spheres and through packed bed column.

Unit-IV: Energy Transport Phenomena: Energy transport in laminar flow: Fourier's law of heat conduction, Prediction of thermal conductivities and its dependence on temperature, Pressure and composition, Boundary conditions, Shell balance approach, Types of heat sources, Principle of extended surfaces, Types of cooling fans, Free and forced convection. Unsteady state heat transport, Unsteady state heat conduction in solids, Heating of semi-infinite slab, Heating of finite slab, Application.

Unit-V: Mass Transport Phenomena: Definitions of concentration, Velocities and mass fluxes, Fick's law of diffusion, Prediction of diffusivity and its dependence on temperature, pressure and composition, Boundary conditions, Shell balance approach for mass transfer problems. Problems of diffusion with homogeneous

and heterogeneous chemical reaction, Diffusion and chemical reaction in porous catalyst the effectiveness factor, Equation of continuity for multicomponent mixtures.

Suggested Text Books:

1. Transport Phenomena by R.B. Bird, W.E. Stewart and E. W. Lighfoot, John Wiley & Sons
2. Transport Phenomena by R. S. Brodkey and H. C. Hershey, McGraw-Hill
3. Fundamentals of Momentum Heat and Mass Transfer by J.R. Welty, C.W. Wicks, R.E. Wilson and G. Rorrer, John Wiley & Sons.

Course Outcomes:

Upon completion of this course, the students will be able to: (a) analyze heat, mass, and momentum transport in a process; (b) formulate problems along with appropriate boundary conditions; (C) develop steady and transient solution for problems involving heat, mass, and momentum transport.

CH07TOE31 Project Engineering, Economics & Management [L:3, T:0, P:0]

Objectives:

This course is required for the future professional career for engineering related industrial economics and management.

Contents:

Unit-I: Nature and Importance of Project and Project Engineering: Concept of Project and Project Management, Characteristics of Project, Introduction to Project Engineering, Role of a Project Leader, General Design Considerations, Plant Layout and Site Selection, Flow Diagram, Concept of Scale Up, Concepts of Techno-Economic Feasibility Report.

Unit-II: Technical and Financial Analysis: Technical Analysis, Financial Analysis, Significance of Financial Analysis, Elementary knowledge of book of accounts-Journal, Ledger, Balance sheet, Profit and Loss Account. Cost Estimation, Cash Flow Investment, Production Cost, Capital Investment, Cost Indices, Production and Overhead Cost, Interest and Taxes.

Unit-III: Project Financing and Value Engineering: Meaning and Importance of Project Finance, Means of Finance and Sources of Project in India, Financial Institution Structure and Financial Assistance, Norms of Finance and Term Loan Procedure, Value Engineering – Function, Aims and Procedure.

Unit-IV: Capital Expenditure, Profitability & Alternative Investments: Importance and Kinds of Capital Expenditure Decision, Capital Budgeting Process, Criteria of Capital Budgeting, Depreciation and its Calculation Methods, Methods of calculating profitability, Alternative investments, Break Even Analysis.

Unit-V: Network Techniques For Project Management: Introduction,

Development of Project Network, Network Scheduling, Critical Path Method, Program Evaluation & Review Technique, Planning and Scheduling of Activity Networks, Time Analysis, and Gantt Chart.

Suggested Text Books:

1. Plant Design & Economics for chemical Engineers by M.S. Peters & K. D. Timmerhaus.
2. Projects: Planning, Analysis, Selection, Financing, Implementation and Review by Prasanna Chandra.
3. Project Engineering of Process Plants by H. F. Rase.
4. Pilot Plants and Models and Scale up Methods in Chemical Engineering by R. E. Johnston.

Course Outcomes:

Upon completion of this course, the students will be able to: (a) select a site for the project from given alternatives, (b) calculate working capital requirement for a given project, (c) calculate cost of equipment used in a plant total project cost, (d) calculate cash flow from a given project, (e) understand the break-even analysis; (f) calculate depreciation; (g) list out various milestones related to project concept to commissioning.

CH07TOE32 Water Conservation & Management [L:3, T:0, P:0]

Objectives:

To introduce the water management principles related to process plants.

Contents:

Introduction: water cycle, water storage, water quality; water conservation in homes; water conservation in the work place; water management-water quality, controlling use and quality of water, water flow measurement, water quality control, testing water salinity, preserving water quality, minimizing evaporation, water sanitation, water audits; water conservation in agriculture; water conservation in process industry; water conservation in construction industry; water conservation in service industry.

Suggested Text Books:

1. Water Conservation, Management and Analysis by V. Madireddi and Subba Rao, Read worthy Publications (P) Ltd
2. Protection and Conservation of, Water Resources by Hadrian F. Cook, John Wiley & Sons Inc.
3. Water Resources, Conservation and Management by S.N. Chatterjee, Atlantic Publishers & Dist.

Course Outcomes:

Upon completion of this course, the students will be able to: (a) evaluate the performance of industrial boilers and furnaces; (b) identify the scope for recycle and reuse of water; (c) choose methods for waste minimization and water conservation.

SCHEME FOR EXAMINATION (Effective from Session 2021-22) B.TECH. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERINGFINAL YEAR, EIGHTH SEMESTER (AICTE)

S. No.	Subject Code	Subject Name	Periods			Evaluation Scheme			Credits
						Sessional			
	THEORY		L	T	P	IA	ESE	TOTAL	
01.	CH08TPC17	Process Equipment Design - III	3	1	0	30	70	100	4
02.	CH08TPE5X		3	0	0	30	70	100	3
03.	CH08TOE4X		3	0	0	30	70	100	3
	PRACTICAL								
01.	CH08PPC13	Project	0	0	8	70	30	100	4
		Total	9	1	8			400	14

IA – Internal Assessment

ESE - End Semester Examination

Total Credits : 14

Total Marks – 400

Total Periods / week - 18

DEPARTMENT OF CHEMICAL ENGINEERING

List of Professional Elective Courses (Seventh and Eighth semester) (AICTE)

S. No.	Semester	Course No.	Subject
01.	VII	CH07TPE41	Petroleum Refinery Engineering
02.		CH07TPE42	Polymer Technology-I
03.		CH07TPE43	Transport Phenomena
04.	VIII	CH08TPE51	Petrochemical Technology
05.		CH08TPE52	Polymer Technology-II
06.		CH08TPE53	Design and Development of Catalyst

List of Open Elective Courses (Seventh and Eighth semester) (AICTE)

S. No.	Semester	Course No.	Subject
01.	VII	CH07TOE31	Project Engineering Economics & Management
02.		CH07TOE32	Water Conservation & Management
03.	VIII	CH08TOE41	Optimization Techniques
04.		CH08TOE42	Process Modelling & Simulation

CH08TPC17 Process Equipment Design- III [L:3, T:1, P:0]

Objectives:

Chemical Engineers should have knowledge about Design of mass transfer Equipments such as absorption, Distillation Columns, dryer etc. This will also be useful for using Design software which is widely used in chemical industries.

