R22

ACADEMIC REGULATIONS, COURSE STRUCTURE, AND DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2022-23)

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2023-2024)

Offered under Choice Based Credit System (CBCS)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC- AUTONOMOUS)

Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTUH
Accredited by NAAC with 'A' Grade. Accredited by NBA

(Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097)

College

Vision:

Imparting Knowledge and instilling skills to the aspiring students in the field of Engineering, Technology, Science and Management to face the emerging challenges of the society.

Mission:

- Encouraging scholarly activities that transfer knowledge in the areas of Engineering, Technology, Science and Management.

- Ensuring students of all levels, well trained to meet the needs of education and their future endeavors.

- Inculcating human values and ethics into the education system for the all-round development of the students.

Department

About Department:

Department of CSE Established in the year 2005, with an intake of 240, M.Tech in CSE with an intake of 24.It has Sophisticated infrastructural, state-of-art labs and experienced faculty. The department is keen in academic exposure of the students to the latest domain trends by conducting a series of Seminars and workshops are organized regularly to help the faculty and students to update their knowledge about the latest tools and technologies. We give additional inputs to the students to meet the corporate needs and expectations. The training that we give and the syllabus we have designed for training apart from university curriculum fills the gap between the University and the Industry. It is updated regularly to keep up with the growing demands and the changing trends of the software industry and research laboratories. It helps students enhance their skills and leave the campus with a sense of total fulfillment. Whether it is intelligent gaming, mobile applications, IOT, cloud computing, data security, social networks, or bio-informatics the heart of CSE with action rules. In view of all these academic activities, the department has been accredited by NBA.

Vision:

Enhance learning that promotes techno graduates aiming employability and entrepreneurship with human values to face the challenges in the global technological society.

Mission:

- Empowering students for professional career and higher studies by providing hands on experience and value education to become successful technocrats in the society.

- Nurturing students with interpersonal and entrepreneurial skills, so that they gain ability to work as a team.

- Imparting quality education, employability skills and techno ethical values among the students for the benefit of the society.

R22

ACADEMIC REGULATIONS, COURSE STRUCTURE, AND DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2022-23)

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2023-2024)

Offered under Choice Based Credit System (CBCS)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

(UGC- AUTONOMOUS)

Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTUH
Accredited by NAAC with 'A' Grade. Accredited by NBA

(Medbowli, Meerpet, Balapur(M), Hyderabad, Telangana- 500097)

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
(UGC Autonomous)

ACADEMIC REGULATIONS - R22

Applicable to

B Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2022-23)

B Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2023- 2024)

Offered under Choice Based Credit System (CBCS)

1.0 <u>Under</u> <u>Graduate Degree</u> <u>Programme in Engineering & Technology (UGP in E&T)</u>

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE (TKREC) offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice BasedCredit System (CBCS) in all branches of Engineering with effect from the Academic Year 2022-23

2.0. Eligibility for Admission

2.1. Admission to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAMCET) or the University or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.

2.2. The medium of instructions for the entire undergraduate programme in Engineering & Technology will be **English** only.

3.0 B.TECH. PROGRAMME STRUCTURE

3.1. A student after securing admission shall complete the B.Tech. programme in a minimumperiod of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester,failing which student shall forfeit seat in B.Tech course. Each student shall secure 160 credits (with CGPA ≥ 5) required for the completion of the undergraduate programme and award of the B.Tech. Degree.

3.2. UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

3.2.1. Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each and in each semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum /course structure suggested by AICTE are followed.

3.2.2 Credit Courses

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits) structure based on the following general pattern.

   ❖ One credit for one hour/ week/ semester for Theory/ Lecture (L) courses or Tutorials.

   ❖ One credit for two hours/ week/ semester for Laboratory/ Practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

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

has followed almost all the guidelines issued by AICTE/UGC.

S. NO.	CATEGORY	Suggested breakup of credits (Total 160)
1	Humanities and Social sciences including Management	10*
2	Basic Sciences	22.5*
3	Engineering Sciences courses including Workshop, Drawing, basics of Electrical /Mechanical / Computer etc.	18.5*
4	Professional Core Courses	63*
5	Professional Elective Courses relevant to chosen specialization/branch	19*
6	Open Electives-Electives from other technical and/or emerging subjects	9*
7	Project work, Seminar and Internship in Industry or elsewhere	18*
8	Mandatory courses [Environmental Sciences, Induction Training, Indian Constitution, Essence of Indian Traditional Knowledge]	(non- credit)
	Total	**160***

* Variation is allowed as per the need of the respective disciplines.

3.2.4. Subject Code Classification

The subject codes of various branches in TKREC Regulations are formulated using the following Procedure

Regulation, Branch, Semester, Classification, S. No.

Regulation	20, 21, 22, …., and so on
UG Branch	Corresponding branch code like CE,EE …..etc
Semester	01, 02, 03, 04, 05, 06, 07, 08
Classification	HS-Humanities and Sciences, BS-Basic Sciences, ES-Engineering Sciences, PC- Professional Core, PE- Professional Elective, OE-Open Elective, PW-Project Work
S. No.	01 to 09

4.0. COURSE REGISTRATION

4.1. A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

4.2. The academic section of the college invites 'registration forms' from students before the beginning of the semester through 'on-line registration', ensuring 'date and time stamping'. The on-line registration requests for any 'current semester' shall be **completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester**'.

4.3. A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor / counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor / Counselor and the student.

4.4. A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s) / course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA/ CGPA, and completion of the '**pre-requisites**' as indicated for various subjects / courses, in the department course structure and syllabus contents.

4.5. Choice for '**additional subjects/ courses**', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor / Mentor / HOD.

4.6. If the student submits ambiguous choices or multiple options or erroneous entries during **on-line** registration for the subject(s) / course(s) under a given/ specified course group/ category as listed in the course structure, only the first mentioned subject/ course in that category will be taken into consideration.

4.7. Subject / course options exercised through **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week** after the commencement of class-work for that semester.

4.8. Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.

4.9**. Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat / should not match with any category (Professional Core, Professional Electives, and Mandatory Courses etc.) of subjects even in the forthcoming semesters.

4.10**. Professional Electives**: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

5.0. SUBJECTS / COURSES TO BE OFFERED

5.1. A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.

5.2. More than **one faculty member** may offer the **same subject** (lab/ practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice for students will be based on - '**first come first serve** basis and CGPA criterion' (i.e. the first focus shall be on early **on-line entry** from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

5.3. If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject / course for **two (or multiple) sections**.

5.4. In case of options coming from students of other departments/ branches/ disciplines (not considering **open electives**), first **priority** shall be given to the student of the '**parent department**'.

6.0. ATTENDANCE REQUIREMENTS

6.1. A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects/ courses (including attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab) for that semester. **Two periods** of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. **This attendance should alsobe included in the attendance submitted every fortnight to the College Examination Branch.**

6.2. Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3. A stipulated fee shall be payable for condoning of shortage of attendance.

6.4. Shortage of attendance below 65% in aggregate shall in **NO** case be condoned.

6.5. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled, including all academic credentials (internal marks etc.) of that semester**. They will not be promoted to the next semester.** They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be re- registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6. A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0. ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendancerequirements mentioned in Item No. **6**.

7.1. A student shall be deemed to have satisfied the academic requirements and earned the credits

allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks including minimum 35% of average Mid-Term examinations for 25 marks) in the internal examinations, not less than 35% (21 marks out of 60 marks) in the semester end examination, and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing **'C'** grade or above in that subject/ course.

7.2. A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Industry Oriented Mini Project / Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time ResearchProject (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such 'one reappearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3. **Promotion Rules**

S. No.	Promotion	Conditions to be fulfilled
1	**First year first semester to firstyear second semester**	**Regular course of study of first year first semester.**
2	**First year second semester to Second year first semester**	**(i) Regular course of study of first yearsecond semester.** **(ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whetherthe student takes those examinations or not.**
3.	**Second year first semester to Second year second semester**	**Regular course of study of second year first semester.**
4	**Second year second semester toThird year first semester**	**(i) Regular course of study of second year second semester.**

		(ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	**Third year first semester to Thirdyear second semester**	**Regular course of study of third year first semester.**
6	**Third year second semester to Fourth year first semester**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second Semester from all the relevant regular and supplementary examinations,whether the student takes those examinations or not.**
7	**Fourth year first semester toFourth year second semester**	**Regular course of study of fourth year first semester.**

7.4. A student (i) shall register for all courses /subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA $\geq$ 5.0 (in each semester), and CGPA $\geq$ 5 (at the end of 8 semesters), (iv) **passes all the mandatory courses,** to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA **(at the end of undergraduate programme),** and shall be indicated in the grade card / marks memo of IV-year II semester.

7.5. If a student registers for '**extra subjects**' (in the parent department or other departments / branches of Engg.) other than those listed subjects totaling to 160 credits as specified in the course structure of his department, the performances in those '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such '**extra subjects**' registered, percentage of marks and letter grade alone will be indicated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items 6 and 7.1 – 7.4 above.

7.6. A student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (thereby failing to secure **'C'** grade or above) may reappearfor that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

7.7. A student **detained in a semester due to shortage of attendance may be re-admittedin the same semester in the next academic year for fulfillment of academic requirements**. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

7.8. A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits.** The academic regulations under which the student has been readmitted shall be applicable to him.

8.0. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

8.1. The performance of a student in every subject / course (including practical and Project Stage – I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination).

8.2. In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of one part for 30 marks with a total duration of 2 hours as follows:

> 1. Midterm Examination in descriptive mode for 30 marks:

The remaining 10 marks of Continuous Internal Assessment (out of 40) are distributed as:

> 2. Assignment for 5 marks. (Average of 2 Assignments each for 5marks)
>
> 3. Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the concerned subject for 5 marks.

The descriptive paper shall contain 5 full questions out of which, the student has to answer all the questions, each carrying 6 marks and internal choice may be given. Average of two mid-term examinations (I Mid-Term & II Mid-Term) will be taken as final marks for mid-term examinations (For 30 marks).

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). 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. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

❖ The student, in each subject, shall have to earn 35% of marks(i.e.14 marks out of 40 marks) in CIE, 35% of marks (i.e.21 marks out of 60) in SEE and overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together to get pass grade (i.e. **C**) or above.

❖ The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 continuous Internal Examination (CIE) marks.

❖ In case, the student appears for Semester End Examination of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled in spite of appearing the SEE.

There is NO Computer Based Test (CBT) for R22 regulations.

8.2.1 The semester end examinations (SEE), for theory subjects, will be conducted for 60 marks consisting of two parts viz. i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

❖ Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.

❖ Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each 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.

The duration of Semester End Examination is 3 hours.

The details of evaluation of end semester exam are as follows

❖ Double evaluation of the answer scripts for the External Examinations is followed.

❖ The average of the two evaluations shall be considered as final marks.

❖ If the difference of two valuations is more than or equal to 15 marks, third evaluation shall be recommended.

❖ If any difference appeared in the marks after the third valuation also, average of two evaluations will be considered whose difference is minimum, as final marks.

The details of challenging valuation of end semester exam are as follows

❖ There shall not be any recounting or re-evaluation for all subjects as the double valuation was adopted. But, the students will be given a chance to apply for challenging valuation for all the theory Subjects (no Practical/lab subjects) within one week from the date of declaration of results.

❖ Whenever the students apply for challenge valuation of answer scripts of semester end examinations, the students should submit their applications (through the HOD) within one week from the date of declaration of the results to the Examination Branch by paying Rs.10,000 (Rupees Ten Thousand only) per subject, in the form of Demand Draft, Drawn in Favor of "TKREC AUTONOMOUS". Any application received after the due date of submission for Challenge valuation, shall not be accepted under any circumstances.

