St. ANN'S COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)
CHIRALA – 523187, ANDHRA PRADESH, INDIA
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE & SYLLABUS
For UG – R22
B. Tech - COMPUTER SCIENCE & ENGINEERING
(Accredited by NBA)

(Applicable for batches admitted from 2022-2023)

St. ANN'S COLLEGE OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)
CHIRALA – 523187, ANDHRA PRADESH, INDIA

(Accredited by NBA, NAAC with 'A' Grade, Accredited by IE (I) & Permanently Affiliated to JNTUK)
Recognized by UGC under Section 2(f) & 12(B) of UGC Act, 1956

Academic Calendar
(B. Tech 2022 Admitted Batch, A.Y. 2022-23)

I Semester			
Description	**From**	**To**	**Weeks**
Commencement of Class Work	**26-09-2022**		
Induction Classes	26-09-2022	10-10-2022	2 Weeks
I Unit of Instruction	11-10-2022	03-12-2022	8 Weeks
I Mid Examinations	05-12-2022	10-12-2022	1 Week
II Unit of Instruction	12-12-2022	28-01-2023	7 Weeks
II Mid Examinations	30-01-2023	04-02-2023	1 Week
Preparation and Practicals	06-02-2023	11-02-2023	1 Week
End Examinations	13-02-2023	25-02-2023	2 Weeks
Commencement of II Semester Class Work	**27-02-2023**		
II Semester			
I Unit of Instructions	27-02-2023	24-04-2023	8 Weeks
I Mid Examinations	25-04-2023	29-04-2023	1 Week
II Unit of Instructions	01-05-2023	19-06-2023	7 Weeks
II Mid Examinations	20-06-2023	24-06-2023	1 Week
Preparation and Practical	26-06-2023	01-07-2023	1 Week
End Examinations	03-07-2023	15-07-2023	2 Weeks
Commencement of II Year Class Work	**31-07-2023**		

Detailed Academic Calendar for B. Tech I Year I Semester for the year 2022-23

Days	SEPTEMBER 2022 Date	Class	OCTOBER 2022 Date	Class	NOVEMBER 2022 Date	Class	DECEMBER 2022 Date	Class	JANUARY 2023 Date	Class	FEBUARY-2023 Date	Class
SUN		Holiday		Holiday		Holiday			1	Holiday		
MON									2	80		
TUE					1	29			3	81		
WED					2	30			4	82	1	MID-II 102
THU	1				3	31	1	54	5	83	2	MID-II 103
FRI	2				4	32	2	55	6	84	3	MID-II 104
SAT	3		1	7	5	33	3	56	7	85	4	MID-II 105
SUN	4	Holiday	2	Holiday	6	Holiday	4	Holiday	8	Holiday	5	Holiday
MON	5		3	DURGASTAMI	7	34	5	MID-1 57	9	86	6	
TUE	6		4	Holiday in lieu of 2nd Saturday	8	35	6	MID-1 58	10	87	7	
WED	7		5	VIJAYA DASAMI	9	36	7	MID-1 59	11	88	8	PRACTICALS
THU	8		6	8	10	37	8	MID-1 60	12	89	9	
FRI	9		7	9	11	38	9	MID-1 61	13	SANKRANTI	10	
SAT	10	2nd Saturday	8	10	12	2nd Saturday	10	2nd Saturday	14	2nd Saturday	11	
SUN	11	Holiday	9	Holiday	13	Holiday	11	Holiday	15	Holiday	12	Holiday
MON	12		10	11	14	39	12	62	16	SANKRANTI	13	
TUE	13		11	12	15	40	13	63	17	90	14	
WED	14		12	13	16	41	14	64	18	91	15	
THU	15		13	14	17	42	15	65	19	92	16	End Examinations
FRI	16		14	15	18	43	16	66	20	93	17	
SAT	17		15	16	19	44	17	67	21	94	18	
SUN	18	Holiday	16	Holiday	20	Holiday	18	Holiday	22	Holiday	19	
MON	19		17	17	21	45	19	68	23	95	20	
TUE	20		18	18	22	46	20	69	24	96	21	
WED	21		19	19	23	47	21	70	25	97	22	
THU	22		20	20	24	48	22	71	26	REPUBLIC DAY	23	
FRI	23		21	21	25	49	23	72	27	98	24	
SAT	24		22	22	26	50	24	73	28	99	25	
SUN	25	Holiday	23	Holiday	27	Holiday	25	Holiday	29	Holiday	26	
MON	26	1	24	DEEPAVALI	28	51	26	74	30	100	27	
TUE	27	2	25	23	29	52	27	75	31	MID-II 101	28	
WED	28	3	26	24	30	53	28	76				
THU	29	5	27	25			29	77				
FRI	30	6	28	26			30	78				
SAT			29	27			31	79				
SUN		Holiday	30	Holiday		Holiday		Holiday		Holiday		
MON			31	28								

Commencement of II Semester Class Work 27-02-2023

Detailed Academic Calendar for B. Tech I Year II Semester for the year 2022-23

Days	FEBUARY-2023 Date	Class	MARCH-2023 Date	Class	APRIL-2023 Date	Class	MAY-2023 Date	Class	JUNE-2023 Date	Class	JULY-2023 Date	Class
SUN		Holiday		Holiday		Holiday		Holiday		Holiday		Holiday
MON							1	47				
TUE							2	48				
WED	1		1	3			3	49				
THU	2		2	4			4	50	1	73		
FRI	3		3	5			5	51	2	74		
SAT	4		4	6	1	27	6	52	3	75	1	
SUN	5	Holiday	5	Holiday	2	Holiday	7	Holiday	4	Holiday	2	Holiday
MON	6		6	7	3	28	8	53	5	76	3	
TUE	7		7	8	4	29	9	54	6	77	4	
WED	8		8	9	5	Babu Jagjivan Ram's Birthday	10	55	7	78	5	
THU	9		9	10	6	30	11	56	8	79	6	
FRI	10		10	11	7	Good Friday	12	57	9	80	7	
SAT	11	2nd Saturday	11	2nd Saturday	8	2nd Saturday	13	2nd Saturday	10	2nd Saturday	8	
SUN	12	Holiday	12	Holiday	9	Holiday	14	Holiday	11	Holiday	9	
MON	13		13	12	10	31	15	58	12	81	10	
TUE	14		14	13	11	32	16	59	13	82	11	
WED	15		15	14	12	33	17	60	14	83	12	
THU	16		16	15	13	34	18	61	15	84	13	
FRI	17		17	16	14	Ambedkar Birthday	19	62	16	85	14	
SAT	18		18	17	15	35	20	63	17	86	15	
SUN	19	Holiday	19	Holiday	16	Holiday	21	Holiday	18	Holiday	16	Holiday
MON	20		20	18	17	36	22	64	19	87	17	
TUE	21		21	19	18	37	23	65	20	MID-II 88	18	
WED	22		22	UGADI	19	38	24	66	21	MID-II 89	19	
THU	23		23	20	20	39	25	67	22	MID-II 90	20	
FRI	24		24	21	21	40	26	68	23	MID-II 91	21	
SAT	25		25	22	22	EID AL FITR	27	69	24	MID-II 92	22	
SUN	26	Holiday	26	Holiday	23	Holiday	28	Holiday	25	Holiday	23	
MON	27	1	27	23	24	41	29	70	26		24	
TUE	28	2	28	24	25	MID-1 42	30	71	27		25	
WED			29	25	26	MID-1 43	31	72	28	PRACTICALS	26	
THU			30	SRIRAMA NAVAMI	27	MID-1 44			29		27	
FRI			31	26	28	MID-1 45			30		28	
SAT					29	MID-1 46					29	
SUN		Holiday		Holiday	30	Holiday		Holiday		Holiday	30	Holiday
MON											31	

(July "Class" column rows 1–15 labelled vertically: END SEM EXAMINATIONS; rows 17–30 labelled vertically: Summer Vacation/1st Year 1st Sem Supply Examinations)

Commencement of II Year I Semester Class Work 31-07-2023

ACADEMIC REGULATIONS (R22) - UG

COURSE STRUCTURE & DETAILED SYLLABUS

For
B. Tech – FOUR YEAR DEGREE COURSE
(Applicable for batches admitted from 2022-2023)

St. ANN'S COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
CHIRALA – 523187, ANDHRA PRADESH, INDIA

ACADEMIC REGULATIONS (R22) FOR B. TECH. (REGULAR)

Applicable for students of B. Tech. (Regular) from Academic Year 2022-23 Onwards

St. Ann's College of Engineering and Technology (Autonomous), Chirala, Regulations (R22 Regulations) are applicable to all under graduate programmes given here under. These regulations are applicable to the B. Tech programmes offered by the institution with effect from the Academic Year 2022-23.

1. Programmes of study:

The following programmes of study are offered at present as specializations for the B. Tech courses in the institution:

S. No	Name of the Branch	Branch Code
1	Civil Engineering	01
2	Electrical & Electronics Engineering	02
3	Mechanical Engineering	03
4	Electronics and Communication Engineering	04
5	Computer Science Engineering	05
6	CSE (Artificial Intelligence & Machine Learning)	42
7	CSE (Data Science)	44
8	CSE (Cyber Security)	46
9	CSE (Internet of Things)	49

2. Medium of Instruction:

The medium of instruction of the entire B. Tech undergraduate programme in Engineering & Technology (including examinations and project reports) will be in **English** only.

3. Admissions:

Admission to the B. Tech Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or on the basis of any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. Programme Pattern:
   a) Total duration of the of B. Tech (Regular) Programme is four academic years
   b) Each Academic year of study is divided in to **two semesters**.
   c) Minimum number of instruction days in each semester is 90.
   d) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
   e) The total credits for the Programme are 160.
   f) A two-week induction program is mandatory for all first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.

g) Student will be introduced to "Choice Based Credit System (CBCS)".

h) A pool of inter disciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering (total five skill courses: two basic level skill courses, one on soft skills and other two on advanced level skill courses)

i) A student has to register for all courses in a semester.

j) All the registered credits will be considered for the calculation of final CGPA.

k) Each semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

l) A 10 months industry/field mandatory internship, both industry and social, during the summer vacation and also in the final semester to acquire the skills required for job and make engineeringgraduates to connect with the needs of the industry and society at large.

m) All students shall be mandatorily registered for NCC/NSS activities.

n) Each college shall assign a faculty advisor/mentor after admission to each student or group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/ GATE/ other competitive exams etc.

5. **Subject/Course Classification:**

All subjects/courses offered for the undergraduate programme in E & T(B. Tech degree programmes) are broadly classified as follows:

S. No	Category	Code	APSCHE breakup of Credits	AICTE Credits of breakup
1	Humanities and Social Science Courses	HS	10.5	12
2	Basic Science Courses	BS	21	25
3	Engineering Science Courses	ES	24	24
4	Professional Core Courses	PC	51	48
5	Open Elective Courses	OE	12	18
6	Professional Courses Elective	PE	15	18
7	Internship, Seminar, Project Work	PROJ	16.5	15
8	Skill Oriented Courses	SC	10	-
9	Laboratory Courses	LC	-	-
10	Mandatory courses	MC	Non-credit	Non-credit
Total Credits			160	160

6. **Registration for Courses:**

i) The college shall invite registration forms from the students at the beginning of the semester for the registration for courses each semester. The registration process shall be closed within one week. If any student wishes to withdraw the registration, he/she shall submit a letter to the principal through the class teacher/instructor and HOD. The principal shall communicate the registration and withdraw details courses of each student in a consolidated form to the college examination section and University without fail.

ii) There are four open electives in each branch. All Open Electives are offered to students of all branches in general. A student shall choose an open elective, by consulting the HOD/advisor, fromthe list in such a manner that he/she has not studied the same course in any form during the Programme.

iii) A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the programme. Students are advised to register for only for minimum 12 weeks in duration MOOCs courses. Student has to pursue and acquire a certificate for a MOOC course only from the SWAYAM/NPTEL through online with the approval of Head of the Department in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester. The details of the MOOCs courses registered by the students shall be submitted to the institution examination center. The Head of the Department shall appoint a mentor for each of the MOOC subjects registered by the students to monitor the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

iv) Two summer internships each with a minimum of six weeks duration shall be mandatorily done/completed respectively at the end of second and third years (during summer vacations). Theinternship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs. After completing the summer internship, the students shall register in the immediate respective odd semester and it will be evaluated at the end of the semester as per norms of the institution. The student has to produce the summer internship satisfactory report and certificate taken from the organization to be considered for evaluation. The College shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

v) In the final semester, the student should mandatorily register and undergo internship and in parallel 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 shallalso be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

vi) Curricular Framework for Skill oriented courses
   a) There are five (05) skill-oriented courses shall be offered during III to VII semesters and students must register and pass the courses successfully.
   b) For skill oriented/skill advanced course, one theory and 2 practical hours (1-0-2) or two theory hours (2-0-0) may be allotted as per the decision of BOS concerned.
   c) Out of the five skill courses; (i) two shall be skill-oriented courses from the same domain andshall be completed in second year (ii) Of 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.
   d) Students may register the interdisciplinary job-oriented skill courses based on the prerequisites and eligibility in consultation with HOD.

e) The student 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. However, the department has to assign mentors in the college to monitor the performance of the students.

f) If a student 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 bythe Department, then the department shall mark overall 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. However, the student is deemed to have fulfilled the attendance requirement of the course, if the external agency issues a certificate with satisfactory condition. If the certificate issued by external agency is marked with unsatisfactory condition, then the student shall repeat the course either in the college or at external agency. The credits will be awarded to the student upon producing the successful Course Completion Certificate from the agency/professional bodies and after passing in the viva-voce examination conducted at college as per college norms at the end of the semester.