Contents:

Mass Transfer Equipment design of: Absorption tower, Distillation tower, Tunnel and rotary dryers.

Suggested Text Books:

1. Hand Book of Chemical Engineering J. H. Perry
2. Coulson & Richardson Vol.- VI
3. Mass Transfer by R. E. Treybal
4. ISI Codes

Candidates have to bring their own copies of ISI Code book and they will be not be supplied by the university or the examination centres.

Course Outcomes:

Upon completion of this course, the students will be able to: (a) design mass transfer equipment's for chemical process.; (b) prepare drawing for chemical process equipment's.

CH08TPE51 Petrochemical Technology [L:3, T:0, P:0]

Objectives:

To impart knowledge of petroleum refining, hydrocarbon processing, and derived petrochemicals.

Contents:

Unit-I: Survey of Petrochemical Industries: Petrochemical industries in India, Plastic and synthetic fiber industries, Product of petroleum industries, Feed stocks for petrochemical production, Purification and separation of feed stocks.
Unit-II: C1 and C2 Hydrocarbons: Chemicals from methane, ethane, ethylene and acetylene, Synthesis gas as a feed stock for chemical industries, Naphtha cracking and reforming, Hydrogen from reforming of hydrocarbons.
Unit-III: Chemicals from C3, C4 and Higher Fractions: Carbon compound, Dehydrogenation of hydrocarbon and higher paraffins, Greases and lubricants, Polymers and their properties, Polymers from olefins- polyethylene (HDPE,

LDPE), Polypropylene, Vinyl polymers.

Unit-IV: Aromatic Hydrocarbons: Production of BTX, Benzene derivatives, Products from toluene, Oxidation products of toluene, Synthetic fibers and their production, Synthetic rubber and its production.

Unit-V: Plastics: Classifications of plastics, Different types of resin and their production, ABS plastics, Poly carbonates (PC), Poly urethanes, Polyimides, Polystyrene, Synthetic detergents and their production.

Suggested Text Books:

1. Modern Petroleum Technology by G.D. Hobson and W Pow.
2. A Textbook on Petrochemical Technology by Bhaskara Rao.

Course Outcomes:

Upon completion of this course, the students will be able to: (a) select the appropriate characterization parameters; (b) specify the properties of petroleum products; (c) attain knowledge of various separation & conversion processes involved in petroleum refining; (d) attain knowledge of manufacturing of various petrochemical products.

CH08TPE52 Polymer Technology - II [L:3, T:0, P:0]

Objectives:

(a) To deal with identification and characterization of raw material for ensuring the quality of polymer product along with different techniques of processing; (b) To develop the skills required for working in production, processing, testing, marketing and sales department of plastics, rubbers and fibres manufacturing Industries.

Contents:

Unit-I: Additives, Blends & Composites: Additives, Plasticizers, Fillers & reinforcements, Stabilizers, Flame retardants, Biocides, Processing additives, Colorants, Polymer blends, Interpenetrating network, Introduction to polymer composites, Composite fabrication.

Unit-II: Polymer Reaction: Hydrolysis, Acidolysis, Aminolysis, Hydrogenation, Addition and substitution reaction, Reaction of various specific groups, Cross linking reaction, Reaction leading of graft & block copolymers, Miscellaneous reactions.

Unit-III: Experimental Methods: Polymer synthesis, Isolation and purification of polymers, Polymer fractionation, Molecular weight determination, Molecular weight distribution curve, Determination of glass transition temperature.

Unit-IV: Engineering and Specialty Polymers: Engineering thermoplastics, Polyolefins, Vinyl polymers, Polyamides, Polycarbonates, Polysulphone,

Fluoropolymers, Inorganic polymers, Thermoplastic polyesters, Natural and synthetic rubber, Cellulose and its derivatives.

Unit-V: Polymer Processing & its Manufacturing: Basic processing operations, Extrusion, Modeling, Calendering, Coating, Injection moulding, Compression moulding, Transfer moulding, Blow moulding, Die casting, Rotation casting, Film casting.

Suggested Text Books:

1. Polymer Science and Technology by Fried
2. Outlines of Polymer Technology by Sinha PHI
3. Polymer Science by V.R. Gowariker New age International Ltd.

Course Outcomes:

Upon completion of this course, the students will be able to: (a) select appropriate techniques of polymerization; (b) produce plastics using appropriate reactions and unit operations steps; (c) produce rubbers using appropriate reactions and unit operations steps; (d) produce fibres using appropriate reactions and unit operations steps; (e) apply different polymer processing techniques.

CH08TPE53 Design and Development of Catalyst [L:3, T:0, P:0]

Objectives:

To gain the knowledge of catalyst characteristics, mechanism of catalytic reactions, and design of catalytic reactors.

Contents:

Structure of Solid Surfaces, Chemisorption and Physiosorption, Thermodynamics and Kinetics of Surface Processes, Principles of Heterogeneous Catalysis, Preparation, Characterization and Classification, Kinetics of Heterogeneous Reactions, Physical, Chemical and Mathematical Description of Catalyst Deactivation, Deactivation by Fouling, Poisoning and Sintering, Deactivation and Regeneration of Catalyst Pellets, Deactivation and Regeneration of Fixed Beds, Dynamics of Polyfunctional Catalysts, Electro catalysis and Photocatalyis, Mechanism and Kinetics of Some Typical Heterogeneous Catalytic Reactions, Applications in Fertilizer, Petroleum, Petrochemical Industries and Pollution Control.

Suggested Text Books:

1. Preparation of Catalyst VI: Scientific bases for the preparation of Haterogeneous Catalysts by G. Poncelet,J. Martens, B. Delmon, Elseveir.
2. Catalyst Preparation: Science and Engineering by John Regalbuto, CRC Press.

