R.V.R. & J.C. COLLEGE OF ENGINEERING :: GUNTUR
(Autonomous)

REGULATIONS (R-20) FOR
Four Year BACHELOR OF TECHNOLOGY (B.Tech.) Degree Program

(w.e.f. the batch of candidates admitted into First Year B.Tech. from the academic year 2020-2021).

1 MINIMUM QUALIFICATIONS FOR ADMISSION

A candidate seeking admission into First Year of B.Tech. Degree Program should have passed either Intermediate examination conducted by the Board of Intermediate Education, Andhra Pradesh with Mathematics, Physics, and Chemistry as optional subjects (or any equivalent examination recognized by the Acharya Nagarjuna University) or A candidate seeking admission into Second Year of B.Tech. Degree Program should have passed either Diploma in Engineering in the relevant branch conducted by the State Board of Technical Education & Training of Andhra Pradesh (or equivalent Diploma recognized by Acharya Nagarjuna University).

The selection is based on the rank secured by the candidate at the EAMCET / ECET (FDH) examination conducted by A.P. State Council of Higher Education. The candidate shall also satisfy any other eligibility requirements stipulated by the University and / or the Government of Andhra Pradesh from time to time.

2 BRANCHES OF STUDY

The B.Tech. Course is offered in the following branches of study:

1. Computer Science & Business Systems
2. Chemical Engineering
3. Civil Engineering
4. Computer Science & Engineering
5. Electrical & Electronics Engineering
6. Electronics & Communication Engineering
7. Information Technology
8. Mechanical Engineering

3 DURATION OF THE COURSE AND MEDIUM OF INSTRUCTION

3.1 The duration of the course is Four academic years consisting of two semesters in each academic year. The medium of instruction and examination is English.

3.2 The duration of the course for the candidates (Diploma Holders) admitted under lateral entry into Second Year B.Tech. is Three academic years consisting of two semesters in each academic year. The medium of instruction and the examination is English.

4 MINIMUM INSTRUCTION DAYS

Each semester shall consist of a minimum number of 90 days of instruction excluding the days allotted for tests, examinations and preparation holidays.

5 REGISTERING THE COURSES

5.1 A candidate has to register and secure 160 credits which include laboratory courses and project work. However, the candidate admitted under lateral entry has to register and secure 121 credits, which includes laboratory courses and project work.

5.2 Skill oriented / Skill advanced courses framework:

5.2.1 Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year.The remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

5.2.2 A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

5.2.3 The candidate shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries / Professional bodies / APSSDC or any other accredited bodies as approved by the concerned BoS.

5.2.4 If a candidate chooses to take a Certificate Course offered by industries/ Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.

5.2.5 If a candidate prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

5.2.6 A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and appropriate grades/marks are to be approved by the Academic Council.

5.3 Honors / Minor Programme framework:

5.3.1 A candidate shall be eligible to register for Honor or Minor degree along with regular B.Tech degree. A candidate shall earn 20 credits in addition to the 160 credits to get Honor / Minor degree along with regular B.Tech degree. A candidate shall be permitted to register either for Honors or for Minor and not for both simultaneously.

5.3.2 A candidate shall be permitted to register for Honors / Minor program at the begining of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired a minimum of 8.00 CGPA upto the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a candidate fails to score the required minimum of 8.00 CGPA, his/her registration for Honors / Minor Programme stands cancelled and he/she shall continue with the regular Programme.

5.3.3 In case a student fails to meet the CGPA requirement for Degree with Honors / Minor at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

5.3.4 Honors / Minor must be completed simultaneously with a major degree program. A student cannot earn Honors / Minor after he/she has already earned bachelor's degree.

5.3.5 A Candidate is eligible to opt for Honors Programme offered by the concerned Department/Discipline and he/she will be awarded B.Tech. (Honors) in the concerned Discipline.

5.3.6 Candidates who are desirous of pursuing their special interest areas in chosen discipline of Engineering may opt for additional courses in minor specialization groups (Specialized Tracks) offered by the concerned department and he/she will get Major degree of concerned Discipline with minor degree of Specialized Track.

5.3.7 Candidates who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups (Gneral Tracks) offered by the department other than their parent department and he/she will get Major degree of concerned Discipline with minor degree in other department.

5.3.8 Candidates can also opt for Industry relevant tracks of any branch like Data Mining track, IOT track, Machine learning track etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc. to obtain the Minor Degree and and he/she will get Major degree of concerned discipline with minor degree in industry track.

5.3.9 In the case of Honors, out of 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs courses, which shall be domain specific, each with 2 credits and with a minimum duration of 8 weeks as recommended by the Board of studies. If the MOOC course is a pass course without any grades, the grade to be assigned as decided by the Academic Council.

5.3.10 In the case of Minor, out of 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme. The remaining 4 credits must be acquired through two MOOCs courses. The courses must be of minimum 8 weeks in duration. Student has to acquire a certificate from the agencies approved by the BoS with grading or marks or pass. If the MOOC course is a pass course without any grades, the grade to be assigned as decided by the Academic Council.

5.3.11 If a candidate drops (or terminated) from the Honors / Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degreecertificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

5.4 A candidate shall register for National Cadet Corps (NCC) / National Service Scheme (NSS) actitivites.

5.4.1 A candidate will be required to participate in an activity for two hours in a week during second and third semesters.

5.4.2 Grade shall be awarded as Satisfactory or Unsatisfactory in the grade sheet on the basis of participation, attendance, performance and behavoiur.

5.4.3 If a candidate gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

5.4.4 The NCC / NSS programme will be held as announced by the respective Co-ordinator(s).

5.5 A candidate has to register and secure at least minimum pass grade in Mandatory Courses, for which no credits are awarded.

5.6 A candidate has to secure at least minimum pass grade in Value Added Courses offered by the individual departments, for which no credits are awarded.

5.7 MOOC (Massive Open Online Course):

5.7.1 A candidate shall complete two MOOC courses (One from Professional Elective course and another from Open Elective course) of 8/12 weeks in duration.

5.7.2 Enrollment of MOOC course will be initiated from the date of commencement of class work for Semester V [Third Year].

5.7.3 MOOC course completion certificate(s) must be submitted on or before the last instruction day of Semester VII [Fourth Year] to consider it for Regular evaluation. Otherwise it will be considred as Supplementary.

5.7.4 candidate has to pursue and acquire a certificate for a MOOC course only from the organizations / agencies approved by the concerned BoS in order to earn the 3 credits. List of organisations offering MOOC courses / List of courses will be announced by the respective Board of Studies at the time of commencement of class work for Semester V [Third Year].

5.8 Mandatory Internship framework:

5.8.1 Students shall undergo mandatory summer internships for a minimum of six weeks duration at the end of second and third year of the Programme.

5.8.2 Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee. The report and the oral presentation shall carry 40% and 60% weightages respectively.

5.8.3 There shall also be mandatory full internship in the final semester of the Programme. In the final semester, the student should mandatorily undergo internship and parallelly he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

5.9 Gap - Year:

Gap Year - concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year / II year / III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at institute level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

6 EVALUATION

The performance of the candidates in each semester shall be evaluated Course wise.

6.1 The distribution of marks between Sessional Examination (based on internal assessment) and Semester End Examination is as follows:

Nature of the Courses	Sessional Marks	Semester End Exam. Marks
Theory Courses / Design and / or Drawing / Practicals	30	70
Skill Courses / Summer Internship/ Mandatory Course / Value Added Course	100	---
Project work	30	70
MOOC Course	---	100

6.2 In each of the Semesters, there shall be two Midterm examinations in every theory course. The Sessional marks to the midterm examinations shall be awarded giving a weightage of 15 marks out of 18 marks (80% approx.) to the midterm examination in which the candidate scores more marks and the remaining 3 marks (20% approx.) to the other midterm examination in which the candidate scores less marks.

A maximum of five marks are allotted for attendance in the respective theory courses in a graded manner as indicated in ***clause 8.2.*** The remaining 7 marks out of the 30 marks earmarked for the sessional marks are awarded based on the average of minimum two online quiz tests conducted by the concerned teacher in the respective theory courses.

6.3 The evaluation for Laboratory class work consists of a weightage of 15 marks for day to day laboratory work including record work and 15 marks for internal laboratory examination including Viva-voce examination.

In case of Project work, the sessional marks shall be awarded based on the performance in two Seminars and the Project Report submitted at the end of the semester.

NOTE : A candidate who is absent for any Mid Term / online quiz Exam, for any reason whatsoever, shall be deemed to have scored zero marks in that Test / Exam and no make-up test / Exam shall be conducted.

6.4 A candidate who could not secure a minimum of 50% aggregate sessional marks is not eligible to appear for the Semester End Examination and shall have to repeat that Semester.

7 LABORATORY / PRACTICAL COURSES

In any semester, a minimum of 10 experiments / exercises specified in the syllabus for laboratory course shall be completed by the candidate and get the record certified by the concerned faculty and Head of the Department, to be eligible to face the Semester End Examination in that Practical course.

8 ATTENDANCE REGULATIONS

8.1 Regular course of study means a minimum of 50% attendance in each subject and an aggregate attendance of 75% in all the courses computed by totalling the number of hours / periods of lectures, design and / or drawing, practical's and project work as the case may be, held in every course as the denominator and the total number of hours / periods actually attended by the candidate in all the courses, as the numerator.