7. **(a) Award of B. Tech. Degree:** A student will be declared eligible for the award of B. Tech. Degreeif he fulfills the following academic regulations:

   i) A student shall be declared eligible for award of the B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years.

   ii) After eight academic years from the year of their admission, he/she shall **forfeit** their seat in B.Tech course and their admission stands cancelled.

   iii) The student shall register for 160 credits and must secure all the 160 credits. All students shall register for NCC/NSS activities and will be required to participate in an activity specified by NSS officer during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

   iv) Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution,Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non- credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

   v) Credit Definition:

1 Hour Lecture (L) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit
2 Hours Practical (Lab) per week	1 Credit

(b) Award of B. Tech. (Honors)/B. Tech. (Minor): B. Tech. with Honors or a B. Tech. with a Minor will be awarded if the student earns 20 additional credits are acquired as per the regulations/guidelines. The regulations/guidelines are separately provided in Annexure III. Registering for Honors/Minor is optional.

8. Attendance Requirements

   a. A student is eligible to write the Semester End Examinations if he acquires

a minimum of 50% in each subject and 75% of attendance in aggregate of all the subjects.

b. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) may be granted by the College Academic Committee. However, this condonation concession is applicable only to any two semesters during the entire programme.

c. Shortage of Attendance below 65% in aggregate shall not be condoned.

d. A student who is short of attendance in a semester may seek re-admission into that semester when offered within 4 weeks from the date of commencement of class work.

e. Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.

f. A stipulated fee of Rs. 500/- in the concerned semester shall be payable towards condonation of shortage of attendance. Students availing condonation on medical ground shall produce a medical certificate issued by the competent authority.

g. A student will be promoted to the next semester if he satisfies the (i) attendance requirement of the present semester and (ii) minimum required credits.

h. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

i. For induction programme attendance requirements as per AICTE norms.

j. For non-credit mandatory courses the students shall obtain the attendance similar to credit courses

9. Evaluation-Distribution and Weightage of marks

(i) Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the college examination section from time to time.

(ii) For non-credit mandatory courses, like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

(iii) A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/ project etc. by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the sum total of the internal marks and end semester examination marks together.

(iv) Distribution and Weightage of marks:

The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The performance of a student in each semester shall be evaluated subject–wise with a maximum of 100 marks for theory subject and 50 marks for practical subject. For theory subjects the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Examinations.

S. No	Components	Internal	External	Total
1	Theory	30	70	100
2	Engineering Graphics/Design/Drawing	30	70	100
3	Practical	15	35	50
4	Mini Project/Internship/Industrial Training/ SkillDevelopment programmes/Research Project	-	50	50
5	Project Work	60	140	200

(v) Continuous Internal Theory Evaluation:

(a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid- term examination consists of (i) one online objective examination (ii) one descriptive examination and (iii) one assignment. The online examination (objective) shall be 10 marks and descriptive examination shall be for 15 marks with a total duration of 1 hour 50 minutes (20 minutes for objective and 90 minutes for descriptive paper).

(b) The first online examination (objective) is set with 20 multiple choice questions for 10 marks (20 questions x ½ marks) from first two and half units (50% of the syllabus) and it is conducted by college examination section**.** The descriptive examination is set with 3 full questions for 5 marks each from first two and half units (50% of the syllabus), the studenthas to answer all questions. In the similar lines, the second online and descriptive examinations shall be conducted on the rest of the syllabus.

(c) The assignment is given by the concerned class teacher for five marks from first two and halfunits (50% of the syllabus). The second assignment shall be given from rest of the syllabus. The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination.

(d) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The first mid marks (Mid-1) consisting of marks of online objective examination, descriptive examination and assignment shall be submitted to the University examination section within one week after completion of first mid examination.

(e) The mid marks submitted to the University examination section shall be displayed in the college notice boards for the benefit of the students.

(f) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of university examination section within one week from the submission.

(g) Second mid marks (Mid-2) consisting of marks of online objective examination, descriptiveexamination and assignment shall also be submitted to university examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of university examination section within one week from the submission.

(h) Internal marks can be calculated with 80% weightage for better of the two mid exams and 20% Weightage for another mid exam.
   Example:
   Mid-1 marks = Marks secured in (online examination-1+descriptive examination-1+one assignment-1)
   Mid-2 marks = Marks secured in (online examination-2+descriptive examination-2+one assignment-2)

   Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

(i) With the above criteria, university examination section will send mid marks of all subjects inconsolidated form to all the concerned colleges and same shall be displayed in the concerned college notice boards. If any discrepancy found, it shall be brought to the notice of universityexamination section through proper channel within one week with all proofs. Discrepancies brought after the given deadline will not be entertained under any circumstances.

(vi) Semester End Theory Examinations Evaluation:

(a) The semester end examinations **will be conducted by the college examination** section for 70 marks consisting of two short answer questions carrying 2 marks each (compulsory) and one question carrying 10 marks from each unit. Each of 10 marks question is from one unit and may contain sub-questions. For each 10 marks question there will be an "either" "or"

choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

(b) For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows:day to day work - 5 marks, Record- 5 marks and the remaining 5 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner appointed by controller of examinations of the college.

Note: Laboratory marks and the internal marks awarded by the College are not final. The internal and laboratory marks awarded by the College will be referred to a committee. The Committee shall arrive at a scaling factor and the marks will be scaled as per the scaling factor. The recommendations of the Committee are final and binding. All the laboratory records and internal test papers shall be preserved in respective departments as per college norms and shall be produced to the Committees of college/university as and when they ask for.

(c) For the subject having design and / or drawing (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester for 15 marks each and final marks can be calculated with 80% weightage for better of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day-to-day work.

(d) Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this internship during summer vacation just before its offering as per course structure. The minimum duration of this course shall be at least 6 weeks. The student shall register for the internship as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendanceof the students while taking up the internship. Attendance requirements are as per the norms of the institution. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner appointed by the institution; Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry40% and 60% weightages respectively.It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the institution.

(e) The job-oriented skill courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job-oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external (appointed by the institution) and internal

examiner (course instructor or mentor). There are no internal marks for the job-oriented skill courses.

(f) Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc. non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.

(g) Procedure for Conduct and Evaluation of MOOC: There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

(h) *Major Project (*Project - Project work, seminar and internship in industry):
In the final semester, the student should mandatorily register and undergo internship and in parallel 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. The project report shall be evaluated with an external examiner.
Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the institution and is evaluated for 140 marks.

10. Integrated theory lab:

  a. The integrated course is in the ratio of 2:1 (total credit: 3).
  b. Attendance shall be counted for both in theory as well as lab (75:25 ratio). Minimum attendance shall be required individually in theory and lab as per institution norms
  c. Student has to attend the internal examination and external examination conducted by the institution as per the regulations.
  d. Student has to pass individually both the external examinations (Theory for 100 marks and Lab for 50 marks) conducted by the institution as per the regulations.

    e. If the student fails in either theory or laboratory, the final result is FAIL only.

    f. The student has to pass separately both in the external theory examination and externallab examination as per the institution regulations.

11. Recounting of Marks in the End Semester Examination: A student can request for recounting of his/her answer book on payment of a prescribed fee as per institution norms.

12. Re-evaluation or Revaluation by Challenge of the End Semester Examination: A student can request for Revaluation or Revaluation by Challenge of his/her answer book on payment of a prescribed fee as per institution norms.

13. Supplementary Examinations: A student who has failed to secure the required credits can appear for a supplementary examination, as per the schedule announced by the institution.

14. Advanced Supplementary Examinations: For the current pass out batch students, advanced supplementary examinations (in addition to the regular supplementary examinations) shall be conducted in the subjects of all semesters (I to VIII) of the program, within six weeks of declaration of the final results.

15. Malpractices in Examinations: Disciplinary action shall be taken in case of malpractices during Mid/End examinations as per the rules framed by the institution (Annexure II).

16. **Promotion Rules**
The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in <u>item no.8 for</u> promotion to higher classes
    a. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per institution norm.
    b. A student will be promoted from II to III year if he fulfills the academic requirement of 40%of credits (33) up to II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II-year II semester.
    c. A student shall be promoted from III year to IV year if he fulfills the academic requirementsof 40% of the credits (50) up to III-year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III-year II semester.

17. **Programme Pattern**
    a. The entire programme of study is for four academic years; all years are on semester pattern.
    b. A student eligible to appear for the semester end examination in a subject, but absent from ior has failed in the end semester examination, may write the supplementary exam in that subject when conducted next.
    c. When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

18. **Earning of Credit:**
A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range A+ to E as given below. Letter grade 'F' in any course implies failure of the student in that course and no credits earned. Absent is also treated as no credits earned. For project same % percentages will be followed for grading:

Marks Range Theory (Max – 100)	Marks Range Lab (Max – 50)	Level	Letter Grade	Grade Point
≥ 90	≥ 45	Outstanding	A+	10
≥80 to 90	≥40 to <45	Excellent	A	9
≥70 to 80	≥35 to <40	Very Good	B	8
≥60 to 70	≥30 to <35	Good	C	7
≥50 to 60	≥25 to <30	Fair	D	6
≥40 to 50	≥20 to <25	Satisfactory	E	5
<40	<20	Fail	F	0
-		Absent	AB	0

19. **Computation of SGPA and CGPA**

The UGC recommends the following procedure to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

(i) **SGPA** (S_k) of kth semester (1 to 8) is ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the total number of credits of all the courses undergone/registered by a student, i.e:

$$SGPA\ (s_k) = \frac{\sum_{i=1}^{n} (C_i * G_i)}{\sum_{i=1}^{n} (C_i)}$$

Where C_i is the number of credits of the ith course/subject in a semester and G_i is the grade point scored by the student in the ith course/subject and n is the number of courses/subjects registered in that semester.

(ii) CGPA: The CGPA is calculated in the same manner taking into account all the, *m*'courses/subjects registered by student over all the semesters of a Programme i.e., in all eight semesters:

$$CGPA = \frac{\sum_{i=1}^{m} (C_i * S_i)}{\sum_{i=1}^{m} C_i}$$

Where S_i is SGPA of the ith semester and C_i is total number of credits in that semester.

(iii) SGPA and CGPA shall be rounded off to 2 decimal points and reported in transcripts.

(iv) As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

Equivalent Percentage = **(CGPA – 0.75) x 10**

(v) Illustration of Computation of SGPA and CGPA

   Illustration for **SGPA:** Let us assume there are 6 subjects in a semester. The

grades obtained are as follows:

Course	Credit	Grade Obtained	Grade Point	S_i= Credit Point (Credit xGrade)
Subject 1	3	B	8	3 X 8 = 24
Subject 2	4	C	7	4 X 7 = 28
Subject 3	3	D	6	3 X 6 = 18
Subject 4	3	A+	10	3 X 10 = 30
Subject 5	3	E	5	3 X 5 = 15
Subject 6	4	D	6	4 X 6 = 24
	20			139

Thus, **SGPA =139/20 =6.95=6.9 (approx.)**

Illustration for **CGPA:**

Semester 1	Semester 2	Semester 3	Semester 4
Credits: 20	Credits: 22	Credits: 25	Credits: 26
SGPA: 6.9	SGPA: 7.8	SGPA: 5.6	SGPA: 6.0

Semester 5	Semester 6	Semester 7	Semester 8
Credits: 26	Credits: 25	Credits: 21	Credits: 23
SGPA: 6.3	SGPA: 8.0	SGPA: 6.4	SGPA: 7.5

Thus,

$$CGPA = \frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6.0 + 26 \times 6.3 + 25 \times 8.0 + 21 \times 6.4 + 23 \times 7.5}{188} = \frac{1276.3}{188} = 6.78$$

20. Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	Remarks
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)	From the CGPA secured from 160 Credits
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 5.00 to < 5.75	

21. Minimum Instruction Days

The minimum instruction days for each semester shall be 90 working days. There shall be no branch transfers after the completion of the admission process.