Course Outcomes:

Differentiate between chemisorption and physical adsorption, List steps involved in adsorption of a solute, and which steps may control the rate of adsorption, Explain the concept of breakthrough in fixed-bed adsorption. Upon completion of this course, the students will be able to: (a) develop various catalytic reaction mechanisms;(b) characterize a catalyst; (c) assess the effects of external heat and mass transfer effects in heterogeneous catalysis; (d) calculate the effectiveness of a porous catalyst; (e) design different types of reactors for catalytic reactions.

CH08TOE41 Optimization Techniques [L:3, T:0, P:0]

Objectives:

To study and apply optimization techniques in the chemical process industry.

Contents:

Unit-I: System Analysis and Modelling: Introduction to systems analysis and modelling with reference to chemical engineering problems, Differential method for solving one and two variable problems with and without constraints, Case studies, Application of langrangian multiplier method.

Unit-II: Linear Programming: Modelling, graphical method, single phase simplex method, two phase simplex method, duality, sensitivity analysis.

Unit-III: Geometric Programming: As applied to chemical engineering problems with degree of difficulty equal to zero and one, with and without constraints.

Unit-IV: Search Methods: Sequential search methods - Golden section method, dichotomous search method, Interval halving method, Fibonacci method.

Unit-V: Dynamic Programming: Introduction to dynamic programming as applied to discrete multistage problems like cascade of CSTR, Train of heat exchanger etc., Computer programming techniques applied to optimization.

Suggested Text Books:

1. Optimization Theory and Practice by Beveridge and Schecheter
2. Optimization Techniques for chemical Engineers by Asghar Hussain
3. Optimization by S.S. Rao
4. Linear Programming by Hadley

Course Outcomes:

Upon completion of this course, the students will be able to: (a) formulate the objective functions for constrained and unconstrained optimization problems; (b) use different optimization strategies; (c) Solve problems using non-traditional optimization techniques; (d) use of different optimization techniques for problem solving.

CH08TOE42 Process Modeling & Simulation [L:3, T:0, P:0]

Objectives: Graduates shall be able to 1. Understand chemical engineering system in term of modelling principle 2. Distinguish simulation from design of equipments 3. Apply software tools such as UNISIM to model chemical processes. 4. Develop algorithm for modelling & solve the model.

Contents:

Unit-I: Introduction: Uses of Mathematical Models, Scope of Coverage, Principles of Formulations. Mathematical Modeling in Chemical Reaction Engineering: CSTR, PFR, Batch Reactor, Semibatch Reactor, Series of Isothermal CSTR, Constant Hold-Up CSTR's, CSTR's with Variable Hold Ups, Gas Phase Pressurized CSTR, Non-Isothermal CSTR, Bioreactor, Trikle Bed Reactor.

Unit-II: Mathematical Modeling in Mass Transfer: Ideal Binary Distillation Column, Multi- Component Non-ideal Distillation Column, Batch Distillation with Hold Up, Steam Distillation, Multi-Solute Batch Liquid- Liquid Extraction, Continuous Extraction, Multistage Countercurrent Extraction, Plug Flow Type Liquid- Liquid Extraction, Reactor with Mass Transfer, Absorption, Adsorption.

Unit-III: Mathematical Modeling in Heat Transfer: Two Heated Tanks, Single Component Vaporizer, Double Pipe Heat Exchanger, Shell and Tube Heat Exchanger, Multicomponent Flash Drum, Cooling Towers.

Unit-IV: Mathematical Modeling of Other Chemical Processes: Interacting and Non-Interacting Systems with and without Heaters, Isothermal Hydraulic System, Forward and Backward Feed Triple Effect Evaporator.

Unit-V: Introduction of MATLAB and Use of Language, Simulation, Program Development and Numerical Solutions of Above Processes.

Text Books:

1. Process Modeling, Simulation and Control for Chemical Engineers by W. L. Luyben, McGraw Hill, 1990.
2. Process Plant Simulation by B. V. Babu, Oxford University Press, 2004.
3.Optimisation Techniques for Chemical Engineers by A. Hussain and K. Gangaiah, Macmillan, 2001.
4. Process Control: Modeling, Design and Simulation by B. W. Bequette. Prentice-Hail India, 2006.
5. Elements of Chemical Reaction Engineering by Fogler, Prentice Hall of India.

Outcomes: 1. Detail the importance of ODE and PDE. 2. Develop model equations for the given system. 3. Solve structural, thermal, fluid flow problems. 4. Demonstrate the model solving ability for various processes/unit operations. 5. Demonstrate the ability to use a process simulation.

CODE OF CONDUCT FOR STUDENTS

CODE OF CONDUCT FOR STUDENTS

The students are admitted to Guru Ghasidas Vishwavidyalaya to achieve excellence and shape their character to become responsible citizens. They must realize their responsibility towards the Vishwavidyalaya and to its components like faculty, staff and fellow students. Failure to maintain a good standard of conduct shall result in disciplinary action.

Attendance: 75% attendance is compulsory in each subject.

Misconduct: Any of the following activities (but not limited to these only) will be treated as misconduct.

1. Disruption of teaching activities or disturbing the learning process of other students on the campus.
2. Any act on the part of the students, which disrupts functioning of the university, endangers health and safety of campus residents and da mages Vishwavidyalaya properties.
3. Cheating in examination and supplying of false documents / information in order to seek any consideration / favor from the University.
4. Possession or consumption of intoxicating beverages on the campus.
5. Failure to return back loaned material, settle University dues.
6. Possession of weapons.
7. Use of unparliamentarily language while in conversation with Vishwavidyalaya Staff and fellow students.

Disciplinary Actions:

Failure to adhere to good conduct may result in disciplinary actions like:

1. A warning by the authorities.
2. Suspension from a particular class.
3. Suspension / expulsion from the University.
4. Suspension of campus privileges e.g. hostel, accommodation etc.
5. Withholding of examination result or withdrawal of awarded diploma / degree certificate.
6. Any other disciplinary action deemed appropriate by the University authorities.

ABOUT RAGGING

ABOUT RAGGING

UGC DRAFT REGULATIONS ON CURBING THE MENACE OF RAGGING IN

HIGHER EDUCATIONAL INSTITUTIONS, 2009

In exercise of the power conferred by Clause (g) of Sub-Section (1) of Section 26 of the University Grants Commission Act, 1956, the University Grants Commission hereby makes the following Regulations, namely-

1. Title, commencement and applicability:-

1.1. These regulations shall be called the "UGC Regulations on Curbing the Menace of Ragging in Higher Educational Institutions, 2009".