8.2 A weightage in sessional marks up to a maximum of 5 marks out of 30 marks in each theory course shall be given for those candidates who put in a minimum of 75% attendance in the respective theory in a graded manner as indicated below:

Attendance of 75% and above but less than 80%	- 2 mark
Attendance of 80% and above but less than 85%	- 3 marks
Attendance of 85% and above but less than 90%	- 4 marks
Attendance of 90% and above	- 5 marks

8.3 Condonation of shortage in attendance may be recommended on genuine medical grounds, up to a maximum of 10% provided the candidate puts in at least 65% attendance as calculated in ***clause 8.1***, provided the Principal is satisfied with the genuineness of the reasons and the conduct of the candidate. However, marks will not be awarded for condonation of shortage in attendance.

8.4 A candidate who could not satisfy the minimum attendance requirements in any semester as mentioned in ***clause 8.1***, is not eligible to appear for the Semester End Examinations and shall have to repeat the same Semester.

8.5 A candidate who could not satisfy the minimum 50% attendance in any subject / course is not eligible to appear for the Semester End Examination in that specified subject / course and shall have to repeat the same subject / course in the subsequent semester when it is offered.

9 DETENTION

A candidate, who fails to satisfy either the minimum attendance requirements as stipulated in ***Clause-8***, or the requirement of minimum aggregate sessional marks as stipulated in ***Clause-6***, shall be detained. Such candidate shall have to repeat the same semester.

10 SEMESTER END EXAMINATION

10.1 For each theory course, there shall be a comprehensive Semester End Examination at the end of each Semester.

10.2 For each Practical course the Smester End Examination shall be conducted by one internal and one external examiner appointed by the Principal of the College, the duration being that approved in the detailed Schemes of Instruction & Examination.

10.3 Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner appointed by the Principal.

10.4 In addition to the Regular semester end examinations held at the end of each semester, supplementary examinations will also be conducted during the academic year. Such candidates taking the Regular / Supplementary examinations as supplementary candidates may have to take more than one examination per day.

10.5 Instant examination will be conducted immediately after the declaration of Semester VIII [Fourth Year] results for those candidates who cleared all courses except one course in Semester VIII [Fourth Year].

11 CONDITIONS FOR PASS

A candidate shall be declared to have passed in individual course if he / she secures a minimum of 35% marks in theory and 50% marks in Practical courses/drawing courses/Project Viva-voce in Semester End Examination and minimum of 40% marks in both Sessional & Semester End Examination put together.

12 AWARD OF CREDITS

12.1 Credits are awarded for each Theory Course / Practical Course and Project Work.

12.2 AWARD OF GRADES

S.No.	Range of Marks	Grade	Grade Points
1	≥ 90	A^+	10.0
2	≥ 80 - < 90	A	9.0
3	≥ 70 - < 80	B	8.0
4	≥ 60 - < 70	C	7.0
5	≥ 50 - < 60	D	6.0
6	≥ 40 - < 50	E	5.0
7	< 40	F	0.0
8	The grade 'W' represents withdrawal / absent	W	0.0

12.3 A candidate securing 'F' grade in any course there by securing zero grade points has to reappear and secure at least 'E' grade in the subsequent examinations for that course.

12.4 After each semester, Grade sheet will be issued which will contain the following details:

- The list of courses for each semester and corresponding credits and grades obtained
- The Semester Grade Point Average (SGPA) for each semester and
- The Cumulative Grade Point Average (CGPA) of all courses put together up to that semester.

SGPA is calculated based on the following formula: $\frac{\sum [\text{ No. of Credits X Grade Points }]}{\sum \text{ No. of Credits}}$

CGPA will be calculated in a similar manner, considering all the courses up to that semester.

12.5 A consolidated Grade Sheet shall be issued to the candidate, after completing all , indicating the CGPA of all the Four / Three years put together.

12.6 Conversion of CGPA into equivalent Percentage.: Percentage of Marks =(CGPA-0.50)x10

13 CONDITIONS FOR PROMOTION

13.1 A candidate shall be eligible for promotion to next semester, if he/she satisfies the minimum requirements of attendance and sessional marks as stipulated in ***Clauses 6 and 8***.

13.2 A candidate shall be eligible for promotion to Third Year, if he / she secures 24 credits (40% approx.) of the total number of credits (60.5) upto Semester III [Second Year] from all examinations by the time the classwork commences for Third Year, in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in ***Clauses 6 and 8*** in Semester IV [Second Year].

13.3 A candidate shall be eligible for promotion to Fourth Year, if he / she secures 41 credits (40% approx.) of the total number of credits (103.5) upto Semester V [Third Year] from all examinations by the time the classwork commences for Fourth Year, in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in ***Clauses 6 and 8*** in Semester VI [Third Year].

13.4 A candidate (Diploma Holder) admitted under lateral entry into Semester III, shall be eligible for promotion to Fourth Year, if he/she secures 25 credits (40% approx.) of the total number of credits (64.5) upto Semester V [Third Year] from all examinations by the time the

classwork commences for Fourth Year, in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in ***Clauses 6 and 8*** in Semester VI [Third Year]

14 ELIGIBILITY FOR AWARD OF B.TECH. DEGREE

The B.Tech. Degree shall be conferred on a candidate who has satisfied the following requirements:

14.1 The candidate must have satisfied the conditions for pass in all the courses of all the years as stipulated in ***Clauses 11***.

14.2 A candidate, who fails to fulfil all the academic requirements for the award of the B.Tech. degree within eight academic years from the year of admission, shall forfeit his/her seat in B.Tech. course.

14.3 A candidate (Diploma Holder) admitted under lateral entry into Second Year B.Tech., who fails to fulfil all the academic requirements for the award of the B.Tech. degree within six academic years from the year of admission, shall forfeit his/her seat in B.Tech. course.

15 AWARD OF CLASS

A candidate who becomes eligible for the award of B.Tech. Degree as stipulated in ***Clause 12*** shall be placed in one of the following Classes.

S.No.	Class	CGPA
1	First Class With Distinction	7.5 or more
2	First Class	6.5 or more but less than 7.5
3	Second Class	5.5 or more but less than 6.5
4	Pass Class	5.0 or more but less than 5.5

16 IMPROVEMENT OF CLASS

A candidate, after becoming eligible for the award of the Degree, may improve the CGPA by appearing for the Semester End Examination in any of the theory course as and when conducted. But this provision shall be within a period of two academic years after becoming eligible for the award of the Degree. However, this facility cannot be availed by a candidate who has taken the Original Degree Certificate.

17 AWARD OF RANK

The rank shall be awarded based on the following:

17.1 Ranks shall be awarded in each branch of study for the top five percent of the candidates appearing for the Regular Semester End Examinations or the top ten candidates whichever is minimum.

17.2 Only such candidates who pass the Final year examination at the end of the fourth/third academic year after admission as regular final year candidate along with others in their batch and become eligible for the award of the degree shall be eligible for the award of rank. The Rank will be awarded only to those candidates who complete their degree within four/three academic years.

17.3 For the purpose of awarding rank in each branch, only such candidates who passed all courses in the first attempt only shall be considered.

18 TRANSITORY REGULATIONS

A Candidate, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for such batch of candidates in which the candidates joins subsequently.

18.1 A candidate, studied under R-18 regulations of RVR & JCCE (Autonomous) curriculum, detained due to lack of academics/attendance at the end of the Semester II [First Year] or Semester III [Second Year], shall join in appropriate Semester of R-20 regulations. The candidate has to clear all the backlog subjects or equivalent subjects if any under R-20 curriculum by appearing the supplementary examinations, conducted by the college under R-20 curriculum. The class will be awarded based on the academic performance of the candidate as R-20 regulations.

18.2 A candidate, studied under R-18 regulations of RVR & JCCE (Autonomous) curriculum, detained due to lack of academics / attendance at the end of the Semester IV [Second Year] and also at the subsequent semesters will follow the same R-18 regulations/curriculum and he/she has to complete all the courses by appearing in the examination conducted by the college under R-18 curriculum. The class will be awarded based on the academic performance of the candidate as per R-18 regulations.

18.3 A candidate, transferred from other institutions / universities into Semester II [Second Year] and also at the subsequent semesters of B.Tech., shall join at appropriate semester of R-20 curriculum. Such candidate shall study all the courses prescribed for that batch, in which, the candidate joins. The candidate has to clear the backlog courses, if any, in the semesters which he/she has studied in the earlier institutions / universities by appearing the supplementary examinations conducted by the college in R-20 circulum courses / equivalent courses. The equivalent courses will be decided by concerned Board of Studies.

19 CONDUCT AND DISCIPLINE

19.1 Candidates shall conduct themselves within and outside the premises of the institute in a manner befitting the candidates of our institution.

19.2 As per the order of Honourable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.

19.3 The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

a Lack of courtesy and decorum, indecent behaviour anywhere within or outside the campus.

b Wilful damage of college / individual property

c Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

d Mutilation or unauthorized possession of library books.

e Noisy and unseemly behaviour, disturbing studies of fellow candidates.

f Hacking of computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber-crime etc.)

g Usage of camera / cell phone in the campus

h Plagiarism of any nature

i Any other acts of gross indiscipline as decided by the academic council from time to time.

19.4 Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debar from examination, disallowing the use of certain facilities of the institute, rustication for a specified period or even outright expulsion from the institute or even handing over the case to appropriate law enforcement or the judiciary, as required by the circumstances.

19.5 For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief warden, the head of the department and the principal respectively, shall have the authority to reprimand or impose fine.

19.6 Cases of adoption of unfair means and / or any malpractice in an examination shall be reported to the principal for taking appropriate action.