22. Withholding of Results

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

23. Transitory Regulations

(a) Discontinued or detained candidates are eligible for re-admission as and when next offered.

(b) The re-admitted candidate will be governed by the rules & regulations under which the candidatehas been admitted.

(c) (i) In case of transferred students from other Universities/institutions, credits shall be transferred to SACET as per the academic regulations and course structure of SACET.

(ii) In addition, the transferred candidates have to pass the failed subjects at the earlier Institute with already obtained internal/sessional marks to be conducted by SACET.

24. 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/II/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at institution 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.

25. General

(a) Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

(b) The academic regulation should be read as a whole for the purpose of any interpretation.

(c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

(d) The institution may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the institution.

ACADEMIC REGULATIONS (R22) FOR B. TECH (LATERAL ENTRY SCHEME)

Applicable for students admitted into II B. Tech. from the Academic Year 2023-24 onwards.

1 Award of B. Tech. Degree

A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations:

a) A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more thansix academic years. After six academic years from the year of their admission, he/she shall **forfeit** their seat in B. Tech course and their admission stands cancelled.

b) The candidate shall register for 121 credits and secure all the 121 credits.

2.

The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech (lateral entry).

3. Promotion Rule

A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.

A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III-year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III-year II semester.

4. Award of Class

After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	Remarks
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)	From the CGPA secured from 121 Credits from II Year to IV Year
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 5.00 to < 5.75	

The Grades secured, Grade points and Credits obtained will be shown separately in the memorandum of marks.

5.

All the other regulations as applicable to **B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)**.

****

COMMUNITY SERVICE PROJECT

Introduction
1. Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
2. Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
3. Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective
Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are:
1. To sensitize the students to the living conditions of the people who are around them,
2. To help students to realize the stark realities of the society.
3. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
4. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
5. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
6. To help students to initiate developmental activities in the community in coordination with public and government authorities.
7. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project
1. Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
2. Each class/section should be assigned with a mentor.
3. Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
4. A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
5. The log book has to be countersigned by the concerned mentor/faculty in charge.
6. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
7. The final evaluation to be reflected in the grade memo of the student.
8. The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
9. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
10. Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

1. A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
2. The Community Service Project is a twofold one:
   a) First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
   b) Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –

   - Agriculture
   - Health
   - Marketing and Cooperation
   - Animal Husbandry
   - Horticulture
   - Fisheries
   - Sericulture
   - Revenue and Survey
   - Natural Disaster Management
   - Irrigation
   - Law & Order
   - Excise and Prohibition
   - Mines and Geology
   - Energy
   - Internet
   - Free Electricity
   - Drinking Water

EXPECTED OUTCOMES
BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS
Learning Outcomes
1. Positive impact on students' academic learning
2. Improves students' ability to apply what they have learned in "the real world"
3. Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
4. Improved ability to understand complexity and ambiguity

Personal Outcomes
1. Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
2. Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes
1. Reduced stereotypes and greater inter-cultural understanding
2. Improved social responsibility and citizenship skills
3. Greater involvement in community service after graduation

Career Development
1. Connections with professionals and community members for learning and career opportunities
2. Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution
1. Stronger relationships with faculty
2. Greater satisfaction with college
3. Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS
1. Satisfaction with the quality of student learning
2. New avenues for research and publication via new relationships between faculty and community
3. Providing networking opportunities with engaged faculty in other disciplines or institutions
4. A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES
1. Improved institutional commitment
2. Improved student retention
3. Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY
1. Satisfaction with student participation
2. Valuable human resources needed to achieve community goals
3. New energy, enthusiasm and perspectives applied to community work
4. Enhanced community- institution relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students
1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture

28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are:
Programmes for School Children
   1. Reading Skill Programme (Reading Competition)
   2. Preparation of Study Materials for the next class.
   3. Personality / Leadership Development
   4. Career Guidance for X class students
   5. Screening Documentary and other educational films
   6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
   7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment
   1. Government Guidelines and Policy Guidelines
   2. Women's Rights
   3. Domestic Violence
   4. Prevention and Control of Cancer
   5. Promotion of Social Entrepreneurship

General Camps
   1. General Medical camps
   2. Eye Camps
   3. Dental Camps
   4. Importance of protected drinking water
   5. ODF awareness camp
   6. Swatch Bharat
   7. AIDS awareness camp
   8. Anti-Plastic Awareness
   9. Programmes on Environment
   10. Health and Hygiene
   11. Hand wash programmes
   12. Commemoration and Celebration of important days

Programmes for Youth Empowerment Leadership
   1. Anti-alcoholism and Drug addiction
   2. Anti-tobacco
   3. Awareness on Competitive Examinations
   4. Personality Development

Common Programmes
1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

Role of Students:
1. Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
2. For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
3. As and when required the College faculty themselves act as Resource Persons.
4. Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc. or with any NGO actively working in that habitation.
5. And also, with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
6. An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks
1. Preliminary Survey (One Week)
   a) A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
   b) A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
   c) The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

2. *Community Awareness Campaigns (Two Weeks)*

   Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. *Community Immersion Programme (Four Weeks)*
   Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem withthem. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4. *Community Exit Report (One Week)*
   During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the institution. Throughout the Community Service Project, a daily log-book need to be maintained by the students' batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

ANNEXURE II

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the institution exam cell.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. Thecandidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college's expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of thatsemester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handedover to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the institution for further action and impose suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved inencouraging mal practices)
   (i) A show because notice shall be issued to the college.
   (ii) Impose a suitable fine on the college.
   (iii) Shifting the examination center from the college to another college for a specific period of notless than one year.

ANNEXURE III

Guidelines B. Tech Minors in Engineering
(Applicable from the Academic Year 2022-23 Regular and 2023-24 Lateral Students (R22))

I. INTRODUCTION

Looking to global scenario, engineering students should have knowledge of subjects from other branches and some advanced subjects of their respective branch in which they are perusing the degree. To complement the same SACET (Autonomous) has decided to take an initiative from 2022-23 in academics by introducing minor to the undergraduate students enrolled in the B. Tech. This gives a provision to the students to pursue minor other than the discipline in which student got admitted. An aspiring student can choose the courses and laboratories in any other discipline and can get a minor in the chosen specialization in addition to regular major B. Tech degree. This way undergraduates are not restricted to learn about courses only in the discipline they get admitted to, but can choose courses of their interest to later on take up a career path of their liking. The students taking up a minor course will get additional credits. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the minor. The department concerned will determine the required courses for award of minor. The subjects in minor programme would be a combination of mostly core and some electives.

II. OBJECTIVES
The objectives of initiating the minor certification are:
(a) To diversify the knowledge of the undergraduates.
(b) To make the undergraduates more employable.
(c) To have more educational and professional skills after the completion of his undergraduate courses.
(d) To give a scope to specialize students in other streams of engineering in addition to the ones they are currently pursuing.

III. Applicability and Enrolment
(a) To all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology
(b) There shall be no limit on the number of programs offered under Minor. The minor programs in emerging technologies based on expertise in the respective departments may be offered and minor can also be offered in collaboration with the relevant industries/agencies.
(c) Total number of seats offered for a minor programme shall be a maximum of 35% of sanctioned intake of major degree programme.
(d) If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.
(e) The allotment of seat into minor is based on the percentage of marks obtained in the major degree programme. Percentage of marks shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students
(f) In the event of any tie during the seat allotment for a minor, the concerned major degree department offering minor shall conduct a test/interview on the prerequisite subjects of minor and final decision shall be taken.
(g) For applicability of minor, both regular B Tech and minor courses shall be successfully completed with specified SGPA/CGPA
(h) A student shall report the principal of the college, if he/she is not interested to pursue/continue the minor programme.
(i) Transfer of credits from a particular minor to regular B. Tech or another major degree and vice-versa shall not be permitted

IV. Entry level

(a) The B. Tech students (both Regular and Lateral Entry) pursuing a major degree programme can register for minor at their choice in any other department offering minor from III semester onwards.

(b) Students registering for minor shall select the subjects from other branches. For example, if a student pursuing major degree in Electrical & Electronics Engineering shall select the subjects specified for minor in Civil Engineering and he/she will get major degree of Electrical & Electronics Engineering with minor of Civil Engineering.

(c) Student pursuing major degree in any engineering branch is eligible to register for minor in any other engineering branch. However, students pursuing major degree in a particular Engineering are not allowed to register for minor in the same engineering branch.

(d) Only those students, who have a CGPA of 7.75 or above, without any backlog, will be permitted to register for a minor.

(e) An SGPA or CGPA in excess of 7.75 has to be maintained in the subsequent semesters in major as well as minor without any backlogs in order to keep the minor registration active.

(f) Should both the SGPA and CGPA fall below 7.75 at any point after registering for the minor; the minor registration will cease to be active.

(g) A student registered for minor in a discipline must register and pass in all subjects with a minimum GPA of 7.75 that constitute requirement for award of minor.

(h) Separate CGPA shall be shown on semester and final transcripts of regular B. Tech and minor.

(i) Students shall not be permitted to register for minor after completion of VI semester.

(j) Students shall be permitted to select a maximum of two subjects per semester from the list of subjects specified for minor.

(k) The students shall complete minor without supplementary appearance within stipulated period as notified by the institution for the completion of regular major B. Tech programme.

(l) Minor shall not be awarded at any circumstances without completing the regular major B. Tech programme in which a student got admitted

(m) If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses of minor

(n) If a student failed in any registered course of the minor, he/she shall not be eligible to continue the B.Tech minor. However, the additional credits and grades thus far earned by the student shall be included in the grade card but shall not be considered to calculate the CGPA.

(o) The subjects completed under minor programme shall not be considered as equivalent subjects in case the student fails to complete the major degree programme

(p) Students completed their degree shall not be permitted to register for minor

V. Structure of Minor in B. Tech

(a) The student shall earn at least 20 credits for award of minor from other branch/ department/ discipline registered for major degree.

(b) Students can complete minor courses either in the college or in online from platforms like NPTEL/SWAYAM etc.

(c) The overall attendance in each semester of regular B. Tech courses and minor courses shall be computed separately

(d) A student shall maintain an overall attendance of 75% in all registered courses of minor to be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per college norms. On the recommendations of College Academic Council, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee of Rs. 500/-.

(e) Student having less than 65% attendance in minor courses shall not be permitted for end semester examinations.

(a) A student detained due to lack of attendance in regular B. Tech programme shall not be permitted to continue minor programme

(b) The teaching, examinations (internal and external) and evaluation procedure of minor courses offered in offline is similar to regular B. Tech courses

(c) The students may choose theory or practical courses to fulfil the minimum credit requirement.

(d) The students may be allowed to take maximum two subjects per semester pertaining to their minor

(e) The students are permitted to opt for only a single minor course in his/her entire tenure of B.Tech (Engineering)

(f) The students registered for B. Tech (Hons) shall not be permitted to register for minor

(g) The student is not permitted to take the electives courses from the parent department fulfil the minimum credit requirement.

VII. Credits requirement

(a) A Student will be eligible to get minor along with major degree engineering, if he/she completes an additional 20 credits. These may be acquired either in offline or online like NPTEL/SWAYAM

(b) Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses of minor, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two NPTEL, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

(c) The colleges offering minor courses shall be ready teach the courses in offline at their college in the concerned departments. Curriculum and the syllabus of the courses shall be approved by the Board of Studies

(d) The online NPTEL/SWAYAM subjects selected by a student shall be approved by concerned BOS. The duration of courses shall be a minimum of 14 weeks.

(e) The teaching and evaluation procedure of minor courses offering in offline mode shall be similar to that of regular B. Tech courses

(f) Students shall produce a certificate issued by the NPTEL/SWAYAM conducting agency as a proof of credit attainment

(g) The assessment and certification of the NPTEL shall be as per the prescribed norms of the NPTEL.

(h) After successful completion of all major and minor courses with specified CGPA the University will award both major and minors

(i) If a student fails to complete a course offered in online/offline, he/she will not be permitted to continue the minor

VIII. Procedure to Applying for the Minor

(a) The department offering the minor will announce specialization and courses before the start of the session.

(b) The interested students shall apply through the HOD of his/her parent department.

(c) The concerned department will announce the list of the selected students for the minor.

(d) The whole process should be completed within one week before the start of every session.

(e) Selected students shall be permitted to register the courses for minor.

IX. Registering for minor courses

(a) Each department offering the minor will submit the final list of selected students to the principal.

(b) The selected students shall submit a joining letter to the principal through the concerned HOD offering the minor. The student shall inform same to the HOD of his/her parent department.