1.2. They shall come into force with immediate effect.

1.3. They shall apply to all the universities established or incorporated by or under a Central Act, a Provincial Act or a State Act, to all institutions deemed to be university under Section 3 of the UGC Act, 1956, to all other higher educational institutions, including the departments, constituent units and hall the premises (academic, residential, sports, canteen, etc) of such universities, deemed universities and other higher educational institutions, whether located within the campus or outside, and to all means of transportation of students whether public or private.

2. Objective:-

To root out ragging in all its forms from universities, colleges and other educational institutions in the country by prohibiting it by law, preventing its occurrence by following the provisions of these Regulations and punishing those who indulge in ragging in spite of prohibition and prevention as provided for in these Regulations and the appropriate law in force.

3. Defi nitions:-

For the purposes of these Regulations:-

3.1 "college" means any institution, whether known as such or by any other name, which provides for a programme of study beyond 12 years of schooling for obtaining any qualifi cation from a university and which, in accordance with the rules and regulations of such university, is recognized as competent to provide for such programmes of study and present students undergoing such programmes of study for the examination for the award of such qualifi cation.

3.2 "Head of the institution" means the 'Vice-Chancellor' in case of a university/deemed to be university, 'Principal' in case of a college, 'Director' in case of an institute.

3.3 "institution" means a higher educational institution (HEI), like a university, a college, an institute, etc. imparting higher education beyond 12 years of schooling leading to a degree (graduate, postgraduate and/or higher level).

3.4 Ragging" means the following: Any disorderly conduct whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness any other student, indulging in rowdy or undisciplined activities which causes or is likely to cause annoyance, hardship or psychological harm or to raise fear or apprehension thereof in a fresher or a junior student or asking the students to do any act or perform something which such student will not in the ordinary course and which has the effect

of causing or generating a sense of shame or embarrassment so as to adversely affect the physique or psyche of a fresher or a junior student.

3.5 "University" means a university established or incorporated by or under a Central Act, a Provincial Act or a State Act, an institution deemed to be university under Section 3 of the UGC Act, 1956, or an institution specially empowered by an Act of Parliament to confer or grant degrees

4 Punishable ingredients of Ragging:-

- Abetment to ragging;
- Criminal conspiracy to rag;
- Unlawful assembly and rioting while ragging;
- Public nuisance created during ragging;
- Violation of decency and morals through ragging;
- Injury to body, causing hurt or grievous hurt;
- Wrongful restraint;
- Wrongful confinement;
- Use of criminal force;
- Assault as well as sexual offences or even unnatural offences;
- Extortion;
- Criminal trespass;
- Offences against property;
- Criminal intimidation;
- Attempts to commit any or all of the above mentioned offences against the victim(s);
- All other offences following from the defi nition of "Ragging".

5 Measures for prohibition of ragging at the institution level:-

5.1 The institution shall strictly observe the provisions of the Act of the Central Government and the State Governments, if any, or if enacted, considering ragging as a cognizable offence under the law on a par with rape and other atrocities against women and ill- treatment of persons belonging to the SC/ST, and prohibiting ragging in all its forms in all institutions.

5.2 Ragging in all its forms shall be totally banned in the entire institution, including its departments, constituent units, all its premises (academic, residential, sports, canteen, etc) whether located within the campus or outside and in all means of transportation of students whether public or private.

5.3 The institution shall take strict action against those found guilty of ragging and/or of abetting ragging.

6 Measures for prevention of ragging at the institution level:-

6.1 Before admissions:-

6.1.1 The advertisement for admissions shall clearly mention that ragging is totally banned in the institution, and anyone found guilty of ragging and/or abetting ragging is liable to be punished Appropriately (for punishments, ref. section 8 below).

6.1.2 The brochure of admission/instruction booklet for candidates shall print in block letters these Regulations in full (including Annexures).

6.1.3 The 'Prospectus' and other admission related documents shall incorporate all directions of the Supreme Court and / or the Central or State Governments as applicable, so that the candidates and their parents/ guardians are sensitized in respect of the prohibition and consequences of ragging. If the institution is an affi liating university, it shall make it mandatory for the institutions under it to compulsorily incorporate such information in their 'Prospectus'.

6.1.4 The application form for admission/ enrolment shall have a printed undertaking, preferably both in English/Hindi and in one of the regional languages known to the institution and the applicant (English version given in Annexure I, Part I), to be filled up and signed by the candidate to the effect that he/she is aware of the law regarding prohibition of ragging as well as the punishments, and that he/she, if found guilty of the offence of ragging and/or abetting ragging, is liable to be punished appropriately.

6.1.5 The application form shall also contain printed undertaking, preferably both in English/Hindi and in one of the regional languages known to the institution and the parent/ guardian (English version given in Annexure I, Part II), to be signed by the parent/ guardian of the applicant to the effect that he/ she is also aware of the law in this regard and agrees to abide by the punishment meted out to his/her ward in case the latter is found guilty of ragging and/or abetting ragging.

6.1.6 The application for admission shall be accompanied by a document in respect of the School Leaving Certifi cate/ Character Certifi cate which shall include a report on the behavioral pattern of the applicant, so that the institution can thereafter keep intense watch upon a student who has a negative entry in this regard.

6.1.7 A student seeking admission to the hostel shall have to submit another undertaking in the form of Annexure I (both Parts) along with his/ her application for hostel accommodation.

6.1.8. At the commencement of the academic session the Head of the Institution shall convene and address a meeting of various functionaries/agencies, like Wardens, representatives of students, parents/ guardians, faculty, district administration including police, to discuss the measures to be taken to prevent ragging in the Institution and steps to be taken to identify the offenders and punish them suitably.

6.1.9. To make the community at large and the students in particular aware of the dehumanizing effect of ragging, and the approach of the institution towards those indulging in ragging, big posters (preferably multicolored with different colours for the provisions of law, punishments, etc.) shall be prominently displayed on all Notice Boards of all departments, hostels and other buildings as well as at vulnerable places. Some of such posters shall be of permanent nature in certain vulnerable places.

6.1.10 The institution shall request the media to give adequate publicity to the law prohibiting ragging and the negative aspects of ragging and the institution's resolve to ban ragging and punish those found guilty without fear or favour.