On receipt of the DD

The answer script of the applied subject will be shown to the candidate to verify whether it belongs to him or not and the script will be evaluated by the senior faculty of the college appointed by the Controller of examinations. If there is any change in marks (Equal or above 15% of the maximum marks) the new marks will be awarded to the student. Otherwise, there will be no change in old marks. If the change in marks (Equal or above 15% of the maximum marks) occurs, an amount of Rs.9,000/- will be refunded to the student. Otherwise, the student will forfeit the total amount which he /she paid.

8.2.2. For the subject, Computer Aided Engineering Graphics, the Continuous Internal Evaluation(CIE) and Semester End Examinations (SEE) evaluation pattern is same as for other theory subjects.

8.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components / procedure, expected outcome) which shall be evaluated for 10 marks.
2. **10 marks for viva-voce (**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before

semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the college.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

10 marks for write-up

15 marks for experiment/program

15 marks for evaluation of results

10 marks for presentation on another experiment / program in the same laboratory course and

10 marks for viva-voce on concerned laboratory course

❖ The student, in each subject, shall have to earn 35% of marks(i.e.14 marks out of 40 marks) in CIE, 35% of marks (i.e.21 marks out of 60) in SEE and overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together to secure Pass grade (i.e. "C") or above.

❖ The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 continuous Internal Examination (CIE) marks.

❖ In case, the student appears for Semester End Examination of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled in spite of appearing the SEE.

8.4 The evaluation of courses having ONLY internal marks in I-Year I Semester and II- Year II Semester is as follows:

1) I Year I Semester course (*ex., Elem ents of CE / ME / EEE / ECE / CSE*): The Continuous Internal Evaluation (CIE) is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e. 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule,or (ii) secures less than 40% marks in this course.

For CSE / IT and allied branches the Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts i) Part – A for 20 marks, ii) Part – B for 20 marks with a total duration of 2 hours.

Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks.

Part B: Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce / PPT / Poster Presentation / Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

For all other branches, the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

a) A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks

b) 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

c) Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 15 marks.

d) The remaining 15 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

2) II Year II Semester *Real-Time (or) Field-based Research Project* course: The Continuous Internal Evaluation (CIE) is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations are the final for 50 marks. Student shall have to earn 40%, i.e. 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (iii) secures less than 40% marks in this course..

8.5. There shall be Industry training (or) Internship (or) Industry oriented Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation /semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project

shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Industry Oriented Mini Project (or) Internship etc, Internal Supervisor and a SeniorFaculty Member of the Department. There shall be **NO internal marks** for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project.

8.6. The UG project shall be initiated at the end of the IV Year I Semester and the durationof the project work is one semester. The student must present Project Stage – I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his project work.

8.7. UG project work shall be carried out in two stages: Project Stage – I for approval of project before Mid-II examinations in IV Year I Semester and Project Stage – II during IV Year II Semester. Student has to submit project work report at the end of IV Year IISemester. The project shall be evaluated for 100 marks before commencement of SEE Theory examinations.

8.8. For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule.

A student who has failed may reappear once for the above evaluation, when it is scheduled again; if he fails in such 'one re appearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.9. For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20marks and Project Supervisor shall evaluate for 20 marks. The topics for Industry Oriented Mini Project / Internship / SDC etc. and the main Project shall be different fromthe topic already taken. The student is deemed to have failed, if he / she (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum totalof the CIE and SEE taken together.

For conducting viva-voce of project, Controller and Principal selects an external examiner from the list of experts in the relevant branch submitted by the HOD concerned

A student, who has failed, may reappear once for the above evaluation, when it is scheduled again; if student fails in such 'one re appearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.10. A student shall be given one time chance to re-register for a maximum of two subjects in a semester

➢ If the internal marks secured by a candidate in the continuous Internal Evaluation marks for 40 (sum of average of two mid-term exams and two assignments & subject Viva-voce / PPT / Poster presentation / Case Study on the topic in concerned subject) are less than 35% and failed in those subjects.

➢ A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the class work in next academic year.

In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled

9.0 GRADING PROCEDURE

9.1. Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/ Practical's / Industry-Oriented Mini Project/Internship / SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

9.2. As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B+ (Good)	7

50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

9.3. A student who has obtained an 'F' grade in any subject shall be deemed to have 'failed' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4. To a student who has not appeared for an examination in any subject, 'Ab' grade will be allocated in that subject, and he is deemed to have 'Failed'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

9.5. A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6. A student earns Grade Point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'Credit Points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a course

9.7. A student passes the subject/course only when GP ≥ 5 ('C' grade or above)

9.8. The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (∑CP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

$$\textbf{SGPA} = \{\sum_{i=1}^{n} \textbf{Ci Gi}\} / \{\sum_{i=1}^{n} \textbf{Ci}\} \dots \textbf{For each semester},$$

where 'i' is the subject indicator index (considering all subjects in a semester), 'N' is the no. of subjects '**registered**' for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the ith subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

9.9. The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses (of 160) in **all** semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

$$\textbf{CGPA} = \{ \sum_{j=1}^{m} \textbf{Cj Gj} \} / \{ \sum_{j=1}^{m} \textbf{Cj} \} \text{ for all S Semesters Registered}$$

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M'** is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered'** i.e., from the 1st semester onwards up to and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the jth subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that jth subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

SGPA = 152/21 = 7.24

Illustration of Calculation of CGPA up to 3rd Semester:

Semester	Course/ Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24

II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	69		Total Credit Points	518

CGPA = 518/69 = 7.51

The calculation process of CGPA illustrated above will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. programme.

9.10. For merit ranking or comparison purposes or any other listing, **only** the '**rounded off**' values of the CGPAs will be used.

9.11. SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0. PASSING STANDARDS

10.1. A student shall be declared successful or 'passed' in a semester, if he secures a GP ≥ 5 ('C' grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA ≥ 5.00 ('C' grade or above) for the award of the degree as required.

10.2. After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits

earned. **There is NO exemption of credits in any case.**

11.0. Declaration of results

11.1. Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2. For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

$$\% \text{ of Marks} = (\text{final CGPA} - 0.5) \times 10$$

12.0. Award of Degree

12.1. A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA $\geq$ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have '**qualified'** for the award of B.Tech. Degree in the branch of Engineering selected at the time of admission.

12.2. A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3. A student with final CGPA (at the end of the undergraduate programme) > 8.00, and fulfilling the following conditions - shall be placed in '**First Class with Distinction'.**
However, he

(i)   Should have passed all the subjects/courses in '**First Appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(ii)   Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA > 8 shall be placed in **'First Class'.**

12.4. Students with final CGPA (at the end of the undergraduate programme) $\geq$ 7.0 but < 8.00 shall be placed in **'First Class'.**

12.5. Students with final CGPA (at the end of the undergraduate programme) $\geq$ 6.00 but < 7.00, shall be placed in '**Second Class'**.

12.6. All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme) $\geq$ 5.00 but < 6, shall be placed in '**pass class'**.

12.7. A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

12.8. Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

12.9**. Award of 2-Year B.Tech. Diploma Certificate**

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) up to B. Tech. – II Year – II Semester, if the student want to exit the 4-Year B. Tech. program. The student **once opted and awarded for 2-Year UG Diploma Certificate, the student will not be permitted to join** in B. Tech. III Year – I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree.

2. A student may be permitted to take one year break after completion of II Year – II Semester or B. Tech. – III Year – II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0 WITHHOLDING OF RESULTS

13.1 If the student has not paid the fees to the College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

14.0. TRANSITORY REGULATIONS

A.   For students detained due to shortage of attendance:

(1) A Student who has been detained in I year of R20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech./B. Pharmacy programme within the stipulated period of eight academic years from the date of first admission in I Year.

(2) A student who has been detained in any semester of II, III and IV years of R20 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech./B. Pharmacy within the

stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

(i) A student of **R20** Regulations who has been detained due to lack of credits, shall be promoted to the next semester of **R22** Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The total credits required are 160 including both **R20 & R22** regulations. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The **R22** Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in **R22** Regulations:

(i) A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

(ii) The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case**.

(iii) If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the University.

Note: If a student readmitted to R22 Regulations and has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the College Principals concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

15.0 STUDENT TRANSFERS

15.1. There shall be no branch transfers after the completion of admission process.

15.2. There shall be no transfers from one college/stream to another within the college.

15.3. The students seeking transfer to TKREC from various other Universities / institutions have to pass the failed subjects which are equivalent to the subjects of TKREC, and also pass the subjects of TKREC which the students have not studied at the earlier institution. Further, though the students

have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of TKREC, the students have to study those subjects in TKREC in spite of the fact that those subjects are repeated.

15.4 The transferred students from other Universities/Institutions to TKREC who are on rolls are to be provided one chance to write the CBT (for internal marks) in the **equivalent subject(s)** as per the clearance letter issued by the University.

15.5 The College will provide one chance to write the internal examinations in the equivalent subject(s) to the students transferred from other Universities/ institutions to TKREC who are on rolls, as per the clearance equivalence) letter issued by the University.

16.0 SCOPE

16.1. The academic regulations should be read as a whole, for the purpose of any interpretation.

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

16.3. The University may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the University authorities.

16.4. Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

****

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE

ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME) FROMTHE AY 2023-24

1. **Eligibility for the award of B.Tech Degree (LES)**

   The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.

2. The student shall register for 120 credits and secure 120 credits with CGPA $\geq$ 5 from II year to IV-year B.Tech Programme (LES) for the award of B.Tech. degree.

3. The students, who fail to fulfill the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5. **Promotion rule**

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester

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

7. LES students are not eligible for 2-Year B. Tech. Diploma Certificate.

****

MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices /Improper conduct	Punishment
	If the candidate:	
1.(a)	Possesses or keeps accessible in examination hall, any paper, notebook, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject to 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 to 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 the relevant material will be kept in the Examinations Branch.

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 practicals 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 College 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. The candidate is also de barred for two consecutive semesters from class work and all **College** 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/	In case of students of the college, they shall be expelled from

	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 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.	examination halls and cancellation of their performance in that subject and allot her 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.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any par there of 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 **College** 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 colleges 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. Person(s) who do not belong to the College will be handed over 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 **Controller/Principal** for further action to award suitable punishment.	

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
(UGC-Autonomous)
Approved by AICTE, Affiliated to JNTUH, Accreditated by NAAC- 'A' Grade
Medbowli, Meerpet, Balapur, Hyderabad, Telangana-500097
Mob: 9393959597.   Email: info@tkrec.ac.in,deanacademics@tkrec.ac.in

---

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R22 REGULATION

COURSE STRUCTURE & SYLLABUS

B.TECH I SEMESTER

FOR
B. TECH COURSE
(Applicable for the batches admitted 2022-2023)

B Tech I Semester (R22)

S. No	Subject Code	Subject Name	Hours per			Credits
			L	T	P	
1	22MA101BS	Matrices and Calculus	3	1	0	4
2	22CH102BS	Engineering Chemistry	3	1	0	4
3	22CS103ES	Programming for Problem Solving	3	0	0	3
4	22EE104ES	Basic Electrical Engineering	2	0	0	2
5	22ME105ES	Computer Aided Engineering Graphics	1	0	4	3
6	22CS106ES	Elements of Computer Science & Engineering	0	0	2	1
7	22CH107BS	Engineering Chemistry Laboratory	0	0	2	1
8	22CS108ES	Programming for Problem Solving Laboratory	0	0	2	1
9	22EE109ES	Basic Electrical Engineering Laboratory	0	0	2	1
		TOTAL	12	2	12	20

22MA101BS: MATRICES AND CALCULUS

(Common toCE, EEE,ECE,CSE,IT,AIML&CSG)

B.Tech I Year I Sem.   **L   T   P   C**
                                                                           3   1   0   4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn
- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solvingthe system of linear equations.
- Concept of eigen values and eigenvectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematicalproblems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

Course outcomes: After learning the contents of this paper the student must be able to

CO1: Write the matrix representation of a set of linear equation s and to analyze the solution of the system of equations

CO2. Find the Eigen values and Eigen vectors and reduce the quadratic form to canonical form using

orthogonal transformations.