(c) Both parent department and department offering minor shall maintain the record of student pursing the minor

(d) With the approval of Principal and suggestion of advisor, students can choose courses from the approved list and shall register the courses within a week as per the conditions laid down in the structure for the minor.

(e) Each department shall communicate the minor courses registered by the students to the time table drafting committee and accordingly time table will be drafting. Time table drafting committee shall see that no clash in time tables.

(f) If the student wishes to withdraw/change the registration of subject/course, he/she shall inform the same to advisor, subject teacher, HODs of minor department and parent department and Principal within two weeks after registration of the course.

X. Procedure for Monitoring the Progress of the Scheme

The students enrolled in the minor courses will be monitored continuously at par with the prevailing practices and examination standards. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

XI. Allocation of seats for minor

(a) The institution will notify the number of the seats for minor in the concerned department well in advance before the start of the semester

(b) Total number of seats offered for a minor programme shall be a maximum of 35% of sanctioned intake of major degree programme.

(c) The list of the elective for minor will be offered from the list of running majors in the concerned subjects. Each department of concerned institute will notify the seats for the minor well before the start of each session as per the following Table

S. No	Name of the course	Sanction seats of major degree programme	Seats offered for minor	Courses offered	Credits for each course

XII. Course Fees for registration of subjects in Minor degree

There is no fee for registration of subjects for minor degree programme offered in offlineat the respective colleges.

XIII. Examinations

(a) The examination for the minor courses offered in offline shall be conducted along with regular B. Tech programme.

(b) The examinations (internal and external) and evaluation procedure of minor courses offered in offline is similar to regular B. Tech courses.

(c) A separate transcript shall be issued for the minor subjects passed in each semester

(d) There is no supplementary examination for the failed subjects in a minor programme.

XIV. Examination Fees

Examination Fees will be as per the college norms.

Guidelines B. Tech Honors in Engineering

(Applicable from the Academic Year 2022-23 Regular and 2023-24 Lateral Students (R22))

I. INTRODUCTION

The goal of introducing B.Tech (Hons) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research. All the students pursuing regular B.Tech with prerequisite CGPA are eligible to the register Honors degree course. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the B.Tech Honors degree. The additional courses shall be advanced subjects in the concerned department/discipline. The department concerned will determine required courses for award of Honor degree. The subjects in the Honor degree would be a combination of core (theory and lab) and some electives.

II. OBJECTIVES

The objectives of initiating the B. Tech (Honors) degree certification are:
a) To encourage the undergraduates towards higher studies and research
b) To prepare the students to specialize in core Engineering streams
c) To attain the high-level competence in the specialized area of Under Graduate programme
d) To learn the best educational and professional skills in the specialized area after the completion of his undergraduate courses.
e) To provide the opportunity to learn the post graduate level courses in the specifiedundergraduate programme

III. Applicability and Enrolment

(k) To all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology
(l) The department offering Honors shall have at least one M. Tech in concerned stream, for B.Tech (Honors) registration.
(m) Total number of seats offered for a minor programme shall be a maximum of 35% of sanctioned intake of major degree programme.
(n) The allotment of seat into Honors degree is based on the percentage of marks obtained inthe major degree programme. Percentage of marks shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students
(o) In the event of any tie during the seat allotment for a Honors degree, the concerned majordegree department offering minor shall conduct a test/interview on the prerequisitesubjects of Honors degree and final decision shall be taken.
(p) For applicability of Honors degree, both regular B Tech and Honors degree courses shall be successfully completed with specified SGPA/GCPA
(q) A student shall report the concerned Principal of the college, if he/she is not interested to pursue/continue the Honors degree programme.
(r) Transfer of credits from a particular minor to regular B. Tech or another major degree and vice-versa shall not be permitted
(s) Institutions having at least two NBA accredited B.Tech/M.Tech programs can offer B.Tech(Honors). The Program should have valid NBA accreditation at the time ofregistration of the student for B.Tech (Honors).

IV. Entry level

(a) The B. Tech students (both Regular and Lateral Entry) pursuing a major degree programme can register for Honors degree at their choice in any same department offering major degree from III semester onwards
(b) Students registering for Honors degree shall select the subjects from same branches/department based on the recommendations of BOS committee. For example, ifa student pursuing major degree in Electrical & Electronics Engineering shall the selects subjects in Electrical & Electronics Engineering only and he/she will get major and Honors degree in Electrical & Electronics Engineering
(c) Only those students, who have a CGPA of 8.0 or above, without any backlog, will be permitted to

register for a Honors degree

(d) An SGPA or CGPA in excess of 8.0 has to be maintained in the subsequent semesters in major as well as Honors degree without any backlogs in order to keep the Honors degree registration active.

(e) Should both the SGPA and CGPA fall below 8.0 at any point after registering for the Honors; the Honors degree registration will cease to be active.

(f) A student registered for Honors degree in a discipline must register and pass in all subjects with a minimum GPA of 8.0 that constitute requirement for award of Honors degree.

(g) Separate SGPA/CGPA shall be shown on semester and final transcripts of regular B. Tech and minor.

(h) Students shall not be permitted to register for Honors degree after completion of VI semester.

(i) Students shall be permitted to select a maximum of two subjects per semester from the list of subjects specified for Honors degree.

(j) The students shall complete Honors degree without supplementary appearance within stipulated period as notified by the institution for the completion of regular major B. Tech programme.

(k) Honors degree shall not be awarded at any circumstances without completing the regular major B. Tech programme in which a student got admitted

(l) If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses for Honors degree

(m) If a student failed in any registered course of the Honors, he/she shall not be eligible to continue the B. Tech Honors. However, the additional credits and grades thus far earned by the student shall be included in the grade card but shall not be considered to calculate the CGPA.

(n) The subjects completed under Honors degree programme shall not be considered as equivalent subjects in case the student fails to complete the major degree programme

(o) Students completed their degree shall not be permitted to register for Honors degree

V. Structure of Minor in B. Tech

(a) The student shall earn at least 20 credits for award of Honors degree from same branch/department/discipline registered for major degree.

(b) Students can complete Honors degree courses either in the college or online from platforms like NPTEL/SWAYAM etc.

(c) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses list in the departments, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two NPTEL, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

(d) The overall attendance in each semester of regular B. Tech courses and Honors degree courses shall be computed separately

(e) A student shall maintain an overall attendance of 75% in all registered courses of Honorsto be eligible for attending semester end examinations. However, condonation for shortage of attendance between 65-75% may be given as per college norms. On the recommendations of College Academic Council, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee of Rs. 500/-.

(f) Student having less than 65% attendance in Honors courses shall not be permitted for semester end examinations.

(g) A student detained due to lack of attendance in regular B. Tech programme shall not be permitted to continue Honors programme

(h) The teaching, examinations (internal and external) and evaluation procedure of Honors degree courses offered in offline is similar to regular B. Tech courses

(i) Students may choose theory or practical courses to fulfil the minimum credit requirement.

(j) Students shall be allowed to take maximum two subjects per semester pertaining to their Honors degree

(k) The students registered for minor shall not be permitted to register for B. Tech (Honors)

VI. Credits requirement

(a) A Student will be eligible to get B. Tech (Honors), if he/she completes an additional 20 credits. These may be acquired either in offline or online like NPTEL/SWAYAM

(b) The colleges offering Honors degree courses shall be ready teach the courses in offline attheir college in the concerned departments. Curriculum and the syllabus of the courses shall be approved by the Board of Studies

(c) The online NPTEL/SWAYAM subjects selected by a student shall be approved byconcerned BOS. The duration of courses shall be a minimum of 14 weeks.

(d) The assessment and certification of the NPTEL shall be as per the prescribed norms of the NPTEL.

(e) Students shall produce a certificate issued by the NPTEL/SWAYAM conducting agencyas a proof of credit attainment.

(f) The teaching and evaluation procedure of Honors courses offering in offline mode shallbe similar to that of regular B. Tech courses

(g) After successful completion of all major and Honors degree courses with specified CGPA the University will award B. Tech (Honors)

(h) If a student fails to complete a course offered in online/offline, he/she will not be permitted to continue the Honors degree

VII. Procedure to Applying for Honors degree

(a) The department offering the Honors will announce courses required before the start ofthe session.

(b) The interested students shall apply for the Honors course to the HOD of the concerned department

(c) The concerned department will announce the list of the selected students for the minor.

(d) The whole process should be completed within one week before the start of everysession.

(e) Selected students shall be permitted to register the courses for Honors degree.

VIII. Joining in minor courses in B. Tech

(a) Each department offering the Honors degree shall submit the final list of selected students to the principal.

(b) The selected students shall submit a joining letter to the principal through the concernedHOD.

(c) The department offering Honors shall maintain the record of student pursing the Honors degree

(d) With the approval of Principal and suggestion of advisor/mentor, students can choose courses from the approved list and shall register the courses within a week as per the conditions laid down in the structure for the Honor degree.

(e) Each department shall communicate the Honors courses registered by the students to the time table drafting committee and accordingly time table will be drafting. Time table drafting committee shall see that no clash in time tables.

(f) If the student wishes to withdraw/change the registration of subject/course, he/she shall inform the same to advisor/mentor, subject teacher, HODs of minor department and parent department and Principal within two weeks after registration of the course.

IX. Procedure for Monitoring the Progress of the Scheme

The students enrolled in the Honor courses will be monitored continuously at par with the prevailing practices and examination standards. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.

X. Allocation of seats for Honors degree

(a) The institute will notify the number of the seats for Honors degree in each department well in advance before the start of the semester

(b) Total number of seats offered for Honors degree shall be a maximum of 35% of sanctioned intake of major degree programme.

(c) Each department of concerned institute will notify the seats for the minor well before thestart of each session as per the following Table

S. No	Name of the course	Sanction seats of major degree programme	Seats offered for minor	Courses offered	Credits for each course

XI. **Course Fees for registration of subjects in Major degree**

There is no fee for registration of subjects for major degree programme offered in offlineat the respective colleges.

XII. **Examinations**

(a) The examination for the Honors degree courses offered in offline shall be conductedalong with regular B. Tech programme.

(b) The examinations (internal and external) and evaluation procedure of Honors degreecourses offered in offline is similar to regular B. Tech courses.

(c) A separate transcript shall be issued for the minor subjects passed in each semester

(d) There is no supplementary examination for the failed subjects in Honors degree programme.

XIII. **Examination Fees**

Examination Fees will be as per the college norms.

JNTUK Code: F0
NAAC 'A' Grade – 1st Cycle
NAAC 'A' Grade – 2nd Cycle
Valid upto Dec. 2027

Counseling Code : ANSN
Recognized Under Section
2(f) & 12(B) of Ugc Act, 1956

St.ANN'S COLLEGE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS

(Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK, Kakinada)

ACCREDITED BY NBA & INSTITUTION OF ENGINEERS (INDIA)

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

➢ Ragging within or outside any educational institution is prohibited.

➢ Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student.

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE SACET A RAGGING FREE COLLEGE

Ragging

ABSOLUTELY
NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.