6.1.11 The institution shall identify, properly illuminate and man all vulnerable locations.

6.1.12 The institution shall tighten security in its premises, especially at the vulnerable places. If necessary, intense policing shall be resorted to at such points at odd hours during the early monthsof the academic session.

6.1.13 The institution shall utilize the vacation period before the start of the new academic year to launch wide publicity campaign against ragging through posters, leafl ets. seminars, street plays, etc.

6.1.14 The faculties/ departments/ units of the institution shall have induction arrangements (including those which anticipate, identify and plan to meet any special needs of any specifi c section of students) in place well in advance of the beginning of the academic year with a clear sense of the main aims and objectives of the induction process.

6.2 On admission:-

6.2.1 Every fresher admitted to the institution shall be given a printed leafl et detailing when and to whom he/she has to turn to for help and guidance for various purposes (including Wardens, Head of the institution, members of the anti-ragging committees, relevant district and police authorities), addresses and telephone numbers of such persons/ authorities, etc., so that the fresher need not look up to the seniors for help in such matters and get indebted to them and start doing things, right or wrong, at their be hest. Such a step will reduce the freshers' dependence on their seniors .

6.2.2 The institution through the leaflet mentioned above shall explain to the new entrants the arrangements for their induction and orientation which promote effi cient and effective means of integrating them fully as students.

6.2.3 The leafl et mentioned above shall also tell the freshers about their rights as bona fi de students of the institution and clearly instructing them that they should desist from doing anything against their will even if ordered by the seniors, and that they have nothing to fear as the institution cares for them and shall not tolerate any atrocities against them.

6.2.4 The leafl et mentioned above shall contain a calendar of events and activities laid down by the institution to facilitate and complement familiarization of juniors with the academic environment of the institution.

6.2.5 The institution shall also organize joint sensitization programmes of 'freshers' and seniors.

6.2.6 Freshers shall be encouraged to report incidents of ragging, either as victims, or even as witnesses.

6.3 At the end of the academic year:-

6.3.1 At the end of every academic year the Vice-Chancellor/ Dean of Students Welfare/ Director/ Principal shall send a letter to the parents/ guardians who are completing the first year informing them about the law regarding ragging and the punishments, and appealing to them to impress upon their wards to desist from indulging in ragging when they come back at the beginning of the next academic session.

6.3.2 At the end of every academic year the institution shall form a 'Mentoring Cell' consisting of Mentors for the succeeding academic year. There shall be as many levels or tiers of Mentors as the number of batches in the institution, at the rate of 1 Mentor for 10 freshers and 1 Mentor of a higher level for 10 Mentors of the lower level.

6.4 Setting up of Committees and their functions:-

6.4.1The Anti-Ragging Committee:- The Anti-Ragging Committee shall be headed by the Head of the institution and shall consist of representatives of faculty members, parents, students belonging to the freshers' category as well as seniors and non-teaching staff. It

shall consider the recommendations of the Anti-Ragging Squad and take appropriate decisions, including spelling out suitable punishments to those found guilty.

6.4.2 The Anti-Ragging Squad:- The Anti-Ragging Squad shall be nominated by the Head of the institution with such representation as considered necessary and shall consist of members belonging to the various sections of the campus community. The Squad will have vigil, oversight and patrolling functions. It shall be kept mobile, alert and active at all times and shall be empowered to inspect places of potential ragging and make surprise raids on hostels and other hot spots. The Squad shall investigate incidentsof ragging and make recommendations to the Anti-Ragging Committee and shall work under the overall guidance of the said Committee.

6.4.3 Monitoring Cell on Ragging:- If the institution is an affi liating university, it shall have aMonitoring Cell on Ragging to coordinate with the institutions affi liated to it by calling for reports from the Heads of such institutions regarding the activities of the Anti-Ragging Committees, Squads, and Mentoring Cells, regarding compliance with the instructions on conducting orientation programmes, counseling sessions, etc., and regarding the incidents of ragging, the problems faced by wardens and other offi cials, etc. This Cell shall also review the efforts made by such institutions topublicize anti-ragging measures, cross-verify the receipt of undertakings from candidates/students and their parents/guardians every year, and shall be the prime mover for initiating action by the university authorities to suitably amendthe Statutes or Ordinances or Bye-laws to facilitate the implementation of anti ragging measures at the level ofthe institution.

6.5 Other measures:-

6.5.1 The Annexure mentioned in 6.1.4, 6.1.5 and 6.1.7 shall be furnished at the beginning of each academic year by every student, that is, by freshers as well as seniors.

6.5.2 The institution shall arrange for regular and periodic psychological counseling and orientation for students (for freshers separately, as well as jointly with seniors) by professional counselors during the first three months of the new academic year. This shall be done at the institution and department/ course levels. Parents and teachers shall also be involved in such sessions.

6.5.3 Apart from placing posters mentioned in 6.1.9 above at strategic places, the institution shall undertake measures for extensive publicity against ragging by means of audio-visual aids, by holding counseling sessions, workshops,painting and design competitions among students and other methods as it deems fit.

6.5.4 If the institution has B.Ed. and other Teacher training programmes, these courses shall be mandated to provide for anti-ragging and the relevant human rights appreciation inputs, as well as topics on sensitization against corporal punishments and checking of bullying amongst students, so that every teacher is equipped to handle at least the rudiments of the counseling approach.

6.5.5 Wardens shall be appointed as per the eligibility criteria laid down for the post refl ecting both the command and control aspects of maintaining discipline, as well as the softer skills of counseling and communicating with the youth outside the class-room situations. Wardens shall be accessible at all hours and shall be provided with mobile phones. The institution shall review and suitably enhance the powers and perquisites of Wardens and authorities involved in curbing the menace of ragging.

6.5.6 The security personnel posted in hostels shall be under the direct control of the Wardens and assessed by them.

6.5.7 Private commercially managed lodges and hostels shall be registered with the local police authorities, and this shall be done necessarily on the recommendation of the Head of the institution. Local police, local administration and the institutional authorities shall ensure vigil on incidents that may come within the definition of ragging and shall be responsible for action in the event of ragging in such premises, just as they would be for incidents within the campus. Managements of such private hostels shall be responsible for not reporting cases of ragging in their premises.

6.5.8 The Head of the institution shall take immediate action on receipt of the recommendations of the Anti-Ragging Squad. He/ She shall also take action suo motto if the circumstances so warrant.