CO3. Apply the mean value theorems and evaluate the improper integrals using Beta and Gamma functions.

CO4. Find the extreme values of functions of two variables with / without constraints.

CO5. Evaluate the multiple integrals and apply the concept to find areas, volumes.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		1								1		
CO2	2	3												
CO3	2	2		1								1		
CO4	2	1		1	2							1		
CO5		1										1		

UNIT - I: Matrices

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT - II: Eigen values and Eigen vectors
Linear Transformation and Orthogonal Transformation: Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction ofQuadratic form to canonical forms by Orthogonal Transformation.

UNIT - III: Calculus
Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series.
Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT - IV: Multivariable Calculus (Partial Differentiation and applications)
Definitions of Limit and continuity.
Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration)
Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.
Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th Editon, 2016.

REFERENCE BOOKS:
1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9[th]Edition,Pearson, Reprint,2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

22CH102BS/ 22CH202BS: ENGINEERING CHEMISTRY

B.Tech I Year I Sem.   **L   T   P   C**
                                                                                                 3   1   0   4

Course Objectives:
- To bring adaptability to new developments in Engineering Chemistry and to acquire the skillsrequired to become a perfect engineer.
- To include the importance of water in industrial usage, fundamental aspects of batterychemistry, significance of corrosion it's control to protect the structures.
- To imbibe the basic concepts of petroleum and its products.
- To acquire required knowledge about engineering materials like cement, smart materials andLubricants.

Course Outcomes:
1. Apply the principle of potable water for industrial and domestic purposes.
2. Identify the electrolytic and electrochemical cells with different types of batteries and make use of corrosion control methods in industry.
3. Explore the fundamental properties of polymers and other materials in engineering field.
4. Distinguish various types of fuels and their applications in day-to-day life.
5. Develop understanding of engineering materials like cement, smart materials and Lubricants.

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2	2					2		
CO2	3	2				2	2					3		
CO3	3	2				2	2					2		
CO4	3	2	1				2					3		
CO5	3	2					2					2		

UNIT - I: Water and its treatment:
Introduction to hardness of water — Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation
- Determination of F^- ion by ion- selective electrode method.
Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water — Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion — theories of chemical and electrochemical corrosion — mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods-Cathodic protection – Sacrificial anode and impressed current methods.

UNIT - III: Polymeric materials:

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples — Nylon 6:6, Terylene**Plastics:** Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).**Rubbers:** Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokolrubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction intrans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources:

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification-solid fuels: coal –analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT - V: **Engineering Materials:**

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinylamides

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism

of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point,pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K.Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:
1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

22CS103ES: PROGRAMMING FOR PROBLEM SOLVING

B.Tech I Year I Sem.

	L	T	P	C
	3	0	0	3

Course Objectives:

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

Course Outcomes: The student will learn

1. Build the algorithm for the given unsolved problems.

2: Apply the concepts of arrays, pointers, strings and structures to find the solution for given problem

3: Apply the various pre-processor commands in a given different real time situations

4: Dissect a problem into sub functions to develop modular reusable code

5: Demonstrate various searching and sorting techniques along with the complexity analysis

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2	2					2		
CO2	3	2				2	2					3		
CO3	3	2				2	2					2		
CO4	3	2	1				2					3		
CO5	3	2					2					2		

UNIT - I: Introduction to Programming

Compilers, compiling and executing a program.

Representation of Algorithm - Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number Flowchart/Pseudocode withexamples, Program design and structured programming

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion,The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.Command line arguments

UNIT - II: Arrays, Strings, Structures and Pointers:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self- referential structures, usage of self referential structures in linked list (no implementation) Enumerationdata type

UNIT - III: Preprocessor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data toexisting files, Writing and reading structures using binary files, Random access using fseek, ftell andrewind functions.

UNIT - IV: Function and Dynamic Memory Allocation:

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursivefunctions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays ofdifferent data types

UNIT - V: Searching and Sorting:

Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexitythrough the example programs

TEXT BOOKS:
1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition,Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)

REFERENCE BOOKS:
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

22EE104ES: BASIC ELECTRICAL ENGINEERING
(Common for CSE, CSD& IT)

B.Tech I Year I Sem.   **L   T   P   C**
                                                                                               2   0   0   2

Prerequisites: Mathematics
Course Objectives:

- To understand common forms of number representation in logic circuits.

- To learn basic techniques for the design of digital circuits and fundamental concepts
  used in the design of digital systems.

- Tounderstandtheconceptsofcombinationallogiccircuitsandsequentialcircuits.

- To understand the Realization of Logic Gates Using Diodes &Transistors.

Course Outcomes (COs): After learning the contents of this paper the student must be able to

1. Verify the basic Electrical circuits through different experiments.
2. Evaluate the performance calculations of Electrical Machines and Transformers through
various testing methods.
3. Analyze the transient responses of R, L and C circuits for different input conditions.
4. To determine the performance of different types of DC, AC machines and Transformers.
5 .To import the knowledge of various electrical installations and the concept of power, power
factor and its improvement.

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

UNIT-I:
D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II:
A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit.Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III:

Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation anddefficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV:

Electrical Machines: Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Constructionand working. Construction and working of synchronous generator.

UNIT-V:

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, "Basic Electrical Engineering", S. Chand,2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1^{st}Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic ElectricalEngineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

22ME105ES: COMPUTER AIDED ENGINEERING GRAPHICS

B.Tech I Year I Sem.   **L   T   P   C**
                                                                             1   0   4   3

Course Objectives:
- To develop the ability of visualization of different objects through technical drawings
- To acquire computer drafting skill for communication of concepts, ideas in the design ofengineering products

Course Outcomes: Using conventional and computer aided drafting tools, the student will be able to:

1: Apply the principles of Engineering Graphics to create Engineering Drawings of various geometric constructions, conic sections, curves and scales as per BIS standards.

2: Construct orthographic projections for points, lines and planes in different quadrants and Auxiliary views.

3: Draw the sectional views and true shape of sections of solids, by applying principles of projections.

4: Draw the development of surfaces in real time situations.

5: Develop isometric and orthographic views of the objects.

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2			2				1	1		1		
CO2	2	2			2				1	1		1		
CO3	2	2			2				1	1		1		
CO4	2	2			2				1	1		1		
CO5	2	2			2				1	1		1		

UNIT – I:
Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT- II:
Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aidedorthographic projections – points, lines and planes

UNIT – III:
Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectionalviews

UNIT – IV:
Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT – V:

Isometric Projections: Principles of Isometric Projection — Isometric Scale — Isometric Views — Conventions — Isometric Views of Lines, Plane Figures, Simple and Compound Solids — Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions. Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S.Chand and company Ltd.

REFERENCE BOOKS:
1. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
2. Engineering Graphics and Design, WILEY, Edition 2020
3. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
5. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

22CS106ES: ELEMENTS OF COMPUTER SCIENCE AND ENGINEERING

B.Tech I Year I Sem.   **L   T   P   C**
                                                                 0   0   2   1

Course Objective: To provide an overview of the subjects of computer science and engineering.

Course Outcomes (COs):

1: Know the working principles of functional units of a basic Computer

2: Understand program development, the use of data structures and algorithms in problem solving.

3: Know the need and types of operating system, database systems.

4: Understand the significance of networks, internet, and WWW and cyber security.

5: Understand Autonomous systems, the application of artificial intelligence.

COs	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					2				3			3	
CO2	3											2	1	
CO3	1	2												2
CO4	2	2	1									2	2	
CO5	2	2	1									2	2	

UNIT – I

Basics of a Computer – Hardware, Software, Generations of computers. Hardware - functional units, Components of CPU, Memory — hierarchy, types of memory, Input and output devices. Software — systems software, application software, packages, frameworks, IDEs.

UNIT – II

Software development – waterfall model, Agile, Types of computer languages – Programming, markup, scripting Program Development – steps in program development, flowcharts, algorithms, data structures — definition, types of data structures

UNIT – III

Operating systems: Functions of operating systems, types of operating systems, Device & Resourcemanagement

Database Management Systems: Data models, RDBMS, SQL, Database Transactions, data centers,cloud services

UNIT – IV

Computer Networks: Advantages of computer networks, LAN, WAN, MAN, internet, WiFi, sensornetworks, vehicular networks, 5G communication.

World Wide Web – Basics, role of HTML, CSS, XML, Tools for web designing, Social media, Onlinesocial networks.

Security – information security, cyber security, cyber laws

R22B.Tech.

UNIT – V

Autonomous Systems: IoT, Robotics, Drones, Artificial Intelligence – Learning, Game Development,natural language processing, image and video processing.

TEXT BOOK:

1. Invitation to Computer Science, G. Michael Schneider, Macalester College, Judith L. GerstingUniversity of Hawaii, Hilo, Contributing author: Keith Miller University of Illinois, Springfield.

REFERENCE BOOKS:

1. Fundamentals of Computers, Reema Thareja, Oxford Higher Education, Oxford University Press.
2. Introduction to computers, Peter Norton, 8th Edition, Tata McGraw Hill.
3. Computer Fundamentals, Anita Goel, Pearson Education India, 2010.
4. Elements of computer science, Cengage.

22CH107BS: ENGINEERING CHEMISTRY LABORATORY

B.Tech I Year I Sem.   **L   T   P   C**
                                                            0   0   2   1

Course Objectives: The course consists of experiments related to the principles of chemistry requiredfor engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry,potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surfacetension and viscosity of oils.

Course Outcomes(COs) : The experiments will make the student gain skills on:

1: Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.

2. Performing experimental methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.

3. Preparation of polymers like Bakelite and nylon-6.

4. Estimation of saponification value, surface tension and viscosity of lubricant oils.

5. Estimation of different types of qualitative and quantitative measurements of a given compound.

CO's	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2		1			2					2		
CO2	2	2					2					2		
CO3	2	2				1	2					2		
CO4	3	2				2	2					2		
CO5	3	2		2								2		

List of Experiments:

I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.
II. Conductometry: Estimation of the concentration of an acid by Conductometry.
III. Potentiometry: Estimation of the amount of Fe^{+2} by Potentiomentry.
IV. pH Metry: Determination of an acid concentration using pH meter.
V. Preparations:
    1. Preparation of Bakelite.
    2. Preparation Nylon – 6.
VI. Lubricants:
    1. Estimation of acid value of given lubricant oil.

2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. Corrosion: Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VIII. Virtual lab experiments

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications,New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

22CS108ES: PROGRAMMING FOR PROBLEM SOLVING LAB

B.Tech I Year I Sem.   **L   T   P   C**
                                                                       0   0   2   1

[Note:The programs may be executed using any available Open Source/ Freely
available IDESome of the Tools available are:
CodeLite: https://codelite.org/
Code:Blocks:
http://www.codeblocks.org/
DevCpp :
http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs

- To analyze the various steps in program development.

- To develop programs to solve basic problems by understanding basic concepts in
  C likeoperators, control statements etc.

- To develop modular, reusable and readable C Programs using the concepts like
  functions,arrays etc.

- To write programs using the Dynamic Memory Allocation concept.

- To create, read from and write to text and binary files

Course Outcomes (COs):

CO1: Formulate the algorithms for simple problems

CO2: Translate the given algorithms to C Programs

CO3: Build the logic using arrays, strings for the given problem

CO4: Make use of pointers in different types to modularize the code with functions

CO5: Apply the appropriate sortig techniques for the given list of elements

CO's	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2						2	3			2	1
CO2	2		2		2				2	3		2	2	
CO3			2		2				2	3			2	3
CO4	2	2			2				2	3		2	2	3
C05	2	2		2					2	3		2		3

Practice sessions:
   a. Write a simple program that prints the results of all the operators available in C

(including pre/post increment , bitwise and/or/not , etc.). Read required operand values from standard input.

b. Write a simple program that converts one given data type to another using auto conversion andcasting. Take the values from standard input.