19.7 All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the academic council.

19.8 The institute level standing disciplinary action committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

19.9 The principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the programmes committee in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved by the appropriate authority, shall be reported to the academic council for ratification.

20.10 ''Grievance and Redressal Committee'' (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters.

20 MALPRACTICES

20.1 The Principal shall refer the cases of malpractices in internal assessment tests and semester-end examinations to a malpractice enquiry committee constituted by him / her for the purpose. Such committee shall follow the approved scales of punishment. The principal shall take necessary action, against the erring candidates basing on the recommendations of the committee.

20.2 Any action on the part of a candidate during an examination trying to get undue advantage or trying to help another, or drive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the staff, who are in-charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned in the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

21 AMENDMENTS TO REGULATIONS

The College may, from time to time, revise, amend, or change the Regulations, Schemes of Examinations, and / or Syllabus.

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R V R & J C COLLEGE OF ENGINEERING, CHOWDAVARAM, GUNTUR-522019

(Autonomous)

(w.e.f. the batch of students admitted during the academic year 2020-21)

4-year Curriculum structure

Undergraduate B.Tech. Degree in Chemical Engineering

Total credits :: 160

I. **Induction Program:**

Induction program (mandatory)	**3 weeks duration**
Induction program for students to be offered right at the start of the first year	• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

II. Semester-wise structure of curriculum

Course Code	**Definition / Description**
BS	Basic Science course
HS	Humanities and Social Sciences including Management Courses
ES	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc
PC	Professional Core Courses
PE	Professional Elective Course
OE	Open Elective Courses – Electives from other technical and /or emerging subjects.
MC	Mandatory Courses (environmental Sciences, Induction Training, Indian Constitution, Essence of Indian Traditional Knowledge) (Non-Credit)
PR	Project work, Seminar and Internship in industry or elsewhere
SC	Skill oriented course*, Skill advanced course/ soft skill course*

B.Tech. Chemical Engineering

Semester I (First Year)

S. No.	Category	Code No.	Subject	Scheme of Instruction periods per week			Scheme of Examination			
				Lecture	Tutorial	Practical	Duration of Semester End Exam. (hrs)	Sessional Marks	Semester End Exam. Marks	Credits
1.	BS	CH 111	Mathematics – I	2	1	-	3	30	70	3
2.	BS	CH 112	Engineering Physics	3	-	-	3	30	70	3
3.	BS	CH 113	Physical Chemistry	3	-	-	3	30	70	3
4.	HS	CH 114	English for Communication Skills	3	-	-	3	30	70	3
5.	BS	CH 151	Physics Lab	-	-	3	3	30	70	1.5
6.	HS	CH 152	English Language Communication Skills Lab.	-	-	3	3	30	70	1.5
7.	ES	CH 153	Engineering Graphics & Design.	1	-	4	3	30	70	3
8.	BS	CH 154	Chemistry Lab	-	-	3	3	30	70	1.5
9.	MC	CHMC02	Constitution of India	2	-	-	-	100	-	-
			Total	14	1	13	-	340	560	19.5

B.Tech. Chemical Engineering

Semester II (First Year)

S.No.	Category	Code No.	Subject	Scheme of Instruction periods per week			Scheme of Examination			
				Lecture	Tutorial	Practical	Duration of Semester End Exam. (hrs)	Sessional Marks	Semester End Exam. Marks	Credits
1.	BS	CH 121	Mathematics – II	2	1	-	3	30	70	3
2.	BS/PC	CH 122	Organic Chemistry	3	-	-	3	30	70	3
3.	ES	CH 123	Basic Electrical & Electronics Engineering	3	-	-	3	30	70	3
4.	ES	CH 124	Programming for Problem Solving	3	-	-	3	30	70	3
5.	ES	CH 161	Basic Electrical & Electronics Engineering Lab	-	-	3	3	30	70	1.5
6.	ES	CH 162	Programming for Problem Solving Lab	-	-	3	3	30	70	1.5
7.	ES	CH 163	Engineering Workshop Practice	1	-	4	3	30	70	3
8.	ES	CH 164	Analysis and Preparation of Chemical Compounds Lab	-	-	3	3	30	70	1.5
9	MC	CH MC01	Environmental Science	2	-	-	-	100	-	-
			Total	16	1	9		340	560	19.5

B.Tech. Chemical Engineering

Semester III (Second Year)

S.No.	Category	Code No. &	Subject	Scheme of Instruction periods per week			Scheme of Examination			
				Lecture	Tutorial	Practical	Duration of Semester End Exam. (hrs)	Sessional Marks	Semester End Exam. Marks	Credits
1.	BS	CH 211	Probability and Statistics	2	1	-	3	30	70	3
2.	ES	CH 212	Material Science	3	-	-	3	30	70	3
3.	PC	CH 213	Chemical Process Calculations	2	1	-	3	30	70	3
4.	PC	CH 214	Momentum Transfer	3	-	-	3	30	70	3
5.	PC	CH 215	Mechanical Operations	3	-	-	3	30	70	3
6.	PC	CH 251	Momentum Transfer Lab	-	-	3	3	30	70	1.5
7.	PC	CH 252	Mechanical Operations Lab.	-	-	3	3	30	70	1.5
8.	PC	CH 253	Computational Programming Lab	-	-	3	3	30	70	1.5
9.	SOC	CH 254	Skill Oriented course 1	1	-	2	3	30	70	2
10.	MC	CHMC 04	Design Thinking & Product Innovation	2	-	-	-	100	--	-
			Total	16	2	11		370	630	21.5

B.Tech. Chemical Engineering

Semester IV (Second Year)

S. No.	Category	Code No.	Subject	Scheme of Instruction periods per week			Scheme of Examination			
				Lecture	Tutorial	Practical	Duration of Semester End Exam. (hrs)	Sessional Marks	Semester End Exam. Marks	Credits
1.	ES	CH 221	Industrial Pollution control	3	-	-	3	30	70	3
2.	PC	CH 222	Process Heat Transfer	2	1	-	3	30	70	3
3.	PC	CH 223	Mass Transfer Operations - I	2	1	-	3	30	70	3
4.	PC	CH 224	Chemical Engineering Thermodynamics	2	1	-	3	30	70	3
5.	HS	CH 225	Economics & Industrial Management	3	-	-	3	30	70	3
6.	PC	CH 261	Process Heat Transfer Lab.	-	-	3	3	30	70	1.5
7.	PC	CH 262	Mass Transfer Operations - I	-	-	3	3	30	70	1.5
8.	ES/PC	CH 263	Industrial Pollution Control Lab	-	-	3	3	30	70	1.5
9.	SOC	CH 264	Skill Oriented Course 2	1	-	2	3	30	70	2
10.	MC	CH MC03	Ethics and Human Values	2	-	-	-	100	--	---
			Total	15	3	11	-	370	630	21.5

Internship 2 Months (Mandatory) during summer vacation

B.Tech. Chemical Engineering

Semester V (Third Year)

S.No.	Category	Code No.	Subject	Scheme of Instruction periods per week			Scheme of Examination			
				Lecture	Tutorial	Practical	Duration of Semester End Exam. (hrs)	Sessional Marks	Semester End Exam. Marks	Credits
1.	PC	CH 311	Chemical Technology	3	-	-	3	30	70	3
2.	PC	CH 312	Chemical Reaction Engineering-	2	1	-	3	30	70	3
3.	PC	CH 313	Mass Transfer Operations - II	2	1	-	3	30	70	3
4.	PE	CH 314	Professional Elective - I	3	-	-	3	30	70	3
5.	OE/jobori	CH 315	Open Elective Course/ Job oriented elective -I	2	-	2	3	30	70	3
6.	PC	CH 351	Mass Transfer Operations-II Lab.	-	-	3	3	30	70	1.5
7.	PC	CH 352	Chemical Technology lab	-	-	3	3	30	70	1.5
8.	PR	CH 353	Summer Internship	-	-	-	-	100	-	1.5
9.	SAC/ SSC	CH 354	Industrial Instrumentation & Instrumental Methods of Analysis	1	-	2	3	30	70	2
			Total	13	2	10	-	340	560	21.5

B.Tech. Chemical Engineering

Semester VI (Third Year)

S.No.	Category	Code No.	Subject	Scheme of Instruction periods per week			Scheme of Examination			
				Lecture	Tutorial	Practical	Duration of Semester End Exam. (hrs)	Sessional Marks	Semester End Exam. Marks	Credits
1.	PC	CH 321	Chemical Engineering Plant Design	2	1	-	3	30	70	3
2.	PC	CH 322	Process Dynamics and Control	3	-	-	3	30	70	3
3.	PC	CH 323	Transport Phenomena	2	1	-	3	30	70	3
4.	PE	CH 324	Professional Elective-II	3	-	-	3	30	70	3
5.	OE/JOE	CH 325	Open Elective Course/Job oriented elective -II	2	-	2	3	30	70	3
6.	PC	CH 361	Computer Aided Process Equipment Design lab	-	-	3	3	30	70	1.5
7.	PC	CH 362	Instrumentation and Process Control Lab	-	-	3	3	30	70	1.5
8.	PC	CH 363	Chemical Reaction Engineering Lab	-	-	3	3	30	70	1.5
9.	SAC/ SSC	CH SO4	Quantitative aptitude	1	-	2	3	30	70	2.0
			Total	14	2	11	-	270	630	21.5

B.Tech. Chemical Engineering

Semester VII (Fourth Year)