6.5.9 Freshers who do not report the incidents of ragging either as victims or as witnesses shall also be punished suitably.

6.5.10 Anonymous random surveys shall be conducted across the 1st year batch of students (freshers) every fortnight during the first three months of the academic year to verify and cross-check whether the campus is indeed free of ragging or not. The institution may design its own methodology of conducting such surveys.

6.5.11 The burden of proof shall lie on the perpetrator of ragging and not on the victim.

6.5.12 The institution shall fi le an FIR with the police / local authorities whenever a case of ragging is reported, but continue with its own enquiry and other measures without waiting for action on the part of the police/ local civil authorities. Remedial action shall be initiated and completed within the one week of the incident itself.

6.5.13 The Migration / Transfer Certificate issued to the student by the institution shall have an entry, apart from those relating to general conduct and behaviour, whether the student has been punished for the offence of committing or abetting ragging, or not, as also whether the student has displayed persistent violent or aggressive behaviour or any desire to harm others.

6.5.14 Preventing or acting against ragging shall be the collective responsibility of all levels and sections of authorities or functionaries in the institution, including faculty, and not merely that of the specifi c body/ committee constituted for prevention of ragging.

6.5.15 The Heads of institutions other than universities shall submit weekly reports to the Vice-chancellor of the university the institution is affiliated to or recognized by, during the first three months of new academic year and thereafter each month on the status of compliance with anti-ragging measures. The Vice Chancellor of each university shall submit fortnightly reports of the university, including those of the Monitoring Cell on Ragging in case of an affiliating university, to the Chancellor.

6.5.16 Access to mobile phones and public phones shall be unrestricted in hostels and campuses, except in class-rooms, seminar halls, library etc. where jammers shall be installed to restrict the use of mobile phones.

6.6 Measures for encouraging healthy interaction between freshers and seniors:-

6.6.1 The institution shall set up appropriate committees including the course-in-charge, student advisor, Warden and some senior students to actively monitor, promote and regulate healthy interaction between the freshers and senior students.

6.6.2 Freshers' welcome parties shall be organized in each department by the senior students and the faculty together soon after admissions, preferably within the fi rst two weeks of the beginning of the academic session, for proper introduction to one another and where the talents of the freshers are brought out properly in the presence of the faculty, thus helping them to shed their inferiority complex, if any, and remove their inhibitions.

6.6.3 The institution shall enhance the student-faculty interaction by involving the students in all matters of the institution, except those relating to the actual processes of evaluation and of faculty appointments, so that the students shall feel that they are responsible partners in managing the affairs of the institution and consequently the credit due to the institution for good work/ performance is due to them as well.

6.7 Measures at the UGC/ Statutory/ Regulatory bodies' level:-

6.7.1 The UGC and other Statutory /Regulatory bodies shall make it mandatory for the institutions to compulsorily incorporate in their 'Prospectus' the directions of the Supreme Court and/or the Central or State Governments with regard to prohibition and consequences of ragging, and that noncompliance with the directives against ragging in any manner whatsoever shall be considered as lowering of academic standards by the erring institution making it liable for appropriate action.

6.7.2 The UGC (including NAAC and UGC Expert Committees visiting institutions for various purposes) and similar Committees of other Statutory/Regulatory bodies shall cross-verify that the institutions strictly comply with the requirement of getting the undertakings from the students and their parents/ guardians as envisaged under these Regulations.

6.7.3 The UGC and other funding bodies shall make it one of the conditions in the Utilization Certificate for sanctioning any financial assistance or aid to the institution under any of the general or special schemes that the institution has strictly complied with the anti-ragging measures and has a blemishless record in terms of there being no incidents of ragging during the period pertaining to the Utilization Certificate.

6.7.4 The NAAC and other accrediting bodies shall factor in any incident ofragging in the institution while assessing the institution in different grades.

6.7.5 The UGC shall constitute a Board for Coordination consisting of representatives of the AICTE, the IITs, the NITs, the IIMs, the MCI, the DCI, the NCI, the ICAR and such other bodies which have to deal with higher education to coordinate and monitor the anti-ragging movement across the country and to make certain policy decisions. The said Board shall meet once in a year in the normal course.

6.7.6 The UGC shall have an Anti-Ragging Cell within the Commission as an institutional mechanism to provide secretarial support for collection of information and monitoring, and to coordinate with the State level and university level Committees for effective implementation of anti-ragging measures.

6.7.7 If an institution fails to curb ragging, the UGC/ the Statutory/ Regulatory body concerned may stop financial assistance to such an institution or take such action within its powers as it may deem fi t and impose such other penalties as provided till such time as the institution achieves the objective of curbing ragging.

7 Incentives for curbing ragging:-

7.1 The UGC shall consider providing special/ additional annual financial grants-inaid to those eligible institutions which report a blemish-less record in terms of there being no incidents of ragging.

7.2 The UGC shall also consider instituting another category of fi nancial awards or incentives for those eligible institutions which take stringent action against those responsible for incidents of ragging.

7.3 The UGC shall lay down the necessary incentive for the post of Warden in order to attract the right type of eligible candidates, and motivate the incumbent.

8 Punishments:-

8.1 At the institution level:

Depending upon the nature and gravity of the offence as established by the Anti-Ragging Committee of the institution, the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following:

8.1.1 Cancellation of admission

8.1.2 Suspension from attending classes

8.1.3 Withholding/ withdrawing scholarship/ fellowship and other benefi ts

8.1.4 Debarring from appearing in any test/ examination or other evaluation process

8.1.5 Withholding results

8.1.6 Debarring from representing the institution in any regional, national or international meet, tournament, youth festival, etc.

8.1.7 Suspension/ expulsion from the hostel

8.1.8 Rustication from the institution for period ranging from 1 to 4 semesters

8.1.9 Expulsion from the institution and consequent debarring from admission to any other institution

8.1.10 Fine of Rupees 25,000/-

8.1.11 Collective punishment: When the persons committing or abetting the crime of ragging are not identifi ed, the institution shall resort to collective punishment as a deterrent to ensure community pressure on the potential raggers.