Simple numeric problems:

a. Write a program for finding the max and min from the three numbers.

b. Write the program for the simple, compound interest.

c. Write a program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction.Read percentage from standard input.

d. Write a program that prints a multiplication table for a given number and the number of rows inthe table. For example, for a number 5 and rows = 3, the output should be:

e. 5 x 1 = 5

f.   5 x 2 = 10

g.   5 x 3 = 15

h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).

b. Write a C program, which takes two integer operands and one operator from the user, performsthe operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

c. Write a program that finds if a given number is a prime number

d. Write a C program to find the sum of individual digits of a positive integer and test given numberis palindrome.

e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

f.   Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

g. Write a C program to find the roots of a Quadratic equation.

h. Write a C program to calculate the following, where x is a fractional

value.i. 1-x/2 +x^2/4-x^3/6

j. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+   +x^n. For example: if n is 3 and x is 5, then the program

Computes 1+5+25+125.

Arrays, Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in asingle dimension array.
c. Write a C program that uses functions to perform the following:
d. Addition of Two Matrices
e. Multiplication of Two Matrices
f. Transpose of a matrix with memory dynamically allocated for the new matrix as row and columncounts may not be the same.
g. Write C programs that use both recursive and non-recursive functions
h. To find the factorial of a given integer.
i. To find the GCD (greatest common divisor) of two given integers.
j. To find x^n
k. Write a program for reading elements using a pointer into an array and display the values usingthe array.
l. Write a program for display values reverse order from an array using a pointer.
m. Write a program through a pointer variable to sum of n elements from an array.

Files:

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters withtheir uppercase equivalents.
c. Write a C program to count the number of times a character occurs in a text file. The file nameand the character are supplied as command line arguments.
d. Write a C program that does the following:
   It should first create a binary file and store 10 integers, where the file name and 10 values aregiven in the command line. (hint: convert the strings using atoi function)
   Now the program asks for an index and a value from the user and the value at that index shouldbe changed to the new value in the file. (hint: use fseek function)

   The program should then read all 10 values and print them back.

e. Write a C program to merge two files into a third file (i.e., the contents of the first file followedby those of the second are put in the third file).

Strings:

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
c. Write a C program that uses functions to perform the following operations:
d. To insert a sub-string into a given main string from a given position.
e. To delete n Characters from a given position in a given string.
f. Write a C program to determine if the given string is a palindrome or not (Spelled

same in bothdirections with or without a meaning like madam, civic, noon, abcba, etc.)

g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn'tcontain ch.

h. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

a. Write a menu driven C program that allows a user to enter n numbers and then choose betweenfinding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalidchoice is entered.

b. Write a C program to construct a pyramid of numbers as follows:

```
   1           *           1           1           *
  1 2         * *         2 3         2 2         * *
 1 2 3       * * *        4 5 6       3 3 3       * * *
                                     4 4 4 4       * *
                                                    *
```

Sorting and Searching:

a. Write a C program that uses non recursive function to search for a Key value in a given

b. list of integers using linear search method.

c. Write a C program that uses non recursive function to search for a Key value in a given

d. sorted list of integers using binary search method.

e. Write a C program that implements the Bubble sort method to sort a given list of

f. integers in ascending order.

g. Write a C program that sorts the given array of integers using selection sort in descending order

h. Write a C program that sorts the given array of integers using insertion sort in ascending order

i. Write a C program that sorts a given array of names

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson

2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI

2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill

3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB

4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)

5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education

22EE109ES: BASIC ELECTRICAL ENGINEERING LABORATORY

B.Tech I Year I Sem.   **L   T   P   C**
                                                                             0   0   2   1

Prerequisites: Basic Electrical Engineering

Course Objectives:
- To measure the electrical parameters for different types of DC and AC circuits usingconventional and theorems approach.
- To study the transient response of various R, L and C circuits using different excitations.
- To determine the performance of different types of DC, AC machines and Transformers.

Course Outcomes: After learning the contents of this paper the student must be able to

1 Verify the basic Electrical DC and AC circuits through different experiments.

2 Evaluate the performance calculations of Transformers through various testing methods.

3 Evaluate the performance calculations of DC Electrical Machines through various testing methods.

4 Evaluate the performance calculations of AC Electrical Machines through various testing methods.

5 Analyze the simple circuit for lighting and power installations.

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

List of experiments/demonstrations:
PART- A (compulsory)
1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC seriescircuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary

Circuits of aSingle-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

PART-B (any two experiments from the given list)
1. Verification of Superposition theorem.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents(Star-Delta, Delta-Delta, Delta-star, Star-Star)
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

TEXT BOOKS:
1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.

REFERENCE BOOKS:
1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S. Chand,2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
(UGC-Autonomous)
Approved by AICTE, Affiliated to JNTUH, Accreditated by NAAC- 'A' Grade
Medbowli, Meerpet, Balapur, Hyderabad, Telangana-500097
Mob: 9393959597.   Email: info@tkrec.ac.in,deanacademics@tkrec.ac.in

DEPARTMENT OF COMPUTERSCIENCE AND ENGINEERING

R22 REGULATION

COURSE STRUCTURE & SYLLABUS

B.TECH II SEMESTER

FOR
B. TECH COURSE
(Applicable for the batches admitted 2022-2023)

B. Tech II Semester (R22)

S. No	Subject Code	Subject Name	Hours per			Credits
			L	T	P	
1	22MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2	22PH202BS	Applied Physics	3	1	0	4
3	22ME203ES	Engineering Workshop	0	1	3	2.5
4	22EN204HS	English for Skill Enhancement	2	0	0	2
5	22EC205ES	Electronic Devices and Circuits	2	0	0	2
6	22CS206ES	Python Programming Laboratory	0	1	2	2
7	22PH207BS	Applied Physics Laboratory	0	0	3	1.5
8	22EN208HS	English Language and Communication Skills Laboratory	0	0	2	1
9	22CS209ES	IT Workshop	0	0	2	1
		TOTAL	10	4	12	20

22MA201BS : ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR

CALCULUS (Common for CE, CSE, IT, EEE, ECE, CSD & AIML)

B.Tech I Year II Sem.   **L   T   P   C**
                                                             3   1   0   4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn
- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course out comes: After learning the contents of this paper, the student must be able to
1. Identify whether the given differential equation of first order is exact or not.
2. Apply the concept of differential equation to real world problems.
3. Use the Laplace transforms techniques for solving ODE's.
4. Use gradient to evaluate directional derivatives and conservative vector field.
5. Calculate the line, surface and volume integrals and converting them from one to another.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3		1	1							1		
CO2	1	2			2							2		
CO3	3	2		2										
CO4	2	1		2								1		
CO5	2	2										1		

UNIT-I: First Order ODE
Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order: Second order linear

differential equations with constant coefficients: Non- Homogeneous sterms of the typee^{ax}, $\sin ax$, $\cos ax$, polynomial $\sin x$,$e^{ax}V(x)$ and$xV(x)$), method of variation of parameters, Equations reducible to linear ODEwithconstantcoefficients:Legendre'sequation,Cauchy-Eulerequation.

UNIT-III: Laplace transforms
Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation
Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, So lenoidal and Irrotational vectors.

UNIT-V: Vector Integration
Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXTBOOKS:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2016.
2. R.K.Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 10th Edition, 2020.

RFERENCEBOOKS:
1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2018.
2. G.B.Thomas and R.L.Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H.K .Dassand Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.
4. N.P.Baliand Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2018.
5. S.L. Ross, differential equations 3rd edition, Wiley India, 2007.

22PH102BS / 22PH202BS : APPLIED PHYSICS

B.Tech I Year II Sem.　　　　　　　　　　　　　　　　　　**L　T　P　C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　3　1　0　4

Course Objectives: The objectives of this course for the student are to:

- Understand the basic principles of quantum physics and band theory of solids.
- Understand the underlying mechanism involved in construction and working principles ofvarious semiconductor devices.
- Study the fundamental concepts related to the dielectric, magnetic and energy materials.
- Identify the importance of nanoscale, quantum confinement and various fabricationstechniques.
- Study the characteristics of lasers and optical fibres.

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

1. Gain knowledge on fundamentals of modern physics and quantum mechanics, and utilize the knowledge in various applications.
2. Able to apply various electronic circuits by the fundamentals of semiconductor physics.
3. Study the fundamental concepts related to the dielectric, magnetic materials and superconductors
4. Identify the importance of nano scale, quantum confinement and various fabrications
5. Able to apply the learned knowledge of LASER and Fibre optics in communication systems.

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3			1						2		
CO2	2	1			1							2		
CO3	2	1			1							1		
CO4	3			2	2							2		
CO5	2	1			1				1			1		

UNIT-I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, blackbody radiation –Energy distribution of black body, Planck's radiation law-photo electric effect-Davis son and Germer experiment–Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation –particle in one dimensional potential box.
Solids: free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution -

Bloch'stheorem-Kronig-Penneymodel–E-Kdiagram-effectivemassofelectron-origin of energy bands-classification of solids.

UNIT-II: SEMI CONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors -construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cell, their structure, materials, working principle and characteristics.

UNIT -III: DI ELECTRIC, MAGNETIC AND SUPER CONDUCTORS

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Hysteresis- soft and hard magnetic materials - magnetostriction, Magneto resistance-applications-bubble memory devices, magnetic field sensors and multi ferroics.

Superconductivity: Introduction to super conductors (temperature dependence), Meissner effect, types of superconductors, characteristics of superconductors, Applications of super conductors

UNIT-IV: NANO TECHNOLOGY

Nano scale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods–top-down fabrication: ball milling-physical vapor deposition(PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM –applications of nano materials.

UNIT-V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations lasing action-pumpingmethods-rubylaser,CO2laser,Argonion Laser, Nd: YAGlaser semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection construction of optical fiber-acceptance angle-numerical aperture-classification of optical fibers Losses in optical fiber-optical fiber for communication system-applications.

TEXTBOOKS:

1. M.N. Avadhanulu, P.G.Kshirsagar & TVS ArunMurthy "A Textbook of Engineering Physics"- S. Chand Publications, 11thEdition2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication, 2019
3. Semi conductor Physics and Devices- Basic Principle–Donald A,Neamen, McGrawHill, 4thEdition, 2021.
4. B.K.Pandey and S.Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition, 2022.
5. Essentials of Nano science & Nano technology by Narasimha Reddy Katta, Typical Creatives
   NANO DIGEST, 1stEdition, 2021.

REFERENCEBOOKS:
1. Quantum Physics, H.C.Verma, TBS Publication, 2ndEdition 2012.
2. Fundamentals of Physics –Halliday, Resnick and Walker, JohnWiley & Sons, 11thEdition,2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L.Gupta and V.Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya -Nano Materials, New AgeInternational,1stEdition,2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S.Bandarenka, CRC Press Taylor & Francis Group
7. Energy Materials, Taylor & FrancisGroup,1stEdition, 2022.

22ME203ES: ENGINEERING WORKSHOP

B.Tech I Year II Sem.   **L T P C**

0 1 3 2.5

Pre- requisites: Practicals kill

Course Objectives:
- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at workplace.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

1. Demonstrate various machines, tools and their operations.

2. Apply different workshop trades like fitting, carpentry, foundry and welding.

3. Practice work shop trades like Tim smithy, Black smithy.

4. Apply suitable tools for different trades of engineering processes including drilling, material removing, measuring, chiseling.