S.No.	Category	Code No.	Subject	Scheme of Instruction periods per week			Scheme of Examination			
				Lecture	Tutorial	Practical	Duration of Semester End Exam. (hrs)	Sessional Marks	Semester End Exam. Marks	Credits
1.	HS	CH 411	**HS Elective**	3	0	0	3	30	70	3
2.	PE	CH 412	Professional Elective - III	3	-	-	3	30	70	3
3.	PE	CH 413	Professional Elective-IV	3	-	-	3	30	70	3
4.	PE	CH 414	Professional Elective-5 (MOOC)	3	-	-	3	30	70	3
5.	OE	CH 415	Open Elective Course/Job oriented elective -III	2	-	2	3	30	70	3
6.	OE	CH 416	Open Elective – IV (MOOC)	2	-	2	3	30	70	3
7.	PR	CH 454	Summer Internship	-	-	-	-	100	-	3
8.	SAC/ SSC	CHSO5	Skill Advanced Course	1	-	2	3	30	70	2
			Total	17	-	6	-	310	490	23.0

B.Tech. Chemical Engineering

Semester VIII (Fourth Year)

S.No.	Category	Code No.	Subject	Scheme of Instruction periods per week			Scheme of Examination			
				Lecture	Tutorial	Practical	Duration of Semester End Exam. (hrs)	Sessional Marks	Semester End Exam. Marks	Credits
1.	PR	CH 461	Project	-	-	-	-	30	70	12.0
			Total	-	-	-	-	30	70	12.0

Semester I [First Year]

CH 111 MATHEMATICS-I

Lectures	:	*2 hrs*	*Sessional Marks*	:	*30*
Tutorial	:	*1 hrs*	*Semester End Exam Marks*	:	*70*
Semester End Exam.	:	*3 hrs*	*Credits*	:	*3*

Course Objectives

i. The objective of this course is to familiarize the prospective engineers with techniques in matrices, multivariate calculus and integral transforms.
ii. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Outcomes

1) Know the basic linear algebraic concepts.
2) Solve multivariate calculus problems of double integrals and vector differentiation.
3) Find integration of vector functions and find Fourier series and transforms.
4) Find Laplace and inverse transforms of a function.

UNIT - I **CO: 1**

Rank of a matrix, Normal form, Inverse by Gauss Jordan method. System of linear equations: Non homogeneous, homogeneous systems.
Eigen values and Eigen vectors, Cayley-Hamilton Theorem (without proof), Diagonalization of matrices, reduction of quadratic form to canonical form.

UNIT – II **CO: 2**

Multiple Integrals - Double integrals (Cartesian and polar), Change of order of integration.
Change of variables: Cartesian to polar coordinates. Scalar and vector point functions, Gradient, directional derivative, divergence and curl, Del applied twice to point and product of point functions (without proofs).

UNIT – III **CO: 3**

Integration of vectors - Line integrals, surface integrals, Green's theorem in the plane (without proof), Stoke's theorem (without proof).
Fourier series - Half range cosine and sine series. Fourier transforms - Fourier transforms, Fourier sine and cosine transforms and inverse transforms.

UNIT – IV **CO: 4**

Laplace transforms - Introduction, properties of Laplace transforms, Evaluation of integrals by Laplace transforms.
Inverse Laplace transforms - Method of partial fractions, other method of finding inverse transforms t f(t)= L [- F(s)], Convolution theorem (without proofs).

LEARNING RESOURCES
TEXT BOOKS:

1) B.S.Grewal - Higher Engineering Mathematics, Khanna publishers, 42nd edition, 2017.

REFERENCE BOOKS:

1) Erwin Kreyszig - Advanced Engineering Mathematics, John Wiley & Sons, 2006.
2) N.P. Bali and Manish Goyal - A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2010.

WEB RESOURCES:

1) http://nptel.iitm.ac.in/courses/

CH 112 ENGINEERING PHYSICS

Lectures	:	*3 hrs*	*Sessional Marks*	:	*30*
Tutorial	:	*- hrs*	*Semester End Exam Marks*	:	*70*
Semester End Exam.	:	*3 hrs*	*Credits*	:	*3*

Course Objectives

i. To understand about basic phenomena of light waves.
ii. To understand about Principle and applications of optical fiber and fundamentals of Laser, its types and applications.
iii. To understand development of Electromagnetic wave equations and various properties, applications of dielectric & magnetic materials.
iv. To understand Essential formulation of physics in the micro world by learning the prerequisite quantum physics.

Course Outcomes

1) Identify and illustrate wave phenomena such as interference in thin films, concept of diffraction, birefringence and production and detection of different polarized lights.
2) Understanding the basic concepts of lasers, fibers and their applications.
3) Acquire knowledge about the Maxwell's equations and various terms related to properties of materials such as permeability, polarization, etc
4) Some of the basic laws related to quantum mechanics such as wave particle duality, uncertainty principle, Schrodinger wave equation & its applications etc.

UNIT - I **CO: 1**

Interference & Diffraction: Introduction, Stoke's principle, interference in thin films due to reflected light (cosine law), Newton's rings (formation, derivation for diameters of bright and dark rings). Concept of diffraction, distinguish between Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit(quantitative), theory of a plane transmission grating, dispersive Power & resolving power of a grating.

Polarisation: Introduction, double refraction, construction & working of a Nicol prism, quarter wave plate, production & detection of circular and elliptical polarizations (qualitative), optical activity (optical rotation & specific rotation).

UNIT – II **CO: 2**

Fiber Optics & Lasers:

Fibre Optics: Introduction, structure of optical fibre, principle of optical fibre, numerical aperture, types of optical fibres, Fiberoptic sensors (intensity modulated temperature sensor, displacement sensor, & liquid level detector), applications.

Lasers: characteristics, spontaneous & stimulated emissions, population inversion, pumping, optical resonant cavity, types of lasers: solid state (Nd:YAG) laser, Gas laser(He-Ne), Semiconductor laser (Ga-As), industrial & medical applications of lasers.

UNIT – III **CO: 3**

Electromagnetism, Dielectrics and Magnetic Properties of Materials: Electromagnetism: induced electric fields, displacement current, Maxwell's equations-qualitative (integral & differential forms) - significance, velocity of an electromagnetic wave equation in free space.
Dielectrics & Magnetic Properties of Materials: Basic definitions, polar and non-polar dielectrics (qualitative), types of polarizations - electronic, ionic polarisations (quantitative), internal fields in solids, Clausius-Mossotti equation, applications of dielectrics. Magnetization, permeability and susceptibility, origin of magnetic moment, classification of magnetic materials, hysteresis curve, soft & hard magnetic materials.

UNIT – IV **CO: 4**

Quantum Mechanics:

Introduction to quantum physics, blackbody radiation explanation using the photon concept (laws of black body radiation, Planck's radiation law-derivation), photoelectric effect (Einstein's equation), Compton effect (explanation, derivation). De-Broglie concept of matter waves, properties of matter waves, verification of matter waves (Davisson - Germer experiment), uncertainty principle-experimental verification (electron diffraction-single slit), Schrodinger time independent wave equation, physical significance of wave function, particle in box (one dimensional).

LEARNING RESOURCES

TEXT BOOKS:

1) M.N. Avadhanulu, P.G. Kshirasagar - Engineering Physics, S. Chand & Company Ltd., 9thedition, Ram Nagar, New Delhi, 2018. (UNIT I)

2) Md. Khan & S. Panigrahi - Principles of Engineering physics-1, Cambridge University Press- 2016. (UNIT II)

3) SL Kakani & Shubhra kakani - Engineering Physics, 3rd Edition, CBS Publications Pvt. Ltd., New Delhi. (UNITs III & IV)

REFERENCE BOOKS:

1) Fundamentals of physics: D. Halliday, R. Resick and J. Walker 6th edition, John Wiley and sons, Inc., New York, 2001..

2) Engineering Physics: Hitender K. Mallick, A.K.Singh McGraw Hill Education (India) Pvt. Ltd., New Delhi.

3) Concepts of Modern Physics: Arthur Beiser 6th edition, Tata McGraw Hill Education Pvt Ltd., New Delhi.

4) D.K.Bhattacharya & Poonam Tandon - Engineering Physics, Oxford University Press-2015.

CH 113 PHYSICAL CHEMISTRY

Lectures	:	*3 hrs*	*Sessional Marks*	:	*30*
Tutorial	:	*- hr*	*Semester End Exam Marks*	:	*70*
Semester End Exam.	:	*3 hrs*	*Credits*	:	*3*

Course Objectives

i. To develop scientific concepts, principles, problem solving skills, attitudes, appreciations and interests.
ii. To make them know the terms associated with thermodynamics, phase rule, kinetics and chemical equilibrium.
iii. To make them understand the mechanisms of catalysis.
iv. To learn to solve problems related to gas laws, thermodynamics, rate constants and equilibrium constants.

Course Outcomes

1) Apply the gaseous laws in solving industrial problems.
2) Calculate molar heat capacities and internal energy & work.
3) Arrive at the number of phases, components and degree of freedom and relate thermodynamic parameters to equilibrium constant and vapour pressure.
4) Calculate rate of reaction and select suitable catalysts for reactions.

UNIT - I **CO: 1**

Gas Laws-definition, mathematical representation, graphical representation and simple problems on Boyle's Law, Charles law, Gay lussac-Charles law, ideal gas equation, Avogadro's law, Dalton's law of partial pressures,

Amagat's law of partial volumes, Vander Waal's gas equation, Henry's law, and Raoult's Law, Critical phenomena, Andrew's isotherms.