2. Ragging entails heavy fines and/or imprisonment.

3. Ragging invokes suspension and dismissal from the College.

4. Outsiders are prohibited from entering the College and Hostel without permission.

5. Girl students must be in their hostel rooms by 7.00 p.m.

6. All the students must carry their Identity Cards and show them when demanded

7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

St. ANN'S COLLEGE OF ENGINEERING & TECHNOLOGY
AUTONOMOUS

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE SACET A RAGGING FREE COLLEGE

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE AND SYLLABUS
For UG –R22
B. TECH - COMPUTER SCIENCE & ENGINEERING
(Applicable for batches admitted from 2022-2023)

ST.ANN'S COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

COURSE STRUCTURE

Year: I   Semester: I

Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
BS	22UMT01	Mathematics – I	3	1	--	--	4	30	70	100	3
BS	22UPH01	Applied Physics	3	1	--	--	4	30	70	100	3
HS	22UEN01	Communicative English	3	1	--	--	4	30	70	100	3
ES	22UCS01	Programming for Problem Solving using C	3	1	--	--	4	30	70	100	3
HS	22UEN02	English Communication Skills Laboratory	--	--	3	--	3	15	35	50	1.5
BS	22UPH02	Applied Physics Laboratory	--	--	3	--	3	15	35	50	1.5
ES	22UCS02	Programming for Problem Solving Using C Laboratory	--	--	3	--	3	15	35	50	1.5
ES	22UCS03	IT Workshop	1	--	4	--	5	15	35	50	3
MC	22UEN03	Constitution of India	2	--	--	--	2	--	--	--	0
		TOTAL	15	4	13	--	32	180	420	600	19.5
		HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course, PC-Professional Core, PE-Professional Elective, OE-Open Elective, OC-Online Course									

Year: I   Semester: II

Category	Course Code	Course Title	Theory/ Lecture (L)	Tutorial (T)	Practical/ Drawing (P)	Self-Study (SS)	Duration in hours	CIE Marks	SEE Marks	Total Marks	Credits
BS	22UMT02	Mathematics - II	3	1	--	--	4	30	70	100	3
BS	22UCH01	Applied Chemistry	3	1	--	--	4	30	70	100	3
ES	22UCS04	Data Structures	3	1	--	--	4	30	70	100	3
ES	22UCS05	Python Programming	3	1	--	--	4	30	70	100	3
ES	22UEC01	Digital Logic Design	3	1	--	--	4	30	70	100	3
BS	22UCH02	Applied Chemistry Laboratory	--	--	3	--	3	15	35	50	1.5
ES	22UCS06	Data Structures using C Laboratory	--	--	3	--	3	15	35	50	1.5
ES	22UCS07	Python Programming Laboratory	--	--	3	--	3	15	35	50	1.5
MC	22UCH03	Environmental Science	2	--	--	--	2	--	--	--	0
OC	22UOC01	SWAYAM, NPTEL, Spoken Tutorials	-	-	-	2	2	-	-	-	0
		TOTAL	17	5	9	2	33	195	455	650	19.5
		HS-Humanities & Sciences, BS-Basic Sciences, ES-Engineering Sciences, MC-Mandatory Course, PC-Professional Core, PE-Professional Elective, OE-Open Elective, OC-Online Course									

Year & Sem	I Year – I Semester					
Course Code	**22UMT01**	**L**	**T**	**P**	**SS**	**C**
Course Name	**MATHEMATICS-I**	**3**	**1**	**0**	**0**	**3**

Course Objectives:
- To instruct the concept of Matrices in solving linear algebraic equations.
- To assist the students to learn the concepts of partial differentiation.
- To enlighten the learners in the concept of differential equations.
- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.
- To make clear the students in the concepts of Multiple Integrals.

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

CO1: Apply matrix techniques to model and solve system of linear equations.
CO2: To apply the mean value theorems to real life problems.
CO3: Solve the differential equations related to various engineering fields.
CO4: Apply double integration techniques in evaluating areas bounded by region.
CO5: Student will learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensinal and 3-dimensional coordinate systems.

UNIT-I: System of Linear Equations, Eigen Values, Eigen Vectors (12 Hours)
Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Elimination method – Eigen values and Eigen vectors and properties. Cayley-Hamilton theorem (without proof) – Reduction of a matrix to Diagonal form. Applications –Finding the inverse and power of a matrix by Cayley Hamilton theorem.
Learning Resources: Text Book-1

UNIT-II: Differential Calculus   (12 Hours)

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem–Taylor's and Mac Laurin's theorems with remainders, Problems and applications on the above theorem. Partial Differentiation: Introduction–Homogeneous function–Euler's theorem–Total derivative – Chain rule – Jacobian – Functional dependence –Taylor's and Mac Laurin's series expansion of functions of two variables. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method.
Learning Resources: Text Book-1

UNIT-III: Differential Equations of First Order and First Degree (12 Hours)

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories.
Learning Resources: Text Book-1

UNIT-IV: Differential Equations of Second and Higher Order (14 Hours)

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, $e^{ax}V(x)$ and $x^nV(x)$ – Method of Variation of parameters, Cauchy and Legendre's linear equations.
Applications: LCR circuits.
Learning Resources: Text Book-1

UNIT-V: Multiple Integrals   **(14 Hours)**

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates. Applications: Finding Areas and Volumes.
Learning Resources: Text Book-1

Text Books:

1. **B.S.Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Reference Books:

1. **Dr.T.K.V.Iyengar, Dr. B.Krishna Gandhi, S.Ranganadham, Dr. M.V.S.S.N. Prasad**, a text book of Engineering Mathematics, S.Chand Publications.
2. **N.P.Bali, Manish Goyal**, A text book of Engineering Mathematics, Lakshmi Publications
3. **B.V.Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc.Graw Hill Education.
4. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10th Edition, Wiley-India.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	3
CO2	2	2	2	2	-	-	-	-	-	-	-	3
CO3	2	2	2	2	-	-	-	-	-	-	-	3
CO4	3	3	2	2	-	-	-	-	-	-	-	3
CO5	3	3	3	2	-	-	-	-	-	-	-	3

Year & Sem	I Year – I Semester					
Course Code	**22UPH01**	**L**	**T**	**P**	**SS**	**C**
Course Name	**APPLIED PHYSICS**	**3**	**1**	**0**	**0**	**3**

This course centers on unifying essential theoretical concepts of Physics governing the physical properties of materials to interpret them from the perspective of engineering and technical applications.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides seamless consolidation of basic principles of Physics and applications. It emphasizes on modern technological advancement relevant to the latest developments in the fields of science, engineering, and technology and to have an insight into Dielectric and magnetic materials, principles of quantum mechanics, and electron dynamics of solids from the perspective of optoelectronic devices.

1. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications
2. Understand the mechanism of emission of light, utilization of lasers as coherent light sources for low and high energy applications, study of propagation of light through optical fibers and their implications in optical communications.
3. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of de Broglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals and band theory for crystalline solids. Metals- Semiconductors-Insulators concepts utilization of transport phenomenon of charge carriers in semiconductors.
4. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
5. To Understand the physics of optoelectronic devices and working mechanism of display devices.

Course Outcomes:

1. Select the concepts of Physical Optics in view of engineering applications. Apply the knowledge of dielectric and magnetic materials to analyse them.
2. Grade the wavelengths of Lasers for suitable applications in the field of industry, medicine and communication and foster the knowledge on optical fibers.
3. Appraise electron dynamics based on quantum principles.
4. Choose dielectric and magnetic material to demonstrate the functioning of electric and electronic devices.
5. Judge the performance of optoelectronic devices based on their construction.

Unit-I: Wave Optics **12hrs**
Interference:
Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index. **Diffraction:** Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). **Polarization:** Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit Outcomes:
- The students will be able to Explain the need of coherent sources and the conditions for sustained interference (L2)
- Identify engineering applications of interference (L3)
- Analyze the differences between interference and diffraction with applications (L4)
- Illustrate the concept of polarization of light and its applications (L2)
- Classify ordinary polarized light and extraordinary polarized light (L2)

Unit-II: Lasers and Fiber optics **8hrs**
Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers. **Fiber optics:** Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.
Unit Outcomes:
- The students will be able to Understand the basic concepts of LASER light Sources (L2)
- Apply the concepts to learn the types of lasers (L3)
- Identifies the Engineering applications of lasers (L2)
- Explain the working principle of optical fibers (L2)
- Classify optical fibers based on refractive index profile and mode of propagation (L2)
- Identify the applications of optical fibers in various fields (L2)

Unit III: Quantum Mechanics, Free Electron Theory and Band theory **10hrs**
Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well. **Free Electron Theory:** Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory-Fermi-Dirac distribution- Density of states (3D) - Fermi energy. **Band theory of Solids:** Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Unit Outcomes:
- The students will be able to explain the concept of dual nature of matter (L2)
- Understand the significance of wave function (L2)

- Interpret the concepts of classical and quantum free electron theories (L2)
- Explain the importance of K-P model¬ Classify the materials based on band theory (L2)
- Apply the concept of effective mass of electron (L3)

Unit-IV: Dielectric and Magnetic Materials 8hrs

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossotti equation. **Magnetic Materials:** Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Eddy currents- Ferrites-Engineering applications.

Unit Outcomes:
- The students will be able to Explain the concept of dielectric constant and polarization in dielectric materials (L2)
- Summarize various types of polarization of dielectrics (L2)
- Interpret Lorentz field and Claussius- Mosotti relation in dielectrics(L2)¬
- Classify the magnetic materials based on susceptibility and their temperature dependence (L2)
- Explain the applications of dielectric and magnetic materials (L2)
- Apply the concept of magnetism to magnetic data storage devices (L3)

Unit V: Semiconductors, Opto Electronic Devices and Nano Materials 10 hrs

Semiconductors: Bands in solids- Valence and conduction band, effective mass (Qualitative), Intrinsic and extrinsic semiconductors-P type and N type, Donor and acceptor levels (Qualitative), Determination of energy gap in semiconductors. Drift and Diffusion currents, Einstein relations, Direct and indirect semiconductors, **Opto electronic Devices:** Photo voltaic effect, Solar cell, Photo detectors, Photodiodes-PIN and APD, Principle and working of LED, Liquid crystal display (LCD), Applications of opto electronic devices.

Text books:

1. M.N.Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and PoonamTandon, Oxford press (2015).
3. Applied Physics by P.K.Palanisamy SciTech publications.

Reference Books:
1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Shatendra Sharma, Jyotsna Sharma, "Engineering Physics", Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
5. Semiconductor physics and devices- Basic principle – Donald A, Neamen, McGraw Hill
6. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	3	-	-
CO3	3	-	3	3	3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	3	-	-	-	-	-	3	-	-

Year & Sem	I Year – I Semester					
Course Code	**22UEN01**	**L**	**T**	**P**	**SS**	**C**
Course Name	**COMMUNICATIVE ENGLISH**	**3**	**1**	**0**	**0**	**3**

Introduction

With the growing importance of English for global communication and the emphasis on training the learners to gain communicative competence, the syllabus is designed to develop linguistic and communicative competence of the engineering students. The major focus of the syllabus is to enhance the communicative ability, with the focus on the language skills, grammar, vocabulary of the learners and to improve the learner's ability to use English language effectively in social, academic and professional contexts. There is a shift from learning about the language to using the language. Thereby enables the learner to appear confidently for international language qualification tests like IELTS, TOEFL, BEC Etc.

Course Objectives:

- Help students develop effective listening skills so that they can understand academic lectures and native English speakers' speech.
- Encourage the development of speaking abilities by taking part in exercises like role-playing, dialogues, and organized talks / oral presentations.
- Pay special attention to effective reading techniques for understanding a range of academic literature and real-world resources.
- Introduce useful writing techniques and illustrate them by summarizing, composing essays with a clear structure, recording and reporting relevant information.
- Increase vocabulary and grammatical knowledge, and promote proper use of words both in speech and writing.

Course Outcomes:

At the end of the module, the learners will be able to

- Comprehend social or transactional discussions presented by native English speakers and recognize the context, subject, and specific information.
- Introduce one self and others and engage in general conversation about well-known subjects.
- Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information.
- Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs
- Form sentences using proper grammatical structures and correct word forms.

Unit- 1
Lesson-1: The Scare Crow by Satyajit Ray from Panorama, a course on reading, Oxford publications. Listening: Listening to short audio texts and identifying the topic. Listening to prose and conversations. **Speaking:** Asking and answering general questions on familiar topics such as home, family, work studies and interests. Self-introduction and introducing others. **Reading:** Skimming text to get the main idea. Scanning to look for specific pieces of information. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices, linkers, signposts and transition signals; mechanics of writing - punctuation, capital letters.

Vocabulary: Synonyms and Antonyms, Affixes.

Grammar: Content words and function words, word forms.

Unit-2
Lesson-1: Nehru's letter to his daughter Indira on her birthday from "**Infotech English**", Maruthi Publications.
Listening: Answering a series of questions about the main idea and supporting ideas after listening to audio texts, both in speaking and writing.

Speaking: Discussion in pairs / small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings. **Reading**: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing**: Summarizing - identifying main idea and rephrasing what is read; avoiding redundancies and repetitions. **Vocabulary**: Synonyms and Antonyms, Root words **Grammar**: Parts of Speech.

Unit- 3

Lesson-1: Telephone Conversation by Wole Soyinka

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing. **Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing. **Reading**: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading. **Writing**: Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV's.
Vocabulary: Synonyms and Antonyms, Word Formation

Grammar: **Verbs, Subject Verb agreement, Common Errors.**

Unit 4

Lesson-1: Water the Elixir of life by C.V.Raman

Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving

information/directions. Functional English: Permissions, Requesting, Inviting. **Reading**: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs / tables, writing for media. **Vocabulary**: Synonyms and Antonyms, Phrasal verbs.

Grammar: Tenses, correction of sentences.

Unit 5

Lesson-1: Stay Hungry-Stay foolish from "**Infotech English**", Maruthi Publications

Listening: Identifying key terms, understanding concepts and interpreting the concepts both inspeaking and writing, TEDX Videos. **Speaking:** Formal oral presentations on topics from academic contexts - without the use of PPTslides. Functional English: Suggesting/Opinion giving. **Reading**: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques. **Reading for Writing**: Writing academic proposals- writing research articles: format and style. **Vocabulary**: Synonyms and Antonyms, Idioms and Phrases. **Grammar**: Voices, Degrees of comparison & Reported speech.