5. Apply basic electrical engineering knowledge for house wiring practice.

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1						2	1		1		
CO2	2	2	1						2	1		1		
CO3	2	1	1						2	1		1		
CO4	2	1	1						2	1		1		
CO5	2	2	1						2	1		1		

1. TRADES FOR EXERCISES:
At least two exercises from each trade:
    I.   Carpentry–(T-Lap Joint, Dovetail Joint, Mortise&Tenon Joint)
    II.   Fitting–(V-Fit, DovetailFit & Semi-circular fit)
    III.   Tin-Smithy–(Square Tin, Rectangular Tray& Conical Funnel)
    IV.   Foundry–(Preparation of Green Sand Mould using Single Piece and Split Pattern)
    V.   Welding Practice–(Arc Welding & Gas Welding)
    VI.   House-wiring–(Parallel & Series, Two-way Switch and Tube Light)
    VII.   Black Smithy–(Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:
Plumbing, Machine Shop, Metal Cutting(WaterPlasma), Power tools in construction and
Wood Working

TEXT BOOKS:
1. Workshop Practice B.L.Juneja Cengage
2. Workshop Manual K.Venugopal, Anuradha.

REFERENCE BOOKS:
Workshop Manual -P.Kannaiah, K.L.Narayana, Scitech Workshop Manual, VenkatReddy, BSP

22EN105HS / 22EN204HS: ENGLISH FOR SKILL ENHANCEMENT

B.Tech I Year I/II Sem.   **L   T   P   C**
                                                                      2   0   0   2

Course Objectives: This course will enable the students to:

- Improve the language proficiency of students in English with an emphasis on Vocabulary,Grammar, Reading and Writing skills.

- Develop study skills and communication skills in various professional situations.

- Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus

Course Outcomes: Students will be able to:

1. Choose appropriate vocabulary and sentence structures for their oral and written communication.

2. Demonstrate their understanding of the rules of functional grammar.

3. Develop comprehension skills from the known and unknown passages.

4. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.

5. Acquire basic proficiency in reading and writing modules of English.

CO's	PROGRAM OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3			3	3		3		
CO2						2			3	3		3		
CO3						3			2	3		3		
CO4						2			3	3		2		
CO5						3			2	3		3		

UNIT-I

Chapter entitled 'Toasted English' by **R.K. Narayan** from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes – Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives– Synonyms and Antonyms

Grammar: Identifying Common Errorsin Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing: Sentence Structures-Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation- Techniques for Writing precisely– Paragraph Writing–Types, Structures and Features of a Paragraph –Creating Coherence –Organizing Principles of Paragraphs in Documents.

UNIT-II

Chapter entitled **'ApproJRD'** by **Sudha Murthy** from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: Words Often Misspelt -Homophones, Homonyms and Homographs

Grammar: Identifying Common Errorsin Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading –Skimming and Scanning–Exercises for Practice

Writing: Nature and Style of Writing -Defining/ Describing People, Objects, Places and Events –Classifying- Providing Examples or Evidence.

UNIT-III

Chapter entitled **'Lessons from Online Learning'** by **F.Haider Alvi, Deborah Hurst et al** from" English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: Words Often Confused- Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading–Intensive Reading and Extensive Reading–Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette ,Job Application with CV/Resume.

UNIT-IV

Chapter entitled **'Art and Literature '** by **Abdul Kalam** from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3RMethod)- Exercises for Practice

Writing: Writing Practices- Essay Writing- Writing Introduction and Conclusion-Précis Writing.

UNIT-V

Chapter entitled 'Go, Kissthe World ' by **Subroto Bagchi** from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats –Structure of Reports (Manuscript Format)- Types of Reports –Writing a Report.

TEXTBOOK:

1."English:Language, ContextandCulture"byOrientBlackSwanPvt.Ltd,Hyderabad.2022.Print.

REFERENCEBOOKS:

1. Effective Academic Writing by Liss and Davis(OUP)

2. Richards,JackC.(2022)InterchangeSeries.Introduction,1,2,3.CambridgeUniversityPress

3. Wood,F.T.(2007).Remedial English Grammar. Macmillan.

4. Chaudhuri, SantanuSinha.(2018).Learn English: A Fun Book of Functional Language, Grammar and Vocabulary.(2nded.,).SagePublications India Pvt. Ltd.

5. (2019).Technical Communication. Wiley IndiaPvt. Ltd.

6. Vishwamohan, Aysha.(2013). English for Technical Communication for Engineering Students. McGraw –Hill Education India Pvt.Ltd.

7. Swan, Michael.(2016). Practical English Usage. Oxford University Press.Fourth Edition.

22EC205ES: Electronic Devices and Circuits

B.Tech I Year II Sem.
                                                                      L T P C
                                                                      2 0 0 2

Course Objectives:
1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of devices.
3. To know the switching characteristics of devices
4. To know the clipping concepts of a signal

Course Outcomes: Upon completion of the Course, the students will be able to:
1. Apply the concepts of Diode applications .
2. Apply concepts of Non-Linear application in solving various problems.
3. Analyse the switching concepts of BJT
4. Compare BJT with FET and MOSFET
5. Design circuits using Special Purpose Devices

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	-	-	1	1	-	-	-	-	1		
CO2	3	2	1	1	-	2	1	-	-	-	-	1		
CO3	3	3	1	1	-	2	1	-	-	-	-	1		
CO4	3	2	2	1							1	1	1	
CO5	3	2	2	1							1	1	2	

UNIT - I
Diodes: Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, V-I Characteristics, Diode as a switch- switching times.

UNIT - II
Diode Applications: Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT - III
Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times,

UNIT - IV
Junction Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, FET as Voltage Variable Resistor, MOSFET, MOSTET as a capacitor.

UNIT – V

Special Purpose Devices: Zener Diode **-** Characteristics, Zener diode as Voltage Regulator, Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode, Photo diode, Solar cell, LED, Schottky diode.

TEXT BOOKS:
1. Jacob Millman - Electronic Devices and Circuits, McGraw Hill Education
2. Robert L. Boylestead, Louis Nashelsky- Electronic Devices and Circuits theory, 11th Edition, 2009, Pearson**.**

REFERENCE BOOKS:
1. Horowitz -Electronic Devices and Circuits, David A. Bell – 5thEdition, Oxford.
2. Chinmoy Saha, Arindam Halder, Debaati Ganguly - Basic Electronics-Principles   and Applications, Cambridge, 2018.

22PH206BS : PYTHON PROGRAMMING LABORATORY

B.Tech I Year II Sem.   **L   T   P   C**
                                                                            0   1   2   2

Course Objectives:
- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

Course Outcomes: After completion of the course, the student should be able to
1. Develop the application specific codes using python.
2. Understand Strings, Lists, Tuples and Dictionaries in Python
3. Verify programs using modular approach, file I/O, Python standard library
4. Implement Digital Systems using Python
5. Learn NUmpy, PlotPy, SCIpy packages

Note: The lab experiments will be like the following experiment examples.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2						2	3			2	1
CO2	2		2		2				2	3		2	2	
CO3			2		2				2	3			2	3
CO4	2	2			2				2	3		2	2	3
CO5	2	2			2				2	3		2	2	3

Week-1:
1. i)Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   ii)Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3.
   i) Write a program to calculate compound interest when principal, rate and number of periods are given.
   ii) Given coordinates(x1,y1),(x2,y2)find the distance between two points
4.Read name, address, email and phone number of a person through keyboard and print the details.

Week-2:

1. Print the below triangle using for loop.

   5
   4 4
   3 33
   2 222
   1 1111

2. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character(use 'if-else-if' ladder)
3. Python Program to Print the Fibonacci sequence using while loop
4. Python program to print all prime numbers in a given interval(use break)

Week-3:

1. i)Write a program to convert a list and tuple into arrays.
   ii)Write a program to find common values between two arrays.
2. Writeafunctioncalledgcdthattakesparametersaandbandreturnstheirgreatestcommondivisor.
3. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Week-4:

1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
2. Write a function called has duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

   i).   Write a function called remove duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
   ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I","a", and the empty string.
   iii).   Write a python code to read dictionary values from the user. Construct a function to invert its content.i.e.,keys should be values and values should be keys.

3. i)Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
   ii) Remove the given word in all the places in a string?
   iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper-case letter and the rest of the letters in the word by corresponding letters in lowercase with out using a built-in function?
4. Write a recursive function that generates all binary strings of n-bit length

Week-5:
1. i)Write a python program that defines a matrix and prints
   ii) Write a python program to perform addition of two square matrices
   iii) Write a python program to perform multiplication of two square matrices
2. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on the masits functions.
3. Use the structure of exception handling all general-purpose exceptions.

Week-6:
1. a. Write a function called draw rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
   b. Add an attribute named color to your Rectangle objects and modify draw rectangles that it uses the color attribute as the fill color.
   c. Write a function called draw point that takes a Canvas and a Point as arguments and draws are presentation of the Point on the Canvas.
   d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects Write a function called draw circle that draws circles on the canvas.
2. Write a Python program to demonstrate the usage of Method Resolution Order(MRO) in multiple levels of Inheritances.
3. Writeapythoncodetoreadaphonenumberandemail-idfromtheuserandvalidateitforcorrectness.

Week-7
1. Write a Python code to merge two given file contents into a third file.
2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
3. Write a Python code to Read text from a text file, find the word with most number of occurrences
4. Write a function that reads a file *file1* and displays the number of words, number of vowels, blank spaces, lowercase letters and uppercase letters.

Week-8
1. Import numpy, Plotpy and Scipy and explore their functionalities.
2. a) Install NumPy package with pip and explore it.
3. Write a program to implement Digital Logic Gates–AND,OR,NOT,EX-OR
4. Write a program to implement Half Adder, Full Adder, and Parallel Adder
5. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

TEXTBOOKS:

1. Super charged Python: Take your code to the next level, Overland
2. Learning Python, MarkLutz, O'reilly

REFERENCE BOOKS:
1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
4. Think Python, Allen Downey, Green Tea Press
5. Core Python Programming, W.Chun, Pearson
6. Introduction to Python, Kenneth A.Lambert, Cengage

22PH107BS / 22PH207BS: APPLIED PHYSICS LAB

B.Tech I Year II Sem.   **L   T   P   C**
                                                              0   0   3   1.5

Course Objectives: The objectives of this course for the student to

- Capable of handling instruments related to the Hall effect and photoelectric effect experimentsand their measurements.

- Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.

- Able to measure the characteristics of dielectric constant of a given material.

- Study the behavior of B-H curve of ferromagnetic materials.

- Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:

1. Able to study the (V-I/P-I) characteristics of LED, LASER and Solar cell.

2. Able to understand the energy gap of semiconductor diode

3. Correlate the theory of Hall Effect with experiment by determining the Hall coefficient.

4. Examine the Bending losses for different Optical fiber cables.

5. Able to understand various concepts-Resonance, Time constant and Magnetic field using LCR, RC, Stewart and Gees circuits.

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		1		2				2			2		
CO2	2		1		1				2			2		
CO3	2			1	2				1			2		
CO4	2		2		1							2		
CO5	2	2	2									2		

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photo electric effect.

2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.

3. Characteristics of series and parallel LCR circuits.

4. V-I characteristics of a p-njunction diode and Zener diode.

5. Input and output characteristics of BJT(CE,CB &CC configurations).

6. a)V-I and L-I characteristics of light emitting diode(LED).

   b)V-I Characteristics of solar cell.

7. Determination of Energy gap of a semi conductor.

8. R-C Circuit: To determine the time constant of R-Ccircuit.

9. Stewart–Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.

10. Determination of Bending losses of optical fiber.

11. a)Determination of wavelength of the given LASER beam using diffraction grating.

    b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.

12. Understanding the method of least squares–Torsional pendulum as an example

Note: Any 8 experiments are to be performed.

REFERENCEBOOK:

1. S.Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- SChand Publishers

22EN109HS /22EN208HS: ENGLISH LANGAUGE COMMUNICATION SKILLS LAB

B.Tech I Year I/II Sem.   **L   T   P   C**
                                                                  0   0   2   1

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

- ✓ To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- ✓ To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- ✓ To improve the fluency of students in spoken English and neutralize the impact of dialects.
- ✓ To train students to use language appropriately for public speaking, group discussions and interviews

Course outcomes:

Students should be able to

1. Employ the nuances of English language through audio-visual experience and group activities.
2. Articulate a neutral accent of English for intelligibility by over coming mother tongue influence.
3. Develop the skill of using appropriate language in various speaking contexts.
4. Understand how to use language to make formal presentations.
5. Interpret speaking skills with clarity and confidence which in turn enhances their interpersonal skills.