UNIT – II **CO: 2**

Thermodynamics: Thermodynamic terms and basic concepts, Thermodynamic processes, reversible and irreversible processes, pressure volume work, Internal energy, First law, enthalpy, molar heat capacities, adiabatic and isothermal expansion of ideal gas.(simple problems on work done)

Spontaneous process, entropy, second law, entropy change for an ideal gas, entropy change accompanying phase change (problems), Physical significance of entropy, Trouton's rule

UNIT – III **CO: 3**

Free energy, work function, free energy change for ideal gas, Gibbs-Helmholtz equation, Clausius-Clapeyron equation, Equilibrium constant–Van't Hoff isotherm, third law of thermodynamics.

Chemical Equilibrium: Homogenous equilibrium, Heterogeneous equilibrium, Law of mass

action, K_p, K_c and K_x-interrelation, Le-Chatelier principle and its applications.
Phase rule: Definition, explanation of the terms –phase, component, degrees of freedom, Phase diagram of water system, Two component system Pb-Ag, Application of eutectics.

UNIT – IV **CO: 4**

Chemical Kinetics: Order, Molecularity, activation energy, Specific reaction rate, first order and second order reactions. Half life period, Effect of temperature on reaction rate (simple problems on 1^{st}, 2^{nd} order reactions and half life periods), methods to determine order of reactions.

Catalysis: Homogeneous and Heterogeneous catalysis, Characteristics of Catalyst, promoter, negative catalyst, catalytic poison, adsorption theory of catalysis, enzyme catalysis, Industrial applications of catalysis.

LEARNING RESOURCES

TEXT BOOKS:

1) Essentials of Physical Chemistry, Bahl.B.S and Tuli, 18^{th} edition, 2010, S.Chand & Co., Delhi.

REFERENCE BOOKS:

1) Engineering chemistry by Jain and Jain, 15^{th} edition, 2008, Dhanpat Rai Publishing company, Delhi.

2) Principles of Physical Chemistry, B.R Puri, L.R Sharma, Madan.S.Pathania, 46^{th} edition, 2013, Vishal publications, Jalandhar

Web references:

http://www.chem.arizona.edu/~salzmanr/103a004/nts004/nts004.html
http://www.cdeep.iitb.ac.in/nptel/Core%20Science/
http://www.wiziq.com/tutorial/
http://www.powerstream.com/BatteryFAQ.html#lec

CH 114 ENGLISH FOR COMMUNICATION SKILLS

Lectures	*:*	*3 hrs*	*Sessional Marks*	*:*	*30*
Tutorial	*:*	*---hrs*	*Semester End Exam Marks*	*:*	*70*
Semester End Exam.	*:*	*3 hrs*	*Credits*	*:*	*3*

Course Objectives

i. To enable students improve their lexical and communicative competence and to equip students with oral and written communication skills.
ii. To help students understand and learn the correct usage and application of Grammar principles.
iii. To get them acquainted with the features of successful professional communication.
iv. To enable students acquire various specific features of effective written communication.

Course Outcomes

1) Use vocabulary contextually.
2) Compose effectively the various forms of professional communication.
3) Apply grammar rules efficiently in spoken and written forms.
4) Improve clarity to locate and learn the required information.

UNIT - I **CO: 1**

1.1 - Root words from foreign languages and their use in English.
1.2 - Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
1.3 - Synonyms, antonyms, and standard abbreviations.
1.4 - One word substitutes

UNIT – II **CO: 2**

2.1 - Proposal writing
2.2 - Letter-writing
2.3 - Techniques for writing precisely (précis writing)
2.4 - E-mail writing

UNIT – III **CO: 3**

Identifying Common Errors in Writing

3.1 - Subject-verb agreement
3.2 - Noun-pronoun agreement
3.3 – Articles
3.4 – Prepositions
3.5 – Tenses
3.6 – Redundancies

UNIT – IV **CO: 4**

Nature and Style of Sensible Writing

4.1 - Description & Narration (Paragraph Writing). [CO:1,2,3]

4.2 - Essay Writing (Expository Essay). [CO:1,2,3]
4.3 - Note-Making and Note-Taking. [CO:1,2,4]
4.4 - Methods of preparing notes. [CO:1,2,4]

LEARNING RESOURCES

TEXT BOOKS:

1) Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press.

REFERENCE BOOKS:

1) Remedial English Grammar. F.T. Wood. macmillan.2007
2) On Writing Well. William Zinsser. Harper Resource Book. 2001
3) Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press.2006.
4) Practical English Usage. Michael Swan. OUP. 1995Press

CH 151 PHYSICS LAB

Practicals	*:*	*3 hrs*	*Sessional Marks*	*:*	*30*
			Semester End Exam Marks	*:*	*70*
Semester End Exam.	*:*	*3 hrs*	*Credits*	*:*	*1.5*

Course Objectives

i. Physics lab provides students the first-hand experience of verifying various theoretical concepts learnt in theory courses.

Course Outcomes

1) Use CRO, Function generator, Spectrometer for making measurements
2) Test the optical instruments using principles of interference and diffraction.
3) Understand the concepts learned in the Physics theory.
4) Carrying out precise measurements and handling sensitive equipment.
5) Draw conclusions from data and develop skills in experimental design.

List of Experiments:

1) Measurements using Vernier Calipers, Screw Gauge and Spherometer.
2) Newton's rings - Measurement of radius of curvature of plano-convex lens.
3) Determination of Energy band gap of a Semiconductor.
4) Optical fibers - Determination of Numerical Aperture.
5) Diffraction grating - Measurement of wavelengths using Spectrometer.
6) Magnetic field in Helmholtz coil.
7) Photo-Voltaic Cell - Determination of fill factor.
8) Series LCR resonance circuit - Determination of Q - factor.
9) Four probe method apparatus for measurements of resistivity and conductivity.
10) Determination of wavelengths using diffraction grating.
11) Variation of magnetic field along the axis of a circular current carrying coil.
12) Carey Foster's bridge - Determination of Specific Resistance.

REFERENCE BOOK: Physics Lab Manual, R.V.R. & J.C. CE, Guntur
Note: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CH 152 ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Practicals	*:*	*3 hrs*	*Sessional Marks*	*:*	*30*
			Semester End Exam Marks	*:*	*70*
Semester End Exam.	*:*	*3 hrs*	*Credits*	*:*	*1.5*

Course Objectives

i. To identify speaker's purpose and tone; make inferences and predictions about spoken discourse, discuss and respond to content of a lecture or listening passage orally and/or in writing.
ii. To acquaint the students with the Standard English pronunciation, i.e., Receive Pronunciation (RP), with the knowledge of stress and intonation.
iii. To develop production and process of language useful for social and professional life.
iv. To develop in them communication and social graces necessary for functioning.
v. Improve the dynamics of professional presentations.
vi. To develop critical reading and comprehension skills at different levels.

Course Outcomes

1) Comprehend relationships between ideas and make inferences and predictions about spoken discourse.
2) Speak English with a reasonable degree of accuracy in pronunciation with success.
3) Develop appropriate speech dynamics in professional situations.
4) Use effective strategies and social graces to enhance the value of communication.
5) Develop effective communication and presentation skills and using language effectively to face interviews.

List of Exercises / Activities:

Oral Communication
(This unit involves interactive practice sessions in Language Lab).

1) Listening Comprehension.
2) Pronunciation, Intonation, Stress and Rhythm.
3) Common Everyday Situations: Conversations and Dialogues.
4) Interviews.
5) Formal Presentations.
6) Reading Comprehension

REFERENCE BOOK(S):

1 Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press.
2 Practical English Usage. Michael Swan. OUP. 1995 Press
3 Exercises in Spoken English. Parts.I- III. CIEFL, Hyderabad. Oxford University
4 Technical English .M. Sambaiah, Wiley Publications, New Delhi

CH 153 ENGINEERING GRAPHICS & DESIGN LAB

Lectures		*1 hr*	*Sessional Marks*	*:*	*30*
Practicals	*:*	*4 hrs*	*Semester End Exam Marks*	*:*	*70*
Semester End Exam.	*:*	*3 hrs*	*Credits*	*:*	*3*

Course Objectives

i. Expose the students to standards and conventions followed in preparation of engineering drawings.
ii. Make them understand the concepts of orthographic and isometric projections.
iii. Develop the ability of conveying the engineering information through drawings.
iv. Make them understand the relevance of engineering drawing to different engineering domains.
v. Develop the ability of producing engineering drawings using drawing instruments.
vi. Enable them to use computer aided drafting packages for the generation of drawings.

Course Outcomes

1) Prepare engineering drawings as per BIS conventions mentioned in the relevant codes.
2) Produce computer generated drawings using CAD software.
3) Use the knowledge of orthographic projections to represent engineering information / concepts and present the same in the form of drawings.
4) Develop isometric drawings of simple objects reading the orthographic projections of those objects.
5) Convert pictorial and isometric views of simple objects to orthographic views.

(Units I to IV shall be taught in conventional drawing method and Unit V shall be taught with the aid of computer)

UNIT - I

General: Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering.

Conic sections: Construction of Ellipse, Parabola, Hyperbola and Rectangular Hyperbola. (General method only).
Curves: Cycloid, Epicycloid, Hypocycloid and Involute and Scales.

UNIT – II

Method of Projections: Principles of projection - First angle and third angle projection of points, Projection of straight lines inclined to both planes. Traces of lines.

Projections of planes: Projections of planes inclined to both the planes, projections on auxiliary planes.