Suggested books:

1. **Infotech English**", Maruthi Publications.
2. **"Panorama, a course on reading", Oxford publications**
3. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
4. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
5. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
6. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012
7. https://onlinecourses.nptel.ac.in/noc20_hs19/preview
8. https://nptel.ac.in/courses/109106094
9. https://news.stanford.edu (Steve Jobs' Speech)

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	1	3	1	1
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	-
CO5	-	-	-	-	-	-	-	-	-	2	-	-

Year & Sem	I Year – I Semester					
Course Code	**22UCS01**	**L**	**T**	**P**	**SS**	**C**
Course Name	**PROGRAMMING FOR PROBLEM SOLVING USING C**	**3**	**1**	**0**	**0**	**3**

Course Objectives:
The objectives of Programming for Problem Solving Using C are
- To learn about the computer systems, computing environments, developing of a computerprogram and Structure of a C Program
- To gain knowledge of the operators, selection, control statements and repetition in C
- To learn about the design concepts of arrays, strings
- To assimilate about pointers, dynamic memory allocation
- To assimilate about File, I/O and significance of functions

Course Outcomes:
Upon the completion of the course the student will learn
CO1: To write algorithms and to draw flowcharts for solving problems and to convert flowcharts/algorithms to C Programs, compile and debug programs
CO2: To use different operators, data types and write programs that use two-way/ multi-way selection
CO3: To select the best loop construct for a given problem
CO4: To design and implement programs to analyze the different pointer applications
CO5: To decompose a problem into functions and to develop modular reusable code and to apply File I/O operations

UNIT-I
Introduction to Computers: Computer Systems - Block Diagram of Computer, Hardware, Software, Algorithms, Flow Charts, Pseudocode **Introduction to the C Language:** Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples. **Structure of a C Program:** Expressions, types of expressions, Precedence and Associativity, Evaluating Expressions, Type Conversion Statements, Simple Programs.

UNIT-II
Bitwise Operators: Logical Bitwise Operators, Shift Operators, Programming Examples. **Selection & Making Decisions:** Logical Data and Operators, Two Way Selection, Multi waySelection, Programming examples. **Repetition:** Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Looping Applications, Programming Examples.

UNIT-III
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Examples. **Strings:** String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions, Programming Examples.

UNIT-IV
Functions: Designing, Structured Programs, Function in C, User Defined Functions, Types of functions, Standard Functions, Passing Array to Functions and Passing Pointers to Functions, Recursion, Scope - Global Scope, Local Scope, Function Scope, and Storage Classes. **Pointers:** Introduction - Definition, Declaration, Initialization, Accessing, Benefits of Pointers, Why Pointers, Pointers to pointers, Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application.

UNIT-V
Structures and Union: Structure- Definition, Declaration, Accessing, Initialization, Arrays in Structures, Array of Structures, Structure Pointers, structures and functions, Unions and Programming Examples. **Files:** Files, Streams, Types of Files- Text and Binary Files, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions, Programming Examples

Text Books:
1) Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2) The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson.
Reference Books:
1) Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2) Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3) Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, OXFORD.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3	1	2									
CO3	3		1									
CO4		2	3	2	3							
CO5		1		2	3							

Year & Sem	I Year – I Semester					
Course Code	**22UEN02**	**L**	**T**	**P**	**SS**	**C**
Course Name	**ENGLISH COMMUNICATION SKILLS LAB**	**0**	**0**	**3**	**0**	**1.5**

Course Objectives

- Learners learn the basics of phonetics- recognize phonetic symbols and facilitates the learners' use of dictionary for pronunciation.
- To enhance the articulation of the sounds and pronunciation of words.
- To improve the communication skills and clarity of speech.
- To enhance effective communication skills.
- Enables learners to speak and communicate confidently.

Course Outcomes:

By the end of the semester the learners develop

1. Proper and accurate articulation of the sounds by following standard pronunciation of words and communicate intelligibly.
2. Speaking fluently with neutral accent.
3. Clarity of speech.
4. To communicate in various contexts using choice of appropriate expressions.
5. To acquire several communicative functions. Thereby enable to interact in different social and work situations.

The course material is divided into five units.

Unit 1:

Introduction and importance of phonetics. Letters and Sounds, Sounds of English (Consonant Sounds, Vowel Sounds)

Unit 2

Pronunciation and pronunciation rules, Plural and past tense marker rules.

Unit 3:

Syllable, word stress, stress in mono, di, and poly syllabic words, stress in compound words, contrastive, word stress, Rhythm and Intonation.

Unit 4:

Just A Minute (JAM)

Unit 5:

Group Discussions and Interview Skills

Suggested books:

1. Infotech English, Maruthi Publications (with Compact Disc).
2. English Pronunciation in use- Mark Hancock, Cambridge University Press.
3. English Pronunciation Dictionary- Daniel Jones, Cambridge University Press.
4. English Phonetics for Indian Students- P. Bala Subramanian, Mac Millan Publications.
5. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju
6. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
7. Cornerstone, Developing soft skills, Pearson Education Technical Communication- Meenakshi Raman, Sangeeta Sharma, Oxford University Press.
8. https://nptel.ac.in/courses/109106067

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPINGS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	3	-	1
CO5	-	-	-	-	-	-	-	-	-	3	-	-

Year & Sem	I Year – I Semester					
Course Code	**22UPH02**	**L**	**T**	**P**	**SS**	**C**
Course Name	**APPLIED PHYSICS LABORATORY**	**0**	**0**	**3**	**0**	**1.5**

(Any 10 of the following listed experiments)

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart &Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

References:
1. S. Balasubramanian, M.N. Srinivasan "A Text Book of Practical Physics"- S Chand Publishers, 2017

Course learning objectives
1. To gain practical knowledge by applying the experimental methods to correlate with the Physics theory. 2. To learn the usage of electrical and optical systems for various measurements.
3. Apply the analytical techniques and graphical analysis to the experimental data.
4. To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.

Course Outcomes (COs)
At the end of the course, the student will be able to
1. Apply the various procedures and techniques for the experiments.
2. Use the different measuring devices and meters to record the data with precision.
3. Apply the mathematical concepts/equations to obtain quantitative results.
4. Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	3	-	-	-	-	-	-	-
CO2	3	-	-	-	3	-	-	-	-	-	-	-
CO3	2	-	-	-	3	-	-	-	-	-	-	-
CO4	3	-	-	-	3	-	-	-	-	-	-	-

Year & Sem	I Year – I Semester				
Course Code	**22UCS02**	**L**	**T**	**P**	**SS**	**C**
Course Name	**PROGRAMMING FOR PROBLEM SOLVING USING C LAB**	**0**	**0**	**3**	**0**	**1.5**

Course Objectives:
- Apply the principles of C language in problem solving.
- To design flowcharts, algorithms and knowing how to debug programs.
- To design & develop of C programs using arrays, strings pointers & functions.
- To review the file operations.

Course Outcomes:
By the end of the Lab, the student
CO1: Gains Knowledge on various concepts of a C language.
CO2: Able to draw flowcharts and write algorithms.
CO3: Able design and development of C problem solving skills.
CO4: Able to design and develop modular programming skills.
CO5: Able to trace and debug a program

Exercise 1:
1. Write a C program to print a block F using hash (#), where the F has a height of sixcharacters and width of five and four characters.
2. Write a C program to compute the perimeter and area of a rectangle with a height of 7inches and width of 5 inches.

Exercise 2:
1. Write a C program to calculate the distance between the two points.
2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3:
1. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.
2. Write a C program to calculate the factorial of a given number.

Exercise 4:
1. Write a program in C to display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.
2. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5:
1. Write a program to display all prime numbers less than n
2. Write a program to display the following output format

1				
2	2			
3	3	3		
4	4	4	4	
5	5	5	5	5

Exercise 6:
    1.Write a program in C to separate odd and even integers in separate arrays.
    2.Write a program in C to sort elements of array in ascending order.

Exercise 7:
    1.Write a program in C for multiplication of two square Matrices.
    2.Write a program in C to find transpose of a given matrix

Exercise 8:
    1.Write a program in C to compare two strings without using string library functions.
    2.Write a program in C to copy one string to another string.

Exercise 9:
    1.Write a c program to read and display the details of an employee using structure
    2. Write a c program to demonstrate array of structures

Exercise 10:
    1.Write a program in C to demonstrate the use of & (address of) and *(value at address)operator.
    2.Write a C program to find sum of n elements entered by user using pointers
    3.Write a C Program to Store Information Using Structures with Dynamically MemoryAllocation

Exercise 11:
    1.Write a program in C to swap elements using call by reference
    2.Find factorial of given number using recursion
    3. Write a program in C to get the largest element of an array using the function

Exercise 12:
    1.Write a program in C to append multiple lines at the end of a text file.
    2.Write a program in C to copy a file in another name.
    3.Write a program in C to remove a file from the disk

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	2							1
CO2	3			2	3							1
CO3		3		2	3							1
CO4	3	2		2	3							1
CO5	3		2	2	3							1

Year & Sem	I Year – I Semester					
Course Code	**22UCS03**	**L**	**T**	**P**	**SS**	**C**
Course Name	**IT WORKSHOP**	**1**	**0**	**4**	**0**	**3**

Course Objectives:
The objective of this lab is to
- Explain the internal parts of a computer, peripherals, I/O ports, connecting cables
- Demonstrate basic DOS commands
- Describe about Antivirus tools
- Demonstrate Office Tools such as Word processors, Spreadsheets and Presentationtools

Course Outcomes:
CO1: By the end of this lab the student is able to Assemble and disassemble components of a Personal Computer
CO2: By the end of this lab the student is familiar with DOS commands
CO3: By the end of this lab the student is familiar Viruses
CO4: By the end of this lab the student is able to work on Word, Power Point and MS Excel

List of Experiments:

UNIT-1
Block diagram of a computer, Identification of peripherals of a PC, Laptop, Server, Smart phones, prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/Output devices, I/O ports and Interfaces, Main Memory, Cache memory and Secondary Storage Devices, Digital Storage Basics, Networking Components and Speeds.
Experiment -1: Identification of peripherals.
Experiment -2: Assembling, Dissembling of a computer.

UNIT-2
Software: Definition, Software types, Application Software, System Software**.**
Experiment -1: DOS Commands.

UNIT-3
MSWord: Creating a Document, Formatting, Bullets and Numbering, Page Settings, Headerand Footer, Insert Word Art, Clip Art, Tables.
Experiment -1: Demonstrate and practice on word Formatting (Bold, Italic, Underline, Alignments, Fonts, Sizes, Headings etc.,)
Experiment -2: Demonstrate and Practice on Page Settings, Margins, Header and Footer**.**
Experiment -3: Demonstrate and Practice on WordArt, ClipArt.
Experiment -4: Demonstrate and Practice on Table Creation.

UNIT-4
MS Excel: Create work sheet and work book, Search for data with in a Web, Insert Rows, Columns, Hiding of Rows and Columns, Renaming of Worksheet, Adjust Row Height and Column Width, Create Tables.
Experiment -1: Create a Table, Perform sum and average of a sheet.

Experiment -2: Adjust Row height and Column width of a Table as per the Requirements

UNIT-5
MS Power Point: Create and Manage Presentation, Slide transition and Animation,
WWW,Web Browser, Virus, Antivirus, Creating mails.
Experiment -1: Create a PPT on a Topic of your Choice.
Experiment -2: Create a mail id with your Roll Number

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1									1
CO2	3	1	1									1
CO3	3	1	1	2	3							2
CO4	3	3	3	2	3							2

Year & Sem	I Year – I Semester					
Course Code	**22UEN03**	**L**	**T**	**P**	**SS**	**C**
Course Name	**CONSTITUTION OF INDIA**	**2**	**0**	**0**	**0**	**0**

Course Objectives:
- To Enable the student to understand the importance of Constitution
- To understand the structure of Executive, Legislature and Judiciary
- To understand philosophy of Fundamental Rights and Duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and High Court Controller and Auditor General of India and Election Commission of India.
- To understand the Central and State relation Financial and Administrative.

Course Outcomes:
At the end of the semester/course, the student will be able to have a clear knowledge on the following:
- Understand Historical Background of the Constitution Making and its importance for building a Democratic India.
- Understand the functioning of three wings of the Government i.e., Executive, Legislative and Judiciary.
- Understand the value of the Fundamental Rights and Duties for becoming good citizen of India.
- Analyze the decentralization of power between Central, State and local Self-Government.
- Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining Democracy.
1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State Government and its Administration.
3. Get acquainted with Local Administration and Panchayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on Roles and Functioning of Election Commission.