CO's	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					3	2			3	3		3		
CO2					3	3			3	3		3		
CO3						3			3	3		3		
CO4					3				3	3		3		
CO5									3	3		3		

Exercise – I

CALL Lab:

Understand: Listening Skill- Its importance–Purpose-Process-Types-Barriers Effective Listening.

Practice: Introduction to Phonetics –SpeechSounds–VowelsandConsonants–MinimalPairs-ConsonantClusters-Past Tense Marker and Plural Marker-Testing Exercises

ICS Lab:

Understand: Spoken vs. Written language- Formal and Informal English.

Practice: Ice-BreakingActivityandJAMSession-SituationalDialogues–Greetings–TakingLeave–IntroducingOneselfandOthers.

Exercise II CALL Lab :

Understand: Structure of Syllables–Word Stress–Weak Forms and Strong Forms–Stress pattern in sentences–Intonation.

Practice: Basic Rules of Word Accent-Stress Shift-Weak Forms and Strong Forms-Stress pattern in sentences–In to nation-Testing Exercises

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues–Role Play-Expressions in Various Situations– Making Requests and Seeking Permissions-Telephone Etiquette.

Exercise-III

CALL Lab:

Understand: Errors in Pronunciation- Neutralising Mother Tongue Interference(MTI).

Practice: Common Indian Variants in Pronunciation–Differences between British and American Pronunciation-Testing Exercises

ICS Lab:

Understand: Descriptions- Narrations –Giving Directions and Guidelines–BlogWriting

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions –Thanking

and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise–IV

CALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests –Testing Exercises

ICS Lab:

Understand: Public Speaking–Exposure to Structured Talks- Non-verbal Communication-Presentation Skills.

Practice: Making a Short Speech–Extempore-Making a Presentation.

Exercise–V

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests-Testing Exercises

ICS Lab:

Understand: Group Discussion

Practice: Group Discussion

Minimum Requirement to infrastructural facilities for ELCS Lab:

 1. Computer Assisted Language Learning(CALL) Lab:

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self-study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

 i) Computers with Suitable Configuration

 ii) High Fidelity Headphones

 2. Inter active Communication Skills(ICS)Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

Source of Material(Master Copy):

Exercises in Spoken English. Part1,2, 3.CIEFL and Oxford University Press

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass,10th Edition.
- English in Mind(Series1-4),Herbert Puchta and JeffStranks with Meredith Levy, Cambridge.
- English Pronunciation in Use(Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use(Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All Orell Digital Language Lab(Licensed Version)

REFERENCEBOOKS:

1. (2022). English Language Communication Skills–Lab Manual cum Workbook .C engage Learning India Pvt. Ltd.
2. Shobha, KN &Rayen ,J.Lourdes.(2019). Communicative English–A workbook. Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp.(2019). Communication Skills: A Workbook. Oxford University Press
4. Board of Editors.(2016).ELCS Lab Manual: A Work book for CALL and ICS Lab Activities. Orient Black Swan Pvt.Ltd.
5. Mishra, Veerendraetal.(2020). English Language Skills: A Practical Approach. Cambridge University Press

22CS209ES: IT WORKSHOP

B.Tech I Year II Sem.   **L   T   P   C**
                                                                0   0   2   1

CourseObjectives: The IT Workshop for engineers is a training lab course spread over 60hours.
The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, Power Point and Publisher.

Course Outcomes:
1. Perform Hardware trouble shooting
2. Understand Hardware components and interdependencies
3. Safeguard computer systems from viruses /worms
4. Document/ Presentation preparation
5. Perform calculations using spread sheets

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1				2			3		2	2	2
CO2	3	2	2	3									3	3
CO3		2	2		3				3				3	2
CO4			2	2					3	3			3	
CO5						3				2	2			

PC Hardware
Task1: Identifytheperipheralsofacomputer,componentsinaCPUanditsfunctions.Drawthebloc kdiagramoftheCPUalongwiththeconfigurationofeachperipheralandsubmittoyourinstructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have

windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: **Orientation & Connectivity Boot Camp:** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task2:Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: **Search Engines & Netiquette:** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active downloads to avoid viruses and/or worms.

LaTeX and WORD

Task1–Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft(MS) office or equivalent(FOSS) tool word: Importance of LaTeX and MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX .and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered: - Formatting Fontsin word, Drop Capin word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered: -Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered: - Table of Content, Newspaper

columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel–Accessing, overview of toolbars, saving excel files, Using help and resources.

Task1:Creating a Scheduler-Features to be covered: Gridlines, Format Cells, Summation, auto fill, FormattingText

Task 2 : Calculating GPA - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting work sheets, Hyper linking, Count function, LOOKUP/VLOOKUP

Task3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Power point

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering Auto Shapes, Lines and Arrows in Power Point.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc),and Inserting–Background, textures, Design Templates, Hidden slides.

REFERENCEBOOKS

1. Comdex Information Technology course toolkit Vikas Gupta, *WILEY Dreamtech*
2. The Complete Computer upgrade and repair book, 3rdedition Cheryl ASchmidt, *WILEY Dreamtech*
3. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education.*
4. PC Hardware- A Handbook–Kate J.Chase *PHI*(Microsoft)

5. LaTeX Companion–Leslie Lamport,*PHI/Pearson*.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme.– *CISCO Press, Pearson Education*.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by PatrickRegan –CISCO Press, *Pearson Education.*

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
(UGC-Autonomous)
Approved by AICTE, Affiliated to JNTUH, Accreditated by NAAC- 'A' Grade
Medbowli, Meerpet, Balapur, Hyderabad, Telangana-500097
Mob: 9393959597.   Email: info@tkrec.ac.in,deanacademics@tkrec.ac.in

DEPARTMENT OFCOMPUTERSCIENCEAND ENGINEERING

R22 REGULATION

COURSE STRUCTURE & SYLLABUS

B.TECH III SEMESTER

FOR
B. TECH COURSE
(Applicable for the batches admitted 2022-2023)

B Tech III Semester (R22)

S. No	Subject Code	Subject Name	Hours per			Credits
			L	**T**	**P**	
1	22EC308PC	Digital Electronics	3	0	0	3
2	22CS301PC	Data Structures	3	0	0	3
3	22MA302BS	Computer Oriented Statistical Methods	3	1	0	4
4	22CS302PC	Computer Organization and Architecture	3	0	0	3
5	22CS303PC	Object Oriented Programming through Java	3	0	0	3
6	22CS304PC	Data Structures Lab	0	0	3	1.5
7	22CS305PC	Object Oriented Programming through Java Lab	0	0	3	1.5
8	22MC309	Gender Sensitization Lab	0	0	2	0
9	22CS306PC	Skill Development Course(Data visualization- R Programming / Power BI)	0	0	2	1
			15	**1**	**10**	**20**

22EC308PC: DIGITAL ELECTRONICS

B.Tech II Year I Sem.   **L   T   P   C**
                                                                                      3   0   0   3

Course Objectives:
1. To understand common forms of number representation in logic circuits.
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
3. To understand the concepts of combinational logic circuits and sequential circuits.
4. To understand the concepts of memory design.

Course Outcomes: Upon completing this course, the students will be able to
1. Apply concepts of numerical information in different forms and Boolean Algebra theorems.
2. Analyse Postulates of Boolean algebra and to minimize combinational functions, and design the combinational circuits.
3. Analyse Combinational Circuits for various cyclic functions.
4. Design sequential circuits
5. Design of Programmable Devices

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	1	-	-	-	-	-	2	2	
CO2	3	2	2	1	2	1	-	-	-	-	-	2	2	
CO3	2	3	3	2	2	1	-	-	-	-	-	1	2	
CO4	3	2	1	1	1	-	-	-	-	-	-	-	1	
C05	2	2	2	1									1	

UNIT-I
BOOLEAN ALGEBRA AND LOGIC GATES: Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic.
Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic gates.

UNIT-II
GATE – LEVEL MINIMIZATION: The map method, Four-variable map, Five-Variable map, product of sums simplification Don't-care conditions, NAND and NOR implementation other Two-level implementations, Exclusive –Or function

UNIT-III
COMBINATIONAL LOGIC: Combinational Circuits, Analysis procedure Design procedure, Binary Adder-Subtractor Decimal Adder, Binary multiplier ,magnitude comparator, Decoders, Encoders, Multiplexers ,HDL for combinational circuits.

UNIT-IV

SEQUENTIAL LOGIC: Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, state Reduction and Assignment, Design Procedure**.** Registers, shift Registers, Ripple counters, synchronous counters, other counters

UNIT-V

MEMORIES AND ASYNCHRONOUS SEQUENTIAL LOGIC: Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array programmable Array logic, Sequential Programmable Devices.
Introduction, Analysis Procedure, Circuits with Latches, Design Procedure, Reduction of state and Flow Tables, Race-Free state Assignment Hazards, Design Example.

TEXT BOOKS:
1. Digital Design–Third Edition, M.Morris Mano, Pearson Education/PHI.
2. Digital Principles and Applications Albert Paul Malvino Donald P.Leach TATA Mc Graw Hill Edition.
3. Fundamentals of Logic Design, Roth, 5thEdition, Thomson.

REFERENC EBOOKS:
1. Switching and Finite Automata Theory by Zvi. Kohavi, Tata Mc Graw Hill.
2. Switching and Logic Design, C.V.S.Rao, Pearson Education
3. Digital Principles and Design– Donald D.Givone, Tata Mc Graw Hill, Edition.
4. Fundamentals of Digital Logic and Microcomputer Design, 5TH Edition, M. Rafiqu zzaman JohnWiley.

22CS301PC: DATA STRUCTURES

B.Tech II Year I Sem.   **L   T   P   C**
                                                                       3   0   0   3

Pre requisites: Programming for Problem Solving

Course Objectives

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms

Course Outcomes

1. Construct appropriate data structures to represent data items in real-world problems with linear data structures.

2. Ability to apply the linear representations of skip lists and dictionaries and hash tables to overcome problems of sequential data structures.

3. Ability to design programs using a variety of non-linear data structures balanced trees

4. Able to implement the principal algorithms graph traversal methods. and searching, and sorting.

5. Implement and know the applications of pattern matching .

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												2	1
CO2	3	2	1	1									2	1
CO3	3	2	1	1	2				1				2	1
CO4	3	2	1	1	2				1				2	1
CO5	3				2				1				2	1

UNIT-I
Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation ,insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.
UNIT-II
Dictionaries: linear list representation, skip list representation, operations - insertion, deletion and searching. Hash Table Representation: hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing, rehashing, extendible hashing.

UNIT-III
Search Trees: Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, B- Trees, B+ Trees, AVL Trees, Definition, Height of an AVL Tree, Operations – Insertion, Deletion and Searching, Red –Black, Splay Trees.
UNIT-IV
Graphs: Graph Implementation Methods. Graph Traversal Methods.
Sorting: Quick Sort, Heap Sort, External Sorting-Model for external sorting, Merge Sort.

UNIT-V
Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer –Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

TEXTBOOKS:
1. Fundamentals of Data Structures in C, 2nd Edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C–A.S.Tanenbaum, Y.Langsam, and M.J.Augenstein, PHI/Pearson Education.

REFERENCEBOOK:
1. Data Structures: A Pseudo code Approach with C, 2nd Edition, R.F.Gilberg and B.A.Forouzan, Cengage Learning.

22MA302BS: COMPUTER ORIENTED STATISTICAL METHODS

B.Tech II Year I Sem.   **L   T   P   C**
                                                                             3   1   0   4

Pre- requisites Mathematics courses of first year of study.

Course Objectives: To learn
1. The theory of Probability, Probability distributions of single and multiple random variables
2. The sampling theory, testing of hypothesis and making statistical inferences
3. Stochastic process and Markov chains.