UNIT – III

Projections of Regular Solids: Projections of solids (Prism, Pyramid, Cylinder and Cone) with varying positions.

Sections of Solids: Sections of Prisms, Pyramids, cylinders and Cones. True shapes of sections. (Limited to the cutting plane perpendicular to one of the principal plane).

Development of surfaces: Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only).

UNIT – IV

Isometric Projections: Principles of Isometric projection-Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids.

Orthographic Projections: Conversion of pictorial views into Orthographic views and Vice-versa. (Treatment is limited to simple castings).
Perspective Projections: Introduction to Perspective Projection.

UNIT V

Over view of Computer Aided drafting (AutoCAD): Introduction, starting and customizing AutoCAD screen, usage of different menus, toolbars (drawing, editing, dimension, text, object properties..etc), tabs (Object, snap, grid, polar, ortho, otrack..etc) and command prompt. Setting units, limits, layers and viewports (Isometric, Top, Front, back..etc).

2D drawings of various mechanical and structural components, electrical and electronic circuits. Orthographic and Isometric views of mechanical castings and simple structures.

LEARNING RESOURCES

TEXT BOOKS:

1) Bhatt N.D., Panchal V.M. & Ingle P.R. - Engineering Drawing, Charotar Publishing House, 2014.

REFERENCE BOOKS:

1) Shah, M.B. & Rana B.C. - Engineering Drawing and Computer Graphics, Pearson Education, 2008.
2) Agrawal B. & Agrawal C. M. - Engineering Graphics, TMH Publication, 2012.
3) Narayana, K.L. & P Kannaiah - Text book on Engineering Drawing, Scitech Publishers, 2008.
(Corresponding set of) CAD Software Theory and User Manuals

CH 154 CHEMISTRY LAB

Practicals	*:*	*3 hrs*	*Sessional Marks*	*:*	*30*
			Semester End Exam Marks	*:*	*70*
Semester End Exam.	*:*	*3 hrs*	*Credits*	*:*	*1.5*

Course Objectives

i. To know the methods of determining hardness and chloride ion content of water sample.
ii. To learn the redox methods to determine Fe^{2+} ions present in solution.
iii. To know principles and methods involved in using instruments like conductivity bridge, spectrophotometer and potentiometer
iv. To know the molecular properties like surface tension, viscosity.

Course Outcomes

1) Estimate the Iron content of a sample.
2) Analyse chloride, hardness content of water and available chlorine in bleaching powder.
3) Use instruments to measure optical density, conductance of solutions and redox potentials of a cell.
4) Measure molecular properties such as surface tension, viscosity and determine physical parameters like saponification value, partition co-efficient and R_f value.

List of Experiments:

1)	Estimation of Mohr's salt using $KMnO_4$.	CO1
2)	Estimation of Mohr's salt using $K_2Cr_2O_7$.	CO1
3)	Determination of chloride ion content of water.	CO2
4)	Determination of available chlorine in bleaching powder.	CO2
5)	Determination of Hardness of water using EDTA method.	CO2
6)	Determination of Fe(II) strength using $K_2Cr_2O_7$ potentiometrically.	CO1,3
7)	Determination on strength of NaOH using HCI conductometrically.	CO3
8)	Determination of concentration of $KMnO_4$ using colorimeter/spectrophotometer.	CO3
9)	Determination of surface tension.	CO4
10)	Determination of Viscosity.	CO4
11)	Determination of Saponification/acid value of oil.	CO4
12)	Determination of partition co-efficient of I_2 in water.	CO4
13)	Determination of R_f value using TLC.	CO4

CHMC02 CONSTITUTION OF INDIA
[MANDATORY NON-CREDIT COURSE]

COURSE OBJECTIVES:
To provide basic information about Indian Constitution.

COURSE OUTCOMES:
After successful completion of the course, the students are able to
L T P C Int Ext
2 - - - 100 -

1. Study guidelines for the State as well as for the Citizens to be followed by the State in the matter of administration as well as in making the laws. It also includes fundamental duties of the Indian Citizens in Part IV A (Article 51A).
2. Know how the State is administered at the State level and also the powers and functions of High Court.
3. Understand special provisions relating to Women empowerment and also children. For the stability and security of the Nation, Emergency Provision are Justified.
4. Understand election commission as an independent body with enormous powers and functions to be followed both at the Union and State level. Amendments are necessary, only major few amendments have been included.

UNIT I [CO:1]
Preamble to the Constitution of India Domicile and Citizenship. Fundamental rights under Part III, Leading Cases. Relevance of Directive Principles of State Policy under Part-IV, IV-A Fundamental duties.

UNIT II [CO:2]
Union Executive - President, Vice-President, Prime Minister, Union Legislature – Parliament and Union Judiciary - Supreme Court of India. State Executive - Governors, Chief Minister, State Legislature and High Court.

UNIT III [CO:3]
Semester II [First Year]
Special Constitutional Provisions for Scheduled Casters and Tribes, Women and Children and Backward Classes, Emergency Provisions.

UNIT IV [CO:4]
Electoral process, Centre State Relations (Amendment Procedure, 42nd, 44th, 74th, 76th, 86^{th} and 91st Constitutional amendments).

LEARNING RESOURCES:

TEXT BOOK:
Durga Das Basu: "Introduction to the Constitution of India" (student edition) Prentice - Hall EEE, 19th/20th Edition, 2001.

REFERENCE BOOK(s):

1. M.V.Pylee, "An Introduction to Constitution of India", Vikas Publishing, 2002.
2. Brij Kishore Sharma, "Introduction to the Constitution of India", PHI, Learning Pvt.Ltd.,New Delhi, 2011.

CH 121 MATHEMATICS-II

Lectures	:	*2 hrs*	*Sessional Marks*	:	*30*
Tutorial	:	*1 hr*	*Semester End Exam Marks*	:	*70*
Semester End Exam.	:	*3 hrs*	*Credits*	:	*3*

Course Objectives

i. The objective of this course is to familiarize the prospective engineers with techniques in differential equations and to introduce the solution methodologies for second order Partial Differential Equations with applications in engineering.

ii. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes

1) Solve differential equations which model physical processes.
2) Solve physical problems using Bessel's and Legendre's functions.
3) Develop their attitude towards problem solving of PDEs.
4) Solve problems in engineering involving PDEs.

UNIT - I **CO: 1**

Differentials equations of first order - Linear equations, Bernoulli's equation, exact equations, equations reducible to exact equations.

Differentials equations of higher order - Second order linear differential equations with constant coefficients - Method of variation of parameters, Cauchy's homogeneous linear equation and Legendre's linear equation.

UNIT – II **CO: 2**

Series solution of differential equations - When x = 0 is an ordinary point, Frobenius method. Bessel equation, Bessel function, recurrence formulae for $J^n(x)$, expansions for J^0, J^1, $J^{1/2}$, $J^{-1/2}$, Generating function, Orthogonality of Bessel functions.

Legendre's equation, Rodrigue's formula, generating function for $P^n(x)$, recurrence formulae for $P^n(x)$, Orthogonality of Legendre's polynomials.

UNIT – III **CO: 3**

Partial differential equations - Introduction, Formation of partial differential equations, Equations solvable by direct integration, Linear equations of the first order.

Applications of partial differential equations - Introduction, Method of separation of variables. Solution of the one-dimensional wave equation.

UNIT – IV **CO: 4**

Solution of one-dimensional heat flow equation.

Solution of Laplace's equation.

LEARNING RESOURCES

TEXT BOOKS:

1) B.S.Grewal - Higher Engineering Mathematics, Khanna publishers, 42nd edition, 2017.

REFERENCE BOOKS:

1) Erwin Kreyszig - Advanced Engineering Mathematics, John Wiley & Sons, 2006

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

CH 122 ORGANIC CHEMISTRY

Lectures	*:*	*3 hrs*	*Sessional Marks*	*:*	*30*
Tutorial	*:*	*0 hr*	*Semester End Exam Marks*	*:*	*70*
Semester End Exam.	*:*	*3 hrs*	*Credits*	*:*	*3*

Course Objectives

i. To learn the various factors involved in reactivity of organic compounds and make them know the reaction mechanisms and basics of isomerism.
ii. To give insights on different reagents and products to obtain various organic compounds.
iii. To study the acidic and basic nature of various organic compounds and stability effects due to derivatization.
iv. To know the chemical composition, structure of Bio molecules, drugs, and their importance in human life.

Course Outcomes

1) Understand the stability of organic compounds based on their chemical reactivity.
2) Predict stereochemistry of simple organic compounds and explain the influence of substituent on reactivity of aromatic compounds.
3) Understand the mechanism of different named reactions and predict the products formed.
4) Explain the acidic and basic strength of different organic compounds, importance of drugs and other biomolecules.

UNIT - I **CO: 1**

Electron displacements in a molecule: Inductive, Mesomeric and Electromeric effects, hyperconjugation. Reaction mechanisms of SN^1, SN^2, E^1 and E^2 reactions.

Reactive intermediates: Structure and Stability of carbocation, carbanion, and free radicals.
Alkenes: Preparation by dehydration of alcohols, dehydrohalogenation of alkyl halides (Saytzeff's rule), Addition reactions –Markownikoff's rule and anti-Markownikoff's rule, 1,2- and 1,4-additions in dienes(Diels-Alder reaction).