UNIT-I
Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and Constitutional History, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning outcomes:
After completion of this unit student will
● Understand the concept of Indian Constitution
● Apply the knowledge on Directive Principle of State Policy
● Analyze the History, Features of Indian Constitution
● Evaluate Preamble Fundamental Rights and Duties

UNIT-II
Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, Power and Position, PM and Council of Ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions

Learning outcomes: -After completion of this unit student will
● Understand the structure of Indian Government
● Differentiate between the State and Central Government
● Explain the role of President and Prime Minister
● Know the Structure of Supreme Court and High court

UNIT-III
State Government and its Administration Governor - Role and Position - CM and Council of Ministers, State Secretariat: Organization, Structure and Functions

Learning outcomes: -After completion of this unit student will
● Understand the structure of State Government
● Analyze the role of Governor and Chief Minister
● Explain the role of State Secretariat
● Differentiate between Structure and Functions of State Secretariat

UNIT-IV
A. Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root Democracy

Learning outcomes: -After completion of this unit student will
● Understand the Local Administration
● Compare and contrast District Administration role and importance
● Analyze the role of Mayor and elected representatives of Municipalities
● Evaluate Zilla panchayat block level organization

UNIT-V
Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women

Learning outcomes: -After completion of this unit student will
● Know the role of Election Commission apply knowledge
● Contrast and compare the role of Chief Election Commissioner and Commissionerate
● Analyze role of State Election Commission
● Evaluate various commissions of viz SC/ST/OBC and women

References:
1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd.. NewDelhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice –Hall of India Pvt. Ltd. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-resources:
1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	-	-	-	-
CO2	-	-	-	-	-	1	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	2	-	-	-	-
CO4	-	-	-	-	-	-	-	1	-	-	-	-
CO5	-	-	-	-	-	1	-	-	-	-	-	-

Year & Sem	I Year – II Semester					
Course Code	**22UMT02**	**L**	**T**	**P**	**SS**	**C**
Course Name	**MATHEMATICS-II**	**3**	**1**	**0**	**0**	**3**

Course Objectives:
- To illuminate the different numerical methods to solve nonlinear algebraic equations.
- To give a definition of Interpolation as it relates to mapping / surveying.
- To familiarize the Laplace, transform techniques in solving the Differential Equations.
- To familiarize the Fourier Series expansions for periodic functions.
- To furnish the learners with basic concepts Fourier Transform techniques to lead them into advanced level by handling various real-world applications.

Course Outcomes:

At the end of the course, the student will be able to

CO1: Evaluate the approximate roots of polynomial and Transcendental equations by different algorithms

CO2: Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals.

CO3: Apply the Laplace transform for solving differential equations.

CO4: Find or compute the Fourier series of periodic signals.

CO5: Apply integral expressions for the forwards and inverse Fourier transform to arrange of non - Periodic wave forms.

UNIT-I Iterative Methods   **(12 Hours)**

Introduction– Bisection method–Secant method – Method of false position– Iteration method –Newton - Raphson method (One variable only) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.
Learning Resources: Text Book – 1

UNIT-II Interpolation   **(12 Hours)**

Introduction – Errors in polynomial interpolation – Finite differences – Forward differences–Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with un equal intervals –Lagrange's interpolation formula – Newton's divide difference formula.
Learning Resources: Text Book - 1

UNIT-III   Laplace Transforms and Inverse Laplace Transforms   **(14 Hours)**

Laplace transforms –Definition and Laplace transforms of some certain functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function –Dirac's delta function Periodic function – Inverse Laplace transforms – Convolution theorem (without proof).
Applications: Solving ordinary differential equations (initial value problems)

using Laplace transforms.

Learning Resources: Text Book – 1

UNIT IV Fourier Series   (12 Hours)

Introduction– Periodic functions – Fourier series of periodic function – Dirichlet's conditions– Even and odd functions–Change of interval– Half - range sine and cosine series.

Learning Resources: Text Book – 1

UNIT V Fourier Transforms   (14 Hours)

Fourier integral theorem (without proof) – Fourier sine and cosine integrals –Sine and cosine transforms – Properties – inverse transforms –Convolution theorem (without proof) – Finite Fourier transforms.

Learning Resources: Text Book - 1

Text Books:

1. **B.S.Grewal,**Higher Engineering Mathematics, 44thEdition, Khanna Publishers.

Reference Books:
1. **Dr.T.K.V. Iyengar, Dr. B. Krishna Gandhi, S. Ranganadham, Dr. M.V.S.S.N. Prasad**, A text book of Engineering Mathematics, S. Chand Publications.
2. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. **N.P. Bali, Manish Goyal**, A text book of Engineering Mathematics, Lakshmi Publications
4. **Erwin Kreyszig,** Advanced Engineering Mathematics, 10thEdition, Wiley-India.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	3
CO2	3	2	3	2	-	-	-	-	-	-	-	3
CO3	2	2	2	2	-	-	-	-	-	-	-	2
CO4	2	3	3	2	-	-	-	-	-	-	-	2
CO5	3	3	2	2	-	-	-	-	-	-	-	3

Year & Sem	I Year – II Semester					
Course Code	**22UCH01**	**L**	**T**	**P**	**SS**	**C**
Course Name	**APPLIED CHEMISTRY**	**3**	**1**	**0**	**0**	**3**

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

COURSE OBJECTIVES

1. Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
2. Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented
3. Explain the preparation of nanomaterials, engineering applications of nanomaterials, superconductors, preparation of semiconductors and applications of Hall effect.
4. Importance of Non-conventional Energy Resources, its design and working along with Fuel cells and Spectroscopic techniques.
5. Outline the basics of computational chemistry and molecular switches.

COURSE OUTCOMES:

1. Analyze types of plastics, methods of fabrication, the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.
2. Understand the theory of construction of electrodes, batteries in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.
3. Understand synthesis of nanomaterials for modern advances of engineering technology analyze the applications of super conductors. Summarize the preparation of semiconducting; analyse the applications of Hall effect.
4. Analyze different models of energy harnessing from different natural sources and also working and applications of Fuel cells and Spectroscopic Techniques.
5. Understand the knowledge of computational chemistry and molecular machines.

UNIT I: POLYMER TECHNOLOGY

(8hrs)

Polymerization: -Introduction, types and methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Types, Compounding, Fabrication (compression, injection, blowing and extrusion moldings), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers: -Introduction, vulcanization of rubber, advantages of vulcanized rubber, preparation, properties and applications (Buna S, Thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable and biomedical polymers.

Course Outcomes: At the end of this unit, the students will be able to **Analyze** types of plastics, methods of fabrication, the different types of composite plastic materials and interpret the mechanism of conduction in conducting polymers.

UNIT II: ELECTRO CHEMICAL CELLS AND CORROSION   (**10hrs**)

Electrochemical cell, Single electrode potential, standard hydrogen electrode, calomel electrode, construction of glass electrode, electrochemical series and uses of series, galvanic series, differentiation between electrochemical series and galvanic series, batteries (Dry cell, Li ion battery and zinc air cells).**Corrosion**: -Definition, factors influencing rate of corrosion, theories of corrosion (direct chemical attack and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating [nickel]),Paints(constituents and special paints).

Course Outcomes: At the end of this unit, the students will be able to **Utilize** the theory of construction of electrodes, batteries in redesigning new engineering products and categorize the reasons for corrosion and study methods to control corrosion.

UNIT III: MATERIAL CHEMISTRY   (10hrs)

PART I:
NANOMATERIALS:
Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerences, carbon nanotubes (types, preparation and applications).
Super conductors: TypeI, TypeII, characteristics and applications
PART II:
Non–elemental semiconducting materials:
Stoichiometric, controlled valency& chalcogen photo / semiconductors-preparation of semi conducting (distillation, zone refining, czochralski crystal pulling, epitaxy, diffusion, ion implantation) – semiconducting devices (p-n junction diode as rectifier, junction transistor).
Magnetic materials: ferro and ferri magnetism – Hall effect and its applications.
Course outcomes: at the end of this unit, the students will be able to
- **Synthesis** nanomaterials for modern advances of engineering technology analyze the applications of superconductors.
- **Summarize** the preparation of semiconducting; analyze the applications of Hall effect.

UNIT IV: NON–CONVENTIONAL ENERGY SOURCES & FUEL CELLS   (8hrs)

NON–CONVENTIONAL ENERGY SOURCES:
Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, hydropower, geothermal power, tidal and wave power, ocean thermal energy conversion.
Fuel cells: Construction, Working and Applications (H2-O2, CH3OH-O2, phosphoric acid and molten carbonate). **Spectroscopic techniques:** Electromagnetic spectrum, UV laws of absorption, instrumentation, chromophores and auxochromes, intensity shifts and applications. FTIR instrumentation and applications.
Course outcomes: At the end of this unit, the students will be able to
- **Design** models for energy by different natural sources.
- **Analyze** the working of and applications of Fuel cells.

UNIT V: ADVANCED CONCEPTS / TOPICS IN CHEMISTRY   (8 hrs)

Computational chemistry: Introduction to computational chemistry, molecular modelling and docking studies, **Molecular switches:** characteristics of molecular motors and machines, rotaxanes and catenanes as Artificial molecular machines, prototypes – linear motions in rotaxanes, an acid – base controlled molecular shuttle, a molecular elevator, an autonomous light -powered molecular motor.

Course out comes: At the end of this unit, the students will be able to

• **Obtain** the knowledge of computational chemistry and molecular machines.

Standard books:
1. P.C. Jainand M.Jain "**Engineering Chemistry**", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "**Engineering Chemistry**", Cambridge University Press, New Delhi, (2019).
3. Shashi Chawla, "**Engineering Chemistry**", Dhanpat Rai Publication Co. (Latest edition).

Reference Books:
1. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry**", Pearson India Edn.
2. O.G. Palana, "**Engineering Chemistry**", Tata Mc. Graw Hill Education Private Limited, (2009).
3. CNR Rao and JM Honig (Eds) "**Preparation and characterization of materials**" Academic press, NewYork (latest edition).
4. B.S. Murthy, P. Shankar and others, "**Text book of Nano science and Nano technology**", University press (latest edition).

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	1	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	2	-	-	-	-	-	-	1

Year & Sem	I Year – II Semester					
Course Code	**22UCS04**	**L**	**T**	**P**	**SS**	**C**
Course Name	**DATA STRUCTURES**	**3**	**1**	**0**	**0**	**3**

Course Objectives:
The objective of the course is to
- Introduce the fundamental concept of data structures and abstract data types
- Emphasize the importance of data structures in developing and implementing efficientalgorithms
- Describe how arrays, records, linked structures, stacks, queues, trees, and graphs arerepresented in memory and used by algorithms

Course Outcomes:
After completing this course, a student will be able to:
CO1: Discuss various sorting & searching Techniques
CO2: Use linked structures in writing programs
CO3: Use Stacks and Queues in Writing Programs
CO4: Use Trees in writing programs and demonstrate different methods for traversing trees
CO5: Demonstrate Graphs and Graph Traversals.

UNIT I
Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.
Searching - Linear search, Binary search, Fibonacci search.
Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radixsort), merging (Merge sort) algorithms.

UNIT II
Linked List: Introduction, Single linked list, Representation of Linked list in memory, Operations on Single Linked list-Insertion, Deletion, Search and Traversal, Reversing Single Linked list, Applications on Single Linked list- Polynomial Expression Representation, Addition, Sparse Matrix Representation using Linked List, Advantages and Disadvantages of Single Linked list, Double Linked list-Insertion, Deletion, Circular Linked list-Insertion, Deletion.

UNIT III
Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, linked list Representation of Stacks, Operations on Linked Stack, Applications-Reversing list, Factorial Calculation, Infix to Postfix Conversion, Evaluating Postfix Expressions.
Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues- Circular Queues, Deques, Priority Queues.

UNIT IV
Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Treesusing Arrays and Linked lists. Tree Traversal – In order, Preorder, Post order. Heaps –Definition,Max Heap, Min Heap, Insertion and Deletion from Max Heap, Heap sort, Binary Search Trees – Basic Concepts, BST Operations: Insertion and Deletion.

UNIT V
Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path, Transitive closure, Warshall's Algorithm.

Text Books:
1) Data Structures Using C. 2nd Edition. Reema Thareja, Oxford.
2) Data Structures and algorithm analysis in C, 2nded, Mark Allen Weiss.