Course outcomes: After learning the content Softhis paper, the student must be able to
1. Apply the concept of probability and Random variables in solving given Real time problems.
2. Formulate and solve problems involving random variables and apply statistical methods for analyzing experimental data.
3. Apply various concepts of distribution to find out continuous distribution values
4. Apply concept so estimation and testing of hypothesis to case studies.
5. Describe Stochastic Principles to simplify processes that satisfy Markov property.

CO-PO Mapping

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1		2								2		
CO2	2	3			1							1		
CO3	2	2			2							1		
CO4	1	2			1									
CO5	2	2			1							1		

UNIT- I: Probability
Sample Space, Events, Counting Sample Points, and Probability of an Event, Additive Rules, Conditional Probability, Independence and the Product Rule, Baye's Rule.
Random Variables and Probability Distributions: Concept of a Random Variable, Discrete Probability Distributions, Continuous Probability Distributions.

UNIT- II: Expectation and discrete distributions
Mean of a Random Variable, Variance and Covariance of Random Variables, Means and Variances of Linear Combinations of Random Variables.
Discrete Probability Distributions: Binomial Distribution, Poisson distribution.

UNIT-III: Continuous and Sampling Distributions
Uniform Distribution, Normal Distribution, Areas under the Normal Curve, Applications of the Normal Distribution, Normal Approximation to the Binomial Distributions.
Fundamental Sampling Distributions: Random Sampling, Some Important Statistics, Sampling Distributions, Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F-Distribution.

UNIT-IV: Sample Estimation & Tests of Hypotheses
L Introduction, Statistical Inference, Classical Methods of Estimation, Single Sample: Estimation the mean, standard error of appoint estimate, prediction interval. Two samples: Estimating the difference between two means, Single sample: Estimating a proportion.
Statistical Hypotheses: General Concepts, Testing a Statistical Hypothesis, Single sample: Tests concerning a single mean two samples: tests on two means.

UNIT-V: Stochastic Processes and Markov Chains
Introduction to Stochastic processes- Markov process. Transition Probability, Transition Probability Matrix, First order and Higher order Markov process, n-step transition probabilities, Markov chain, Steady state condition, Markov analysis.

TEXTBOOKS:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics For Engineers & Scientists, 9thEd. Pearson Publishers.
2. SC Gupta and VKK apoor, Fundamentals of Mathematical statistics, Khanna publications.
3. S.D. Sharma, Operations Research, Keda rnath and Ramnath Publishers, Meerut, Delhi.

REFERENCEBOOKS:
1. T.T. Soong, Fundamentals of Probability and Statistics For Engineers, John Wiley & Sons, Ltd,2004
2. Sheld on MRoss, Probability and statistics for Engineers and scientists, academic press. Miller and Freund's, Probability and Statistics for Engineers, 9th Edition, Pearson Educations

22CS302PC: COMPUTER ORGANIZATION AND ARCHITECTURE

B.Tech II Year I Sem.   L   T   P   C
                                                                     3   0   0   3

Co-requisite: A Course on "Digital Electronics".
Course Objectives
1. The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
2. It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
3. Topics include computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

Course Outcomes
1. Understand the basics of instruction sets and their impact on processor design.
2. Demonstrate an understanding of the design of the functional units of a digital computer system.
3. Evaluate cost performance and design trade-offs in designing and constructing a computer processor including memory.
4. Design a pipeline for consistent execution of instructions with minimum hazards.
5. Recognize and manipulate representations of numbers stored in digital computers

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	1	2	1	0	0	0	1	0	2	1	1	2
CO2	1	1	3	3	2	0	0	0	2	0	1	2	1	1
CO3	2	1	1	2	1	0	0	0	2	0	1	3	2	2
CO4	2	1	2	2	2	0	0	0	2	0	2	1	2	2
CO5	2	1	1	3	1	0	0	0	2	0	1	2	2	1

UNIT-I
Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.
Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.
UNIT-II
Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.
Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes,

Data Transfer and Manipulation, Program Control.
UNIT-III
Data Representation: Data types, Complements ,Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms ,Floating –point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.
UNIT-IV
Input-Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.
UNIT-V
Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

TEXT BOOK:
1. Computer System Architecture – M.Morris Mano, Third Edition, Pearson/PHI.

REFERENCE BOOKS:
1.   Computer Organization –Carl Hamacher,Zvonks Vranesic, SafeaZaky, Vth Edition, Mc GrawHill.
2.   Computer Organization and Architecture–William Stallings Sixth Edition, Pearson/PHI.
3.   Structured Computer Organization–AndrewS.Tanenbaum,4th Edition, PHI/Pearson.

22CS303PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA

B.Tech II Year I Sem.

L T P C
3 0 0 3

Course Objectives
1. To understand the basic object-oriented programming concepts and apply them in problem solving.
2. To illustrate inheritance concepts for reusing the program.
3. To Demonstrate multitasking by using multiple threads and event handling.
4. To develop data-centric applications using JDBC.
5. To Understand the basics of java console and GUI based programming .

Course Outcomes
1. Demonstrate the behaviour of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
2. Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords
3. Use multithreading concepts to develop inter process communication.
4. Understand the process of graphical user interface design and implementation using AWT or swings.
5. Develop applets that interact abundantly with the client environment and deploy on the server.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	1	-	-	2	3	-	2	3	2
CO2	3	3	3	2	-	1	-	-	3	3	2	3	3	3
CO3	3	3	3	2	-	-	-	-	3	3	2	3	3	3
CO4	3	3	3	3	2	2	2	1	3	3	3	2	3	3
CO5	3	3	3	3	3	2	2	1	3	3	3	2	3	3

UNIT - I
Object oriented thinking and Java Basics- Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT - II
Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance specialization, specification, construction, extension, limitation,

combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class. Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring java.io.

UNIT - III

Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception subclasses. String handling, exploring java.util. Differences between multithreading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter thread communication, thread groups, daemon threads. Enumerations, autoboxing, annotations, generics.

UNIT - IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, checkbox groups, choices,

Lists panels – scroll pane, dialogs, menu bar, graphics, and layout manager – layout manager types – border, grid, and flow, card and grid bag.

UNIT - V

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Java the complete reference, 7th edition, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCE BOOKS:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley& sons.
2. An Introduction to OOP, third edition, T. Budd, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. Johnson- Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education.
6. Core Java 2, Vol 2, Advanced Features, Cay.S. Horstmann and Gary Cornell, eighth Edition, Pearson Education
7. Object Oriented Programming with Java, R.Buyya, S.T.Selvi, X.Chu, TMH.
8. Java and Object Orientation, an introduction, John Hunt, second edition, Springer. 9. Maurach's Beginning Java2 JDK 5, SPD.

22CS304PC: DATA STRUCTURES LAB

B.Tech II Year I Sem.   **L   T   P   C**
                                                                             0   0   3   1.5

Pre requisites: A Course on "Programming for problem solving".
Course Objectives:
1. It covers various concepts of C programming language
2. It introduces searching and sorting algorithms
3. It provides an understanding of data structures such as stacks and queues.

Course Outcomes:

1. Identity the appropriate data structure to solve various problems

2. Implement various list operations by using pointers and dynamic memory allocation

3. Implementing linear data structures stack, queue operations by using arrays and pointers.

4. Implement various sorting algorithms

5. Implement various non-linear data structures trees, graphs operations.

COs	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2				1				3	3
CO2	3	3	3	3	2				1				3	3
CO3	3	3	3	3	2				1				3	3
CO4	3	3	3	3	2				1				3	3
CO5	3	3	3	3	2				1				3	3

List of Experiments:
1. Write a program that uses functions to perform the following operations on singly linked list.:
        i) Creation   ii)Insertion   iii)Deletion   iv)Traversal

2. Write a program that uses functions to perform the following operations on doubly linked list.:
        i) Creation   ii)Insertion   iii)Deletion   iv)Traversal

3. Write a program that uses functions to perform the following operations on circular linked list.:
        i) Creation   ii)Insertion   iii)Deletion   iv)Traversal

4. Write a program that implement stack(its operations)using
        i)Arrays   ii)Pointers

5. Write a program that implement Queue (its operations)using
        i)Arrays   ii)Pointers

6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
        i) Quicksort   ii) Heapsort   iii)Merge sort

7. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).

8. Write a program to implement
      i) BinarySearch tree   ii)BTrees   iii)B+ Trees   iv)   AVLtrees   v)Red –Black
trees

9. Write a program to implement the graph traversal methods.

10. Implement a Pattern matching algorithms using Boyer-Moore, Knuth-Morris-Pratt

TEXTBOOKS:
1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson
Freed, Universities Press.
2. Data Structures using C–A.S.Tanenbaum, Y.Langsam, and M.J.Augenstein, PHI/ Pearson
Education.

REFERENCEBOOK:
1.DataStructures:APseudocodeApproachwithC,2ndEdition,R.F.GilbergandB.A.Forouzan,Cengag
eLearning.

22CS305PC: OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

B.Tech II Year I Sem.

L	**T**	**P**	**C**
0	**0**	**3**	**1.5**

Course Objectives:
1. To write programs using abstract classes.
2. To write programs for solving real world problems using the java collection framework.
3. To write multithreaded programs.
4. To write GUI programs using swing controls in Java.
5. To introduce java compiler and eclipse platform.
6. To impart hands-on experience with java programming.

Course Outcomes:
1. Able to write programs for solving real world problems using the java collection framework.
2. Able to write programs using abstract classes.
3. Able to write multithreaded programs.
4. Able to write GUI programs using swing controls in Java.
5. Create web pages using Applets for example problem.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	3	-	1	-	-	-	3	3	3
CO2	3	3	3	-	-	3	-	-	-	-	-	3	3	2
CO3	3	3	2	1	-	-	-	-	-	-	-	3	3	3
CO4	3	3	2	3	-	-	-	1	3	3	3	3	3	3
CO5	3	3	3	3	3			1	3	3	3	3	3	3

Note:
1. Use LINUX and MySQL for the Lab Experiments. Though not mandatory, encourage the use of the Eclipse platform.

2. The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list as needed.

List of Experiments:

1. Use Eclipse or Net bean platform and acquaint yourself with the various menus. Create a test project, add a test class, and run it. See how you can use auto suggestions, auto fill. Try code formatter and code refactoring like renaming variables, methods, and classes. Try debug step by step with a small program of about 10 to 15 lines which contains at least one if else condition and a for loop.

2. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. Handle any possible exceptions like divided by zero.

3. A) Develop an applet in Java that displays a simple message.
   B) Develop an applet in Java that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.

4. Write a Java program that creates a user interface to perform integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num 2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception. Display the exception in a message dialog box.

5. Write a Java program that implements a multi-thread application that has three threads. First thread generates a random integer every 1 second and if the value is even, the second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of the cube of the number.

6. Write a Java program for the following: Create a doubly linked list of elements.

   Delete a given element from the above list. Display the contents of the list after deletion.

7. Write a Java program that simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green with radio buttons. On selecting a button, an appropriate message with "Stop" or "Ready" or "Go" should appear above the buttons in the selected color. Initially, there is no message shown.

8. Write a Java program to create an abstract class named Shape that contains two integers and an empty method named print Area (). Provide three classes named Rectangle, Triangle, and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

9. Suppose that a table named Table.txt is stored in a text file. The first line in the file is the header, and the remaining lines correspond to rows in the table. The elements are separated by commas.
   Write a java program to display the table using Labels in Grid Layout.

10.   Write a Java program that handles all mouse events and shows the event name at the center of the window when a mouse event is fired (Use Adapter classes).

11.   Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).

12.   Write a Java program that correctly implements the producer – consumer problem using the concept of inter thread communication.

13.   Write a Java program to list all the files in a directory including the files present in all its subdirectories.

REFERENCE BOOKS:
1. Java for Programmers, P. J. Deitel and H. M. Deitel, 10th Edition Pearson education.
2. Thinking in Java, Bruce Eckel, Pearson Education.
3. Java Programming, D. S. Malik and P. S. Nair, Cengage Learning.
4. Core Java, Volume 1, 9th edition, Cay S. Horstmann and G Cornell, Pearson.