8.2 At the university level in respect of institutions under it:

If an institution under a university (being constituent of, affi liated to or recognized by it) fails to comply with any of the provisions of these Regulations and fails to curb ragging effectively, the university may impose any or all of the following penalties on it:

8.2.1 Withdrawal of affi liation/ recognition or other privileges conferred on it

8.2.2 Prohibiting such institution from presenting any students then undergoing any programme of study therein for the award of any degree/diploma of the university

8.2.3 Withholding any grants allocated to it by the university

8.2.4 Any other appropriate penalty within the powers of the university.

8.3 At the UGC level:

If an institution fails to curb ragging, the UGC may impose any or all of the following penalties on it:

8.3.1 Delisting the institution from section 2(f) and /or section 12B of the UGC Act

8.3.2 Withholding any grants allocated to it

8.3.3 Declaring institutions which are not covered under section 2(f) and or 12B as ineligible for any assistance like that for Major/ Minor Research Project, etc.

8.3.4 Declaring the institution ineligible for consideration under any of the special assistance programmes like CPE (College with potential for Excellence), UPE (University with Potential for Excellence) CPEPA (Centre with Potential for Excellence in a Particular Area), etc.

8.3.5 Declaring that the institution does not have the minimum academic standards and warning the potential candidates for admission accordingly through public notice and posting on the UGC Website.

DISCIPLINE AMONG STUDENTS IN UNIVERSITY EXAMINATIONS

DISCIPLINE AMONG STUDENTS IN UNIVERSITY EXAMINATIONS

I UNIVERSITY END SEMESTER EXAMINATIONS

1. The end –semester examination shall be held under the general supervision of the Head of Department by the faculty member concerned. He/she shall be responsible for the fair and orderly conduct of the examination
2. In case of detection of unfair means (as specified in clause 1 of General Guidelines below), the same shall be brought to the notice of the head of the department concerned for further action specified under clause 5 of the General Guidelines below

II ENTRANCE EXAMINATIONS

1. During an entrance examination the candidates shall be under the disciplinary control of the chief Superintendent of the centre who shall issue the necessary instructions. If a candidate disobeys instructions or misbehaves with any member of the supervisory staff or with any of the invigilators at the centre, he/she may be expelled from the examination for that session.
2. The Chief Superintendent shall immediately report the facts of such a case with full details of evidence to the Controller of Examinations who will refer the matter to the Examination Discipline Committee in terms of clause 4 of General Guidelines below. The committee will make recommendations for disciplinary action as it may deem fit to the Vice-Chancellor as provided under clause 7
3. Everybody, before an examination begins, the invigilators shall call upon all the candidates to search their persons, tables, desks, etc. and ask them to hand over all papers, books, notes or other reference material which they are not allowed to have in their possession or accessible to them in the examination hall. Where a late-comer is admitted this warning shall be repeated to him at the time of entrance to the examination hall. They are also to see that each candidate has his/her identification card and hall ticket with him/her.

III GENERAL GUIDELINES

1. Use of Unfair means:
   A candidate shall not use means in connection with any examination. The following shall be deemed to unfair means:
   a. Found in possession of incriminating material related/unrelated to the subject of the examination concerned.
   b. Found copying either from the possessed material or from a neighbor.
   c. Inter-changing of answer scripts.
   d. Change of seat for copying.
   e. Trying to help others candidates.

f. Found consulting neighbours
g. Exchange of answer sheets or relevant materilas.
h. Writing some other candidate's register number in the main answer paper.
i. Insertion of pre-written answer sheets (Main sheets or Additional sheets)
j. Threatening the invigilator or insubordinate behavior as reported by the Chief Superintendent and / or Hall Superintendent.
k. Consulting the invigilator for answering the questions in the examination.
l. Cases of impersonation
m. Mass copying
n. Using electronic devices for the purpose of malpractice.

The Executive Council may declare any other act of omission or commission to be unfair means in respect of any or all the examination.

2. If the Vice-Chancellor is satisfied that there has been mass-scale copying or use or unfair means on a mass-scale at particular center(s), he may cancel the examination of all the candidates concerned and order re-examination.
3. Where the invigilator incharge is satisfied that one third (1/3) or more students were involved in using unfair-means or copying in a particular Examination Hall. It shall be deemed to be a case of mass copying.

   a) The Chief Superintendent of the examination centre shall report to the Controller of Examinations without delay and on the day of the occurrence if possible, each case where use of unfair means in the examination is suspected or discovered with full details of the evidence in support thereof and the statement of the candidate concerned, if any, on the forms supplied by the Controller of Examination for the purpose.

   b) A candidate shall not be forced to give a statement but the fact of his /her having refused to make a statement shall be recorded by the Chief Superintendent and shall be got attested by two other members of the supervisory staff on duty at the time of occurrence of the incident.

   c) A candidate detected or suspected of using unfair means in the examination may be permitted to answer the question paper, but on separate answer-book. The answer-book in which the use of unfair means is suspected shall be seized by the Chief Superintendent, who shall send both the answer-books to the Controller of Exami9nation with his report. This will not affect the concerned candidate appearing in the rest of the examinations.

   d) All cases of use of unfair means shall be reported immediately to the Controller of the Examination by the Centre Superintendent, examiner, paper-setter, evaluator, moderator, tabulator or the person connected with the University examination as the case may be, with all the relevant material.
4. Examination Discipline Committee

a) All the cases of alleged use of unfair means shall be referred to a committee called the Examination Discipline Committee to be appointed by the Vice-Chancellor.

b) The Committee shall consists of five members drawn from amongst the teachers and officers of the university. One member will be nominated as Chairman from amongstthem by the Vice Chancellor.

c) A member shall be appointed for a term of two years, and shall be eligible for re-appointment.

d) Three members present shall constitute the quorum.

e) Ordinarily, all decisions shall be taken by the Committee by simple majority. If the members cannot reach a consensus, the case shall be referred to the Vice-Chancellor, whose decision shall be final.

f) All decisions taken by the examination discipline committee will be placed before the Vice-Chancellor for approval

g) A candidate within one month of the receipt of the decision of the university may appeal to the Vice-Chancellor, in writing for a review of the case. If the Vice-Chancellor is satisfied that the representation merits consideration, he/she may refer the case back to the Examination Discipline Committee for reconsideration.