Reference Books:
1) Fundamentals of Data Structures in C, 2nd Edition, Horowitz, Sahni, UniversitiesPress.
2) Data Structures: A PseudoCode Approach, 2/e, Richard F.Gilberg, Behrouz A. Forouzon,Cengage.
3) Data Structures with C, Seymour Lipschutz TMH

e-Resources:
1) http://algs4.cs.princeton.edu/home/
2) https://faculty.washington.edu/jstraub/dsa/Master_2_7a.pdf

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3							2
CO2	3	1	2	2	3							1
CO3	3	1	2	2	3							2
CO4	3	3	2	2	3							2
CO5					1							2

Year & Sem	I Year – II Semester					
Course Code	**22UCS05**	**L**	**T**	**P**	**SS**	**C**
Course Name	**PYTHON PROGRAMMING**	**3**	**1**	**0**	**0**	**3**

Course Objectives:
The Objectives of Python Programming are
- To learn about Python programming language syntax, semantics, and the runtimeenvironment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution,loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:
CO1: Develop essential programming skills in computer programming concepts like data types, containers
CO2: Apply the basics of programming in the Python language
CO3: Solve coding tasks related conditional execution, loops
CO4: Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming
CO5: Design applications using GUI and Handle Exceptions

UNIT I
Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.
Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and CharacterSets, Using functions and Modules.
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.
Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops

UNIT II
Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration the While Loop
Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

UNIT III
List and Dictionaries: Lists, Defining Simple Functions, Dictionaries
Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top-Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.
Modules: Modules, Standard Modules, Packages.

UNIT IV

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read (), readline () and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributesand destructors, Real time use of class in live projects, Inheritance, overlapping and overloadingoperators, Adding and retrieving dynamic attributes of classes, Programming using Oops support **Design with Classes:** Objects and Classes, Data modeling Examples, Case Study An ATM,Structuring Classes with Inheritance and Polymorphism

UNIT V

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs,Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming: Introduction to Programming Concepts with Scratch.

Text Books

1) Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.

2) Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:

1) Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.

2) Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2							1
CO2	2	2	1	1	2							1
CO3	2	2	1	1	2							1
CO4	3	2	1	1	2							1
CO5	2	2	1	1	2							1

Year & Sem	I Year – II Semester					
Course Code	**22UEC01**	**L**	**T**	**P**	**SS**	**C**
Course Name	**DIGITAL LOGIC DESIGN**	**3**	**1**	**0**	**0**	**3**

Course Learning Objectives: This course will enable the students to
- Study about the number systems, complements, signed binary numbers and binary codes.
- Study about Boolean algebra; illustrate map method for minimization of switching functions.
- Design combinational logic circuits like Adders, Subtractors, Decoders, and Encoders.
- Describe Latches and Flip-Flops
- Learn about counters and registers.

Course Outcomes:

After completion of this course, the students will be able to

CO1: Define different number representation and conversion from one radix to other.
CO2: Explain the minimization techniques using Boolean algebra and K-map method.
CO3: Analyze and design the combinational logic circuits.
CO4: Design the sequential circuits using Flip-Flops.
CO5: Design the registers and counters.

UNIT- I: Number Systems

Number Systems: Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit binary codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc.

UNIT -II: **Boolean algebra**

Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical Forms, Minterms and Maxterms, Karnaugh Maps-3,4 variables, don't – Care terms, POS and SOP Simplification, NAND/ NOR Implementation, Logic gates.

UNIT –III: **Combinational Logic**

Analysis and design procedure for combinational logic, Adders and Subtractors, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator.
Programmable logic devices: PROM, PAL, PLA

UNIT- IV: Synchronous Sequential Logic

Introduction to Sequential Circuits: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

UNIT -V: Registers and Counters

Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

TEXT BOOKS:

1. Digital Design, M.Morris Mano, Michael D Ciletti, PEA.
2. Switching and finite automata theory Zvi.KOHAVI, Niraj.K.Jha 3rdEdition,Cambridge UniversityPress,2009
3. Switching theory and logic design by Hill and Peterson, Mc-Graw Hill TMH edition, 2012.

REFERENCE BOOKS:

1. Modern Digital Electronics, R.P. Jain, TMH.
2. Switching Theory and Logic Design by A. Anand Kumar, PHI Learning pvt ltd, 2016.
3. Digital fundamentals by Thomas L. Floyd, Pearson EDU India.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	3	1	2	-	-	-	-	-	-	2
CO4	3	3	3	1	2	-	-	-	-	-	-	2
CO5	3	3	3	1	2	-	-	-	-	-	-	2

Year & Sem	I Year – II Semester					
Course Code	**22UCH02**	**L**	**T**	**P**	**SS**	**C**
Course Name	**APPLIED CHEMISTRY LABORATORY**	**0**	**0**	**3**	**0**	**1.5**

Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn^{+2} using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Cu^{+2} using standard hypo solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Fe^{+3} by a colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).
9. Determination of pH by using pH-meter.
10. Determination of the concentration of strong acid vs strong base (by conductometric method).
11. Determination of strong acid vs strong base (by potentiometric method).
12. Determination of Mg^{+2} present in an antacid.
13. Determination of $CaCO_3$ present in an egg shell.
14. Estimation of Vitamin C.
15. Determination of phosphoric content in soft drinks.
16. Adsorption of acetic acid by charcoal.
17. Preparation of nylon-6, 6 and Bakelite (demonstration only).
Of the above experiments at-least 10 assessment experiments should be completed in a semester.

Outcomes:
   The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus, at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.

Reference Books
   1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	-	-	-	-	-	-	-	1
CO2	3	3	2	2	-	-	-	-	-	-	-	1
CO3	3	3	3	1	2	-	-	-	-	-	-	2
CO4	3	3	3	1	2	-	-	-	-	-	-	2
CO5	3	3	3	1	2	-	-	-	-	-	-	2

Year & Sem	I Year – II Semester				
Course Code	**22UCS06**	**L**	**T**	**P**	**SS**	**C**
Course Name	**DATA STRUCTURES USING C LABORATORY**	**0**	**0**	**3**	**0**	**1.5**

Course Objectives:
The objective of this lab is to
- Demonstrate the different data structures implementation.

Course Outcomes:
By the end of this lab the student is able to
CO1: Use various searching and sorting algorithms
CO2: Use basic data structures such as arrays and linked list.
CO3: Programs to demonstrate fundamental algorithmic problems including Stacks, Queues and Tree Traversals.

List of Experiments:

Exercise -1 (Searching)
a) Write C program that use both recursive and non-recursive functions to perform Linearsearch for a key value in a given list.
b) Write C program that use both recursive and non-recursive functions to perform Binarysearch for a key value in a given list.

Exercise -2 (Sorting-I)
a) Write C program that implement Bubble sort, to sort a given list of integers in ascendingorder
b) Write C program that implement Quick sort, to sort a given list of integers in ascendingorder
c) Write C program that implement Insertion sort, to sort a given list of integers in ascendingorder

Exercise -3(Sorting-II)
a) Write C program that implement radix sort, to sort a given list of integers in ascendingorder
b) Write C program that implement merge sort, to sort a given list of integers in ascendingorder

Exercise -4(Singly Linked List)
a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion operation on a singly linked list
c) Write a C program that uses functions to perform deletion operation on a singly linked list
d) Write a C program to reverse elements of a single linked list.

Exercise -5(Stack)
 a) Write C program that implement stack (its operations) using arrays
 b) Write C program that implement stack (its operations) using Linked list
 c) Write a C program that uses Stack operations to evaluate postfix expression

Exercise -6(Queue)
 a) Write C program that implement Queue (its operations) using arrays.
 b) Write C program that implement Queue (its operations) using linked lists

Exercise -7(Binary Tree)
 d) Write a recursive C program for traversing a binary tree in preorder, in order and post order.

Exercise -8(Binary Search Tree)
 a) Write a C program to Create a BST
 b) Write a C program to insert a node into a BST.
 c) Write a C program to delete a node from a BST.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3							2
CO2	3	1	2	2	3							2
CO3	3	1	2	2	3							2

Year & Sem	I Year – II Semester					
Course Code	**22UCS07**	**L**	**T**	**P**	**SS**	**C**
Course Name	**PYTHON PROGRAMMING LABORATORY**	**0**	**0**	**3**	**0**	**1.5**

Course Objectives:
The Objectives of Python Programming are
- To learn about Python programming language syntax, semantics, and the runtimeenvironment
- To be familiarized with universal computer programming concepts like data types,containers
- To be familiarized with general computer programming concepts like conditionalexecution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Course Outcomes:
CO1: Develop essential programming skills in computer programming concepts like data types, containers
CO2: Apply the basics of programming in the Python language
CO3: Solve coding tasks related conditional execution, loops
CO4: Solve coding tasks related to the fundamental notions and techniques used in object-oriented programming

List of Experiments:
1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3) Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5) Use a for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.
*
**
***
****
6) Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7) Write a program that asks the user for two numbers and prints Close if the numbers are within .001 of each other and not close otherwise.
8) Write a program that asks the user to enter a word and prints out whether that word contains any vowels.

9) Write a program that asks the user to enter two strings of the same length. Theprogram should then check to see if the strings are of the same length. If they are not the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters abcde and ABCDE the program should print out AaBbCcDdEe.

10) Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.

11) In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4yor 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.

12) Write a program that generates a list of 20 random numbers between 1 and 100.
   (a) Print the list.
   (b) Print the average of the elements in the list.
   (c) Print the largest and smallest values in the list.
   (d) Print the second largest and second smallest entries in the list
   (e) Print how many even numbers are in the list.

13) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.

14) Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.

15) Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].

16) Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts toinches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, it is much shorter with lists and it is also easier to add new conversions if you use lists.

17) Write a function called sum digits that is given an integer num and returns the sum of the digits of num.

18) Write a function called first_diff that is given two strings and returns the first locationin which the strings differ. If the strings are identical, it should return -1.

19) Write a function called number_of_factors that takes an integer and returns how many factors the number has.

20) Write a function called is_sorted that is given a list and returns True if the list is sorted and False otherwise.

21) Write a function called root that is given a number x and an integer n and returns x1/n. In the function definition, set the default value of n to 2.

22) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.

Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.

(a) Do this using the sort method. (b) Do this without using the sort method.

23) Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in

a smaller word can't exceed the number of occurrences of the letter in the user's word.

24) Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.

25) Write a program that reads a list of temperatures from a file called temps.txt, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.

26) Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, andthe regular price of the product. There should be a method get_price that receives the numberof items to be bought and returns the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called make purchase that receives the number of items tobe bought and decreases amount by that much.

27) Write a class called Time whose only field is a time in seconds. It should have a method called convert_to_minutes that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called convert_to_hours that returns a string of hours, minutes, and seconds formatted analogously to the previous method.

28) Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. Forexample, using the Converter object created above, the user could call c.feet() and shouldget 0.75 as the result.

29) Write a Python class to implement pow (x, n).

30) Write a Python class to reverse a string word by word.

31) Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.

32) Write a program to demonstrate Try/except/else.

33) Write a program to demonstrate try/finally and with/as.

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) and (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	2							1
CO2	2	2	1	1	2							1
CO3	2	2	1	1	2							1
CO4	3	2	1	1	2							1

Year & Sem	I Year – II Semester					
Course Code	**22UCH03**	**L**	**T**	**P**	**SS**	**C**
Course Name	**ENVIRONMENTAL SCIENCE**	**2**	**0**	**0**	**0**	**0**

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

COURSE OBJECTIVES

The objectives of the course are to impart:
- Overall understanding of the natural resources.
- Basic understanding of the ecosystem and its diversity.
- Acquaintance on various environmental challenges induced due to unplanned Anthropogenic activities.
- An understanding of the environmental impact of developmental activities.
- Awareness on the social issues, environmental legislation and global treaties.

COURSE OUTCOMES

CO1: The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources

CO2: The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web

CO3: The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity

CO4: Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices

CO5: About environmental assessment and the stages involved in EIA and the environmental audit.

UNIT-I:

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects; Role of information technology in environment and human health.
Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem; Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food

chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-II:

Natural Resources: Natural resources and associated problems.

Forest resources: Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT-III:

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, man- wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his wellbeing.
Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V:

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting - Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act - Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness. **Environmental Management**: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Green business and green politics. The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Text Books:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers,Vijayawada
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford UniversityPress.
3. EnvironmentalStudies,P.N.Palanisamy,P.Manikandan, A.Geetha,andK.Manjula Rani; PearsonEducation,Chennai

Reference:

1. TextBook of Environmental Studies, Deeshita Dave & P.UdayaBhaskar, CengageLearning.
2. A Textbook of Environmental Studies, Shaashi Chawla, TMH, NewDelhi
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, NewDelhi
4. Perspectives in Environment Studies, Anubha Kaushik, C P Kaushik, NewAge InternationalPublishers,2014

Contribution of Course Outcomes (CO's) towards the achievement of programme outcomes (PO's) (Strong – 3, Moderate – 2, Weak – 1)

CO – PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			3			2	3					
CO2			3			2	3					
CO3			3			2	3					
CO4			3			2	3					
CO5			3			2	3					