22MC309: GENDER SENSITIZATION LAB

B.Tech II Year I Sem.   **L   T   P   C**
                                                                            0   0   2   0

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questionsabout the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines — such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies — to examine cultural assumptions aboutsex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex andgender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it. Students will acquire insight into the gendered division of labor and its relation to politics and economics.
4. Men and women students and professionals will be better equipped to work and live together as equals. Students will develop a sense of appreciation of women in all walks of life.
5. Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

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

Unit-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology- exploring Attitudes   towards Gender-Construction of Gender-Socialization: Making Women, Making Men Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

Unit – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't
Work." "Sharethe Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized
and Unaccounted work.
-Gender Development Issues-Gender, Governance and Sustainable Development-Gender and
Human Rights-Gender and Mainstreaming

Unit – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing-Coping withEveryday Harassment- Further Reading: "*Chupulu*".
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

Unit – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and
PopularLiterature- Gender Development Issues-Gender Issues-Gender Sensitive Language-
Gender andPopular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers.
Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

> **Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".**

ESSENTIAL READING: The Textbook, *"Towards a World of Equals: A Bilingual Textbook on Gender"* written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:
- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

22CS306PC: SKILL DEVELOPMENT COURSE

(DATA VISUALIZATION - R PROGRAMMING/ POWER BI)

B.Tech II Year I Sem.　　　　　　　　　　　　　　　　　　　**L　T　P　C**
　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　0　0　2　1

Course Objectives:

1. Effective use of Business Intelligence (BI) technology (Tableau) to apply data visualization
2. To discern patterns and relationships in the data.
3. To build Dashboard applications.
4. To communicate the results clearly and concisely.
5. To be able to work with different formats of data sets.

Course Outcomes: At the end of the course a student should be able to

1. Understand How to import data into Tableau.
2. Understand Tableau concepts of Dimensions and Measures.
3. Develop Programs and understand how to map Visual Layouts and Graphical Properties.
4. Create a Dashboard that links multiple visualizations.
5. Use graphical user interfaces to create Frames for providing solutions to real world problems.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	3	-	-	-	3	2	1	3	3	3
CO2	3	2	1	-	3	-	-	-	2	2	1	3	3	3
CO3	3	3	3	-	3	-	-	-	2	2	1	3	3	3
CO4	3	3	3	-	3	-	-	-	2	2	1	3	3	3
CO5	3	2	3	3	3	-	-	-	2	2	1	3	3	3

Lab Problems:

1. Understanding Data, What is data, where to find data, Foundations for building Data Visualizations, Creating Your First visualization?

2. Getting started with Tableau Software using Data file formats, connecting your Data to Tableau,creating basic charts(line, bar charts, Tree maps),Using the Show me panel.

3. Tableau Calculations, Overview of SUM, AVR, and Aggregate features, Creating custom calculationsand fields.

4. Applying new data calculations to your visualizations, Formatting Visualizations, Formatting Toolsand Menus, Formatting specific parts of the view.

5. Editing and Formatting Axes, Manipulating Data in Tableau data, Pivoting Tableau data.

6. Structuring your data, Sorting and filtering Tableau data, Pivoting Tableau data.

7. Advanced Visualization Tools: Using Filters, Using the Detail panel, using the Size panels,customizing filters, Using and Customizing tooltips, Formatting your data with colors.

8. Creating Dashboards & Storytelling, creating your first dashboard and Story, Design for differentdisplays, adding interactivity to your Dashboard, Distributing & Publishing your Visualization.

9. Tableau file types, publishing to Tableau Online, Sharing your visualizations, printing, and Exporting.

10. Creating custom charts, cyclical data and circular area charts, Dual Axis charts.

REFERENCE BOOKS:
1. Microsoft Power BI cookbook, Brett Powell, 2nd edition.
2. R Programming for Data Science by Roger D. Peng (References)
3. The Art of R Programming by Norman Matloff Cengage Learning India.

TEEGALA KRISHNA REDDY ENGINEERING COLLEGE
(UGC-Autonomous)
Approved by AICTE, Affiliated to JNTUH, Accreditated by NAAC- 'A' Grade
Medbowli, Meerpet, Balapur, Hyderabad, Telangana-500097
Mob: 9393959597.   Email: info@tkrec.ac.in,deanacademics@tkrec.ac.in

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

R22 REGULATION

COURSE STRUCTURE & SYLLABUS

B. TECH IV SEMESTER

FOR
B. TECH COURSE
(Applicable for the batches admitted 2022-2023)

B Tech IV Semester (R22)

S. No	Subject Code	Subject Name	Hours per			Credits
			L	T	P	
1	22MA401BS	Discrete Mathematics	3	0	0	3
2	22HS401MS	Business Economics & Financial Analysis	3	0	0	3
3	22CS401PC	Operating Systems	3	0	0	3
4	22CS402PC	Database Management Systems	3	0	0	3
5	22CS403PC	Software Engineering	3	0	0	3
6	22CS404PC	Operating Systems Lab	0	0	2	1
7	22CS405PC	Database Management Systems Lab	0	0	2	1
8	22CS401PW	Real-time Research Project/ Societal Related Project	0	0	4	2
9	22CS406PC	Skill Development Course (Node JS/ React JS/ Django)	0	0	2	1
10	22MC410	Constitution of India	3	0	0	0
		TOTAL	18	0	10	20

22MA401BS: DISCRETEMATHEMATICS

B.Tech II Year II Sem.   **L   T   P   C**
                                                               3   0   0   3

Course Objectives:
1. Introduce elementary discrete mathematics for computer science and engineering.
2. Topics include formal logic notation, methods of proof, induction, sets, relations, algebraic structures, elementary graph theory, permutations and combinations, counting principles; recurrence relations and generating functions.

Course Outcomes:
1. Understand and construct precise mathematical proofs
2. Apply logic and set theory to formulate precise statements
3. Analyze and solve counting problems on finite and discrete structures
4. Describe and manipulate sequences
5. Apply graph theory in solving computing problems

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2			2							1		
CO2	3	1			1							2		
CO3	1	2										1		
CO4	1	2										1		
CO5	2	2			2							2		

UNIT-I
Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT-II
Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering , Functions.

UNIT-III
Algebraic Structures: Introduction, Algebraic Systems, Semi groups and Monoids, Lattices as Partially Ordered Sets, Boolean Algebra.

UNIT-IV
Elementary Combinatorics: Basics of Counting, Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutation with Constrained Repetitions, Binomial Coefficient, The Binomial and Multinomial Theorems, The Principle of Exclusion.

UNIT-V
Graph Theory: Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multi-graphs and Euler Circuits, Hamiltonian Graphs, Chromatic Numbers, The Four-Color Problem.

TEXTBOOKS:
1. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay, R.Manohar,McGraw-Hill,1st ed.
2. Discrete Mathematics for Computer Scientists & Mathematicians: Joel.Mott, AbrahamKandel, TeodoreP.Baker, Prentis Hall of India,2nd ed.

REFERENCEBOOKS:
1. Discrete and Combinatorial Mathematics - an applied introduction: Ralph.P. Grimald, Pearsoneducation,5thedition.
2. Discrete Mathematical Structures: ThomasKosy, Tata Mc Graw Hill publishing co.

22SM401MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B.Tech II Year II Sem.   **L   T   P   C**
                                                                                    3   0   0   3

Course Objective: To learn the basic business types, impact of the economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

Course Outcome:
   1. Understand and Learn the Business Economic Concepts in Micro and Macro Business firm
   2. Understand microeconomic factors in related to demand and supply analysis and its forecasting
   3. Apply the theory of production function and Cost concepts to determine the Break Even Analysis. Remember different market structures, pricing strategies and different forms business organization
   4. Determine the financial statement by using Fundamental accounting concepts
   5. Interpret the financial statement by using Fundamental accounting concepts and Ratio analysis

Cos	PROGRAMME OUTCOMES													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					2								
CO2	3					2								
CO3	2	1	1		2									
CO4		2			3									
CO5	1		1		3	2								

Unit – I: Introduction to Business and Economics
Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.
Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II: Demand and Supply Analysis
Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.
Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

UNIT - III: Production, Cost, Market Structures & Pricing
Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.
Cost analysis: Types of Costs, Short run and Long run Cost Functions.
Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. **Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV: Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts(Simple Problems).

UNIT - V: Financial Ratios Analysis: Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXT BOOKS:
1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, InternationalBook House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:
1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

22CS401PC: OPERATING SYSTEMS

B.Tech II Year II Sem.   **L   T   P   C**
                                                                        3   0   0   3

Prerequisites:
1. A course on "Computer Programming and Data Structures".
2. A course on " Computer Organization and Architecture".

Course Objectives:
1. Introduce operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O sub systems and protection)
2. Introduce the issues to be considered in the design and development of operating system
3. Introduce basic Unix commands, system call interface for process management, inter process communication and I/O in Unix

Course Outcomes:
1. Understanding of basic system calls and processes in Operating system
2. Getting Knowledge of process scheduling algorithms and mechanism for overcoming deadlocks
3. Understanding about process management, synchronization of process and how inter process communication is done among the processes.
4. Able to understand about the working mechanism of memory management and how virtual memory is used for handling multiple processes.
5. Knowing the file system interfaces and operations on files.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	2	2	1	-	-	-	-	-	-	-	-	2	2	2
CO-2	2	-	-	-	-	-	-	-	-	-	-	2	2	1
CO-3	2	2	2	2	-	-	-	-	-	-	-	3	2	1
CO-4	3	2	2	2	-	-	-	-	-	-	-	3	3	1
CO-5	3	2	2	2								2	2	2

UNIT-I
Operating System- Introduction, Structures- Simple Batch, Multi programmed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls
Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT-II
CPU Scheduling- Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling. System call interface for process management- fork, exit, wait, wait pid, exec

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and   Recovery from Deadlock

UNIT-III

Process Management and Synchronization-The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors

Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT-IV

Memory Management and Virtual Memory - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT-V

File System Interface and Operations- Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

TEXT BOOKS:
1. Operating System Principles-Abraham Silberchatz, PeterB.Galvin, GregGagne , 7th Edition, JohnWiley.
2. Advanced programming in the UNIX environment, W.R.Stevens, Pearson education.

REFERENCE BOOKS:
1. Operating Systems- Internals and Design Principles, William Stallings,Fifth Edition–2005, Pearson Education/PHI
2. Operating System A Design Approach- Crowley, TMH.
3. Modern Operating Systems, Andrew S.Tanenbaum 2nd edition, Pearson/PHI
4. UNIX programming environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals-The New Frontiers, U.Vahalia, Pearson Education.

22CS402PC: DATABASE MANAGEMENT SYSTEMS

B.Tech II Year II Sem.   **L   T   P   C**
                                                                     3   0   0   3

Pre requisites: A course on "Data Structures".

Course Objectives:
1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics included at a models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Course Outcomes:
1. Construct the E-R model to represent databases on real world problems.
2. Experiment with queries and nested queries on real world problems by using several operators like join, set, and aggregate.
3. Plan and Relate the concept of data planning and database design using normalization.
4. Utilize the ACID properties in transaction management and interpret concurrency control mechanisms.
5. Categorize various file organizations and indexing for faster retrieval of data, persistent storage of data.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2	3										3	
CO2		2	1	2									2	
CO3			3	2	1								2	
CO4				2	1				1				2	
CO5	1	2	2						3				3	

UNIT-I
Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS
Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model

UNIT-II
Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views.
Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT-III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active databases.

Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, First, Second, Third normal forms, BCNF, lossless join decomposition, multivalued dependencies, Fourth normal form, Fifth normal form.

UNIT-IV

Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery andAtomicity,Log–BasedRecovery,RecoverywithConcurrentTransactions