UNIT – II **CO: 2**

Stereo chemistry: Basics of optical and geometrical isomerisms – Enantiomers, Diastereomers, Meso compounds, Sequence rules- R and S, E and Z configuration, Keto-enol tautomerism
Conformational Analysis: Conformations of ethane and n- butane, Stability of cycloalkanes, Bayer's Strain theory, Conformation analysis of cyclohexane and di-substituted cyclohexanes.
Benzene: Resonance, aromaticity, Huckel's rule, Molecular Orbital description of aromaticity, Electrophilic aromatic substitution, Mechanism of nitration, Friedal–Crafts alkylation.

UNIT – III **CO: 3**

Heterocyclic Compounds: Synthesis and properties of Furan, Thiophene, Pyrrole, Pyridine and Indole.
Hydroxy Compounds: Preparation methods of alcohols-phenols–acidity comparison with

alcohols–differences between phenols and alcohols. Reactions of Phenols–Reimer-Tiemann reaction, Kolbe's reaction.

Carbonyl compounds: Aldehydes and Ketones–Preparation–Grignard reagents. Nucleophilic addition reactions of carbonyl compounds-Cannizaro reaction, Aldol condensation, Perkin reaction, Claisen condensation, Wolf-Kishner reduction.

UNIT – IV **CO: 4**

Carboxylic acids: Acidity, Influence of substituents on acidity, Functional derivatives of carboxylic acids-acid halides, amides, anhydrides and esters.

Aliphatic and Aromatic amines: 1^0, 2^0, 3^0 amines-Distinguishing tests, Preparation by Hofmann's degradation of amides, basicity of amines, Diazonium salts-preparation and synthetic importance-Sand Mayer reaction.

Bio molecules: Nomenclature, Classification of Carbohydrates, Structure and general reactions of Glucose and Fructose, muta rotation. Amino acids and their classification

Drugs:

Synthesis of anti-bacterial drugs: Sulphanilamide, Sulphapyridine

Synthesis of anti-malarial drugs**:** Isopentaquine, Chloroquine.

LEARNING RESOURCES

TEXT BOOKS:

1) Text Book of Organic Chemistry, B.S.Bahl and Arun Bahl, 20th Edition (Unit-I,II,and III) (2011) S.Chand & Co., Delhi.

2) Text Book of Organic Chemistry, Vol.2, I.L. Finar, 5th Edition, Pearson education (Unit-IV) (2007).

REFERENCE BOOKS:

1) Text Book of Organic Chemistry, R.T.Morrison and R.N.Boyd, 6th edition, PHI, Delhi.(2008)

2) Principles of Organic Chemistry, M.K. Jain, 9th edition. S. Nagin & Co.

3) Fundamentals of Biochemistry, J.L. Jain.

Web references:

www.chemguide.co.uk/

www.adichemistry.com/

www.research.cm.utexas.edu/nbauld/

www.chem.ucla.edu/harding/tutorials/

ME/CH – 123 :: BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Lectures	:	*3 hrs*	*Sessional Marks*	:	*100*
Tutorial	:	*0 hr*	*Semester End Exam Marks*	:	--
Semester End Exam.	:		*Credits*	:	--

Course Objectives:

The main objectives of this course are

1. To introduce fundamental laws, basic electrical elements, sources and their characteristics.
2. To develop the ability to apply circuit analysis to AC circuits.
3. To provide students with fundamental concepts on the construction and operation of transformers and electrical machines.
4. To know the principle of operation and characteristics of diode, transistors and oscillators.

Course Outcomes:

Upon successful completion of the course, the student will be able to:

1. Analyse the concepts of basic electrical circuits and batteries.
2. Solve problems on basic AC circuits.
3. Summarize the operation of electrical machines.
4. Describe the operating principles and characteristics of diodes, transistors and oscillators.

UNIT – I Text Books – 1&2 [CO1]

DC Circuits: Batteries: Lead-acid, Nickel-iron, Nickel-Cadmium batteries (Operation only). Elementary calculations for energy consumption. DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

UNIT-II Text Books – 1&2 [CO2]

AC Circuits: Representation of sinusoidal waveforms, peak and rms values of sinusoidal waveform, phasor representation. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), real power, reactive power, apparent power, power factor. Three phase balanced circuits, voltage and current relations in star and delta connections (balanced loads only). Working principle of single phase transformer, ideal and practical transformer

UNIT-III Text Book – 2 [CO3]

Electrical Machines: Construction, working principle of DC generator and motor (Elementary treatment only), torque-speed characteristic of separately excited dc motor. Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Construction and working of synchronous generators.

UNIT - III Text Book – 2 [CO4]

Semiconductor Diodes: Semiconductor diode, Zener diode, Half-Wave Rectifier, Full-Wave rectifier, Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitter configuration, Common collector configuration. Feedback and Oscillator Circuits: Feedback concepts, Barkhausen criteria, Phase-Shift oscillator, Wien bridge oscillator, Hartley

oscillator, Colpitts oscillator.

TEXT BOOKS:

1.A.Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", 5th Edition, TMH, 2017. (unit-1,2)

2. M.S.Sukhija, T.K.Nagasarkar, "Basic Electrical & Electronics Engineering", Oxford press, 2012. (unit-3,4)

REFERENCE BOOKS:

1. Mahmood Nahvi and Joseph Edminister, Electric Circuits, 5th Edition, Schaum's outline series, TMH, 2017.

2. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S.Chand, 2010.

3. S.Salivahanan, A.Vallavaraj, "Electronic Devices and Circuits", Tata McGraw Hill Publishers, 2011.

4. B.L.Theraja& A.K.Theraja – "Textbook of Electrical technology"- S.Chand & Co, 2014.

CH 124 PROGRAMMING FOR PROBLEM SOLVING

Lectures	:	*3 hrs*	*Sessional Marks*	:	*30*
Tutorial	:	*---hrs*	*Semester End Exam Marks*	:	*70*
Semester End Exam.	:	*3 hrs*	*Credits*	:	*3*

Course Objectives

i. To understand the basic problem solving process using Flow Charts and algorithms.
ii. To understand the basic concepts of control structures in C.
iii. To learn concepts of arrays, functions, pointers and Dynamic memory allocation in C.
iv. To use the concepts of structures, unions, files and command line arguments in C.

Course Outcomes

1) Develop algorithms and flow charts for simple problems.
2) Use suitable control structures for developing code in C.
3) Design modular programs using the concepts of functions and recursion.
4) Develop code for complex applications using structures, pointers and file handling features.

UNIT - I **CO: 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 / Pseudocode 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, Arithmetic expressions and precedence.

UNIT – II **CO: 2**

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching, Iteration and loops.

Arrays: Arrays (1-D, 2-D), Character arrays and Strings Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations.

UNIT – III **CO: 3**

Function: Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference.

Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series.

UNIT – IV **CO: 4**

Structures: Structures, Defining structures and Array of Structures.
Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures.

File handling: Defining and opening a file, closing a file, input/output operations on files using file handling functions, random access to files.

LEARNING RESOURCES

TEXT BOOKS:

1) Byron Gottfried - Programming with C (Schaum's Outlines), Third Edition, Tata McGraw-Hill.

REFERENCE BOOKS:

1) Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2) Programming in C by Stephen G. Kochan, Fourth Edition, Pearson.
3) C Complete Reference, Herbert Sheildt, TMH., 2000
4) Programming with C by K R Venugopal & Sudeep R Prasad, TMH., 1997.

WEB RESOURCES:

1) http://cprogramminglanguage.net/
2) http://lectures-c.blogspot.com/
3) http://www.coronadoenterprises.com/tutorials/c/c_intro.htm
4) http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf

CH 161 BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

Practicals	*:*	*3 hrs*	*Sessional Marks*	*:*	*30*
			Semester End Exam Marks	*:*	*70*
Semester End Exam.	*:*	*3 hrs*	*Credits*	*:*	*1.5*

Course Objectives

i. To conduct experiments on electrical circuits.
ii. To design experimental setups for theorems.
iii. To learn Diode characteristics, and basic diode applications as rectifiers and regulators.
iv. To learn BJT characteristics and Oscillators.

Course Outcomes

1) Get an exposure to common electrical components and their ratings.
2) Make electrical connections by wires of appropriate ratings.
3) Understand the usage of common electrical measuring instruments.
4) Verify the network theorems.
5) Design Zener voltage regulator to meet the specifications.
6) Verify experimentally popular BJT applications such as Amplification.

List of Experiments:

1) Familiarization of Electrical Installations and Electrical Testing Equipment: Miniature circuit breakers (MCBs), Moulded Case Circuit Breakers (MCCBs), Earth-leakage circuit breakers (ELCBs), Fuses, Types of Wires, Wire Gauges, continuity test, megger, Cables and Earthing.
2) Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, wattmeter, multi-meter, oscilloscope, measurement of basic parameters.
3) Verification of KVL& KCL.
4) Verification of Superposition Theorem.
5) Verification of Thevenin's Theorem.
6) Verification of Norton's Theorem.
7) Determination of choke coil parameters.
8) Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
9) Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
10) Speed control of dc motor.
11) Torque-Slip Characteristics of an induction motor
12) Characteristics of Silicon, Germanium diodes.

13) Characteristics of Zener diode.
14) Half Wave Rectifier and Full Wave Rectifier.
15) Transistor Characteristics in CE configuration.
16) Wein Bridge Oscillator.
17) Colpitt's Oscillator.