5 The Examination Discipline Committee may recommend one of the following punishments for cases of unfair means

Nature of unfair means	Scale of Punishment
If the candidate has used unfair means specified in sub-clause (a) to (g) of clause 3	Cancel all the University Examinations registered by the candidate in that session.
If the candidate has repeated the unfair means shown at 3(a) to (g) a second time	Cancel the University Examination of all subjects registered by the candidate in that session and debar him/her for the next examination session (i.e. all university Examinations in the subsequent session)
If the candidate has repeated the unfair means shown at 3(a) to (g) third time	Cancel the University Examination of all subjects registered by the candidate for that session and debar him/her for two years from registering and appearing for the university Examination
If the candidate has used unfair means specified in sub-clause (h) of clause	Cancel the University Examination of all subjects registered by the candidate during that semester only.
If the candidate has used unfair means specified in sub-clause (i) of clause	Cancel the University Examination of all subjects registered by the candidate for that session and debar him/her for two subsequent Examination sessions.
If the candidate has used unfair means specified in sub-clause (j) of clause 3	Cancel the University Examination of all subjects registered by the candidate for that session and debar him/her for two years from registering and appearing for

	the university Examination
If the candidate has used unfair means specified in sub-clause (k) of clause	Cancel the University Examination of all subjects registered by the candidate for that session
If the candidate has used unfair means specified in sub-clause (l) of clause	Cancel the University Examination of all subjects registered by the candidate for that session and debar him/her for two years from registering and appearing for the examination sessions. Moreover, relevant legal action shall be initiated if an outsider is involved.
If the candidate used unfair means in sub-clause (m) of clause 3	ix) a) In the single Hall: Cancel the relevant examination taken by the students of that Hall. Debar the concerned Hall superintendent and other involved directly or indirectly from the examination work such as invigilation, question paper-setting, valuation, etc. for the next six examination sessions. b) In a Centre: Cancel the relevant examination taken by the students of the center. Debare the Hall Superintendents and the Chief Superintendent and other involved directly or indirectly from the examination work such as invigilation, question paper-setting, valuation, etc. for the next six examination sessions and cancel the examination center for two years

Important Phone No.s

S. No.	POSITION	NAME	Mb. No. & PHONE NO. (07752)
01.	Vice Chancellor (Acting)	Prof. Alok Kumar Chakrawal	260283, 260353
02.	Registrar (Acting)	Prof. Shailendra Kuma	79995-17050
03.	Controller of Exam	Mr. Raj Kumar Sharma	260000
04.	Dean Student Welfare (DSW)	Prof. M.N. Tripathi	99814-01993
05.	Proctor	Dr. Pankaj Gupta	88210-20709
06.	Chief, Warden Hostel	Prof. Pradeep Shukla	94252-27219
07.	Librarian (Central Library)	Dr. A.K. Sharma	94253-74463
08.	Media Incharge	Prof. Pratibha J. Mishra	94063-04040
09.	N.S.S. Coordinator	Dr. Dilip Kumar Jha	99260-03033
10.	Professor Incharge Campus security Management	Prof. Pradeep Shukla	94252-27219
11.	Dean, School of Studies in Engineering & Technology	Prof. T.V. Arjunan	98943-32446
12.	Assistant Registrar (Administration)	Mr. Abhideep Tiwari	260017
13.	HoD (Civil Engineering)	Dr. M. Charadhara Rao	260429
14.	HoD (Computer Science and Engineering)	Dr. Alok Singh Kushwaha	80906-31394
15.	HoD (Information Technology)	Dr. Rohit Raja	70005-59696
16.	HoD (Electronics & Comm. Engineering)	Mrs. Anita Khanna	260458
17.	HoD (Industrial & Production Engineering)	Dr. S.C. Shrivastava	94313-82634
18.	HoD (Chemical Engineering)	Dr. Anil Kumar Chandrakar	75873-00404

19.	HoD (Mechanical Engineering)	Prof. T.V. Arjunan	98943-32446
20.	Adm. warden , Girl's Hostel	Dr. Rashmi Agrawal	91794-44732
21.	Warden-1, Girl's Hostel	Dr. Gunjan Patil	81035-12024
22.	Warden-2, Girl's Hostel	Dr. Archana Yadav	79742-61757
23.	Warden-3, Girl's Hostel	Smt. Praveena Rajpoot	97701-06216
24.	Matron- 1, Girl's Hostel	Ms. Geeta Sahu	08234003308 Girls Hostel office 07752-260462
25.	Warden -1 (Resident warden S.V.B.H) Boy's Hostel	Dr. M. S. Dhapola	94253-40051
26.	Warden - 2 Boy's Hostel (S.V.B.H)	Dr. R. S. Thakur	62613-33358
27.	Warden - 2 Boy's Hostel (S.V.B.H)	Mr. Prashant Jangde	90981-16702
28.	Warden - 3 Boy's Hostel (S.V.B.H.Type-II IV)	Mr. Sumit Kumar Gupta	96855-78005
29.	Warden - 4 Boy's Hostel (B.H. Type-II IV)	Dr. Santosh Soni	88711-40312
30.	Boy's Hostel Office	--	260466
31.	Boy's Hostel Main Gate	--	260479
32.	Medical doctor	Dr. A. Mandal	94255-46165 260427
33.	Ambulance	Mr. Yogeshwar Tiwari	93407-36973
34.	Health Centre University -	---	260427
35.	University Guest House	---	260024
36.	Workshop superintendent	Mr. Anulal Mahato	94255-35122
37.	Training and Placement officer	Mr. Premnath Kamlesh	94792-18765
38.	University Engineer	Er. Laxmikant Jaiswal	93017-85608
39.	Public Relation Officer	Dr. Satyesh Bhatt	99710-85666
40.	Asst. Librarian (SoS., E&T)	Ms. Afsa Ansari	260007

41.	Sports Officer (SoS., E&T)	Mr. Ratin Jogi	98279-23220
42.	Assistant Security Officer	Mr. Suraj Singh	93024-08561
43.	SC / ST Cell	Dr. Devendra Kumar Singh	98274-71404 260438
44.	Central Vigilance Officer	Prof. M. K. Singh	94791-71019
45.	Bank of India	-	260073
46.	Punjab National Bank	-	260034

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Mr. V. P. Yadav	Assistant Professor	94241-25825	vyadav27@gmail.com
Dr. Sandeep Dharmadhikari	Assistant Professor	79995-38850	sandeep.d@ggu.ac.in
Dr. Ghoshna Jyoti	Assistant Professor	88783-84867	ghoshna2006@gmail.com

B. STAFF

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Mr. Indresh Mishra	Lab Attend	99261-11784
Mr. Shyam Lal Sen	MTS	62605-67580

WELL EQUIPPED LABS

CHEMICAL ENGINEERING DEPARTMENT

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR

DEPARTMENT OF CHEMICAL ENGINEERING