Note: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CH/CE/CS/EE/EC/IT/ME 162 PROGRAMMING FOR PROBLEM SOLVING LAB

Practicals	*:*	*3 hrs*	*Sessional Marks*	*:*	*30*
			Semester End Exam Marks	*:*	*70*
Semester End Exam.	*:*	*3 hrs*	*Credits*	*:*	*1.5*

Course Objectives

i. To understand the basic problem solving process using Flow Charts and algorithms.
ii. To understand the basic concepts of control structures in C.
iii. To learn concepts of arrays, functions, pointers and Dynamic memory allocation in C.
iv. To use the concepts of structures, unions, files and command line arguments in C.

Course Outcomes

1) Develop algorithms and flow charts for simple problems.
2) Use suitable control structures for developing code in C.
3) Design modular programs using the concepts of functions and recursion.
4) Develop code for complex applications using structures, pointers and file handling features.

List of Exercises / Activities:

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

1 **Tutorial 1: Problem solving using computers:**
Lab1: Familiarization with programming environment
2 **Tutorial 2: Variable types and type conversions:**
Lab 2: Simple computational problems using arithmetic expressions
3 **Tutorial 3: Branching and logical expressions:**
Lab 3: Problems involving if-then-else structures.
4 **Tutorial 4: Loops, while and for loops:**
Lab 4: Iterative problems e.g., sum of series.
5 **Tutorial 5: 1D Arrays: searching, sorting:**
Lab 5: 1D Array manipulation.
6 **Tutorial 6: 2D arrays and Strings:**
Lab 6: Matrix problems, String operations.
7 **Tutorial 7: Functions, call by value:**
Lab 7: Simple functions.
8 **Tutorial 8 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration):**
Lab 8 and 9: Programming for solving Numerical methods problems.
9 **Tutorial 10: Recursion, structure of recursive calls:**
Lab 10: Recursive functions.
10 **Tutorial 11: Pointers, structures and dynamic memory allocation:**
Lab 11: Pointers and structures
11 **Tutorial 12: File handling:**

Lab 12: File operations.

CH/CS/EC/IT 163 ENGINEERING WORKSHOP PRACTICE

Lectures	*:*	*1 hrs*	*Sessional Marks*	*:*	*30*
Practicals		*4 hrs*	*Semester End Exam Marks*	*:*	*70*
Semester End Exam.	*:*	*3 hrs*	*Credits*	*:*	*3*

Course Objectives

i. Engineers, whatever be their line of activity, must be proficient with all aspects of manufacturing, however it should not be forgotten that practice without theory is blind and the theory without practice is lame.

ii Students involved in acquiring manufacturing skills must have balanced knowledge of theory as well as practice.

iii Imparts basic knowledge of various tools and their use in different sections of manufacture such as fitting, carpentry, tin smithy, moulding, casting, welding, electrical wiring, PCB work on electronic circuits and practice with machine shop tools & equipments.

Course Outcomes

1) Will gain knowledge of the different manufacturing processes which are commonly employed in the industry to fabricate components using different materials.

List of Experiments:

1) Welding shop (both arc &gas welding)
-Square butt joint
-Lap joint
-Single v butt joint
-Gas welding & Cutting

2) Fitting Shop& Casting
-Inclined fit
-Half round fit
-V fit
-Moulding and casting of Hand wheel

3) Practice on electrical wiring and Electronic circuit boards
-One bulb controlled by one switch &one bulb controlled by two switches
-Two bulbs controlled by one switch (Stair case connection)
-Tube light connection
-Measurement of resistance, voltage and current with the help of a multi-meter & soldering on an electronic PCB circuit.

4) Machine Shop
-Practice of machining operations on Lathe, Milling, Shaping, Drilling and Slotting Machines.

5) Carpentry
-Lap joint
-Cross lap joint
-Dovetail joint
-Turning on wood turning Lathe

5) Tin Smithy
-Rectangular tray
-Funnel
-Pipe joint
-Rectangular Scoop
-Plastic mounding and glass cutting

Plastic moulding and glass cutting

Note: A minimum of 2 (two) from each trade – Total 12 (twelve) experiments – have to be performed and recorded by the candidate to attain eligibility for Semester End Practical Examination.

CH 164 : ANALYSIS AND PREPARATION OF CHEMICAL COMPOUNDS LAB

Practicals	*3 hrs*		*Sessional Marks*	*:*	*30*
			Semester End Exam Marks	*:*	*70*
Semester End Exam.	*: 3 hrs*		*Credits*	*:*	*1.5*

Course Objectives

i. To know how various types of reactions can be applied in organic compound preparations.
ii. To acquire knowledge about the qualitative analysis of organic compounds.
iii. To learn how the yield of an organic compound can be determined.
iv. To learn the preparation of suitable derivatives of organic compounds.

Course Outcomes

1) Prepare organic compounds using suitable reactions.
2) Confirm the identity of organic compounds using suitable methods.
3) Analyze and identify the nature and type of a given organic compound.

List of Experiments:

1)	Preparation of Aspirin	CO1&2
2)	Preparation of Benzanilide	CO1&2
3)	Preparation of m-dinitrobenzene	CO1&2
4)	Preparation of p-bromo acetanilide	CO1&2
5)	Preparation of Phenol Formaldehyde resin.	CO1&2
6)	Detection of Extra elements.	CO2
7)	Analysis of compound -1	CO2&3
8)	Analysis of compound - 2	CO2&3
9)	Analysis of compound - 3	CO2&3
10)	Analysis of compound - 4	CO2&3
11)	Analysis of compound - 5	CO2&3
12)	Analysis of compound – 6	CO2&3

Note: Analysis of organic compound with single functional groups containing phenol, aldehyde, ketone, carboxylic acid, amides, amines, monosaccharides with two derivatives.

CHMC01 ENVIRONMENTAL SCIENCE

Lectures	*: 3 hrs*	*Sessional Marks*	*: 100*
Tutorial	*: 0 hr*	*Semester End Exam Marks*	*: --*
Semester End Exam.	*:*	*Credits*	*: --*

COURSE OBJECTIVES: To enable the students to

1. understand that humans are an integral part of environment and hence their activities reflect on the environment.
2. realize and appreciate the importance of ancient practices and their importance in the present times
3. appreciate the contribution of individuals for the upkeep of environmental standards, in turn help the humans live better.
4. describe and discuss the environmental pollution implications with related environmental acts and relevant case studies.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. evaluate the implications of human activities and thereby promote ecofriendly technologies.
2. promote awareness among the members of the society for a sustainable environment.
3. include and give priority to environmental protection in all developmental projects.
4. understand the causes, effects and controlling measures of different types of environmental pollutions with some case studies.

A. AWARENESS ACTIVITIES - SMALL GROUP MEETINGS

I. Source of water for human consumption/activities:

a. collection of information pertaining to water resources and consumption in Andhra Pradesh
b. Water resource on campus: General / Laboratory use and
c. Drinking water - understand the background and adopt judicious management.
d. Recycled water for Gardening - Particularly Lawns.
e. Cut down wastage of electricity in class rooms / labs / hostels etc. by avoiding misuse.

II. After the group meetings and exposure to the local issues and healthy practices, students motivated to make:

a. Posters
b. Slogans/One liners for promoting awareness

III. Lectures from Experts (at least 2 in the course duration)

IV. A walk in the neighborhood to promote a chosen theme on environmental consciousness.

B. ACTUAL ACTIVITIES

1. Plantation on Campus and on the sides of approach road.
2. Distribution of saplings to the local colony dwellers and encourage plantation.
3. Development of Kitchen garden on campus - Cultivation of atleast leafy vegetables and creepers

like cucumber etc. for use in college canteen/hostels etc.
4. Adoption of "NO PLASTICS" on campus.
5. Field trip to gain knowledge of biodiversity, water shed, mining, pollution and other local issues.
6. Preparation of working models for energy generation/transformation etc.

C. THEORY SYLLABUS FOR ASSESSMENT
Part-I 1.

1. Introduction to Environmental Studies, Scope and Importance.
2. Natural resources Renewable and Non-Renewable; Definition and importance of the following resources in detail: a. Forest b. Water c. Land d. Energy
3. Sustainable development - Concept and Measures.
4. Biodiversity - Definition, Types of Biodiversity, Values and threats to Biodiversity, Conservation of biodiversity, IUCN classification: Endangered, Threatened, Vulnerable, Rare species; Endemic and Exotic species.
5. Climate change - Global warming, Ozone depletion and Acid rain.

Part-II
6. Water shed, water shed management in detail.
7. Solid wastes and Solid waste management.
8. Environmental Legislation, Environmental acts - Wild life protection act, Water act, Forest conservation act, Air act and Environmental protection act.
9. Case studies: Chernobyl nuclear disaster, Bhopal gas tragedy, Narmada bachao andolan, Silent valley, Story of Tuvalu, Story of Ganga.
10.Earth summit and Kyoto protocol; Measures at individual level for conservation of natural resources and sustainable development.

Text Books 1. Anubha Kaushik and C.P.Kaushik - Environmental Studies, 3rd Edition, New Age International Publishers, New Delhi., 2012.

2. R. Rajagopalan - Environmental studies from crisis to cure, 3rd Edition, Oxford University press, 2012.

ASSESSMENT 1. Two assessments each of 40 marks will be done in the semester. The split up of each assessment is as follows:
a. Two internal theory examinations will be conducted for 18 marks each.
b. Evaluation of the prepared activity sheets and working models will be done for 12M (continual evaluation) twice in the semester in line with the theory examination.
c. 5 Marks for attendance and 5 marks for oral test.

Note: Weightages for a, b & c will be taken as per the assessment guidelines of the R-20 curriculum and projected to 100 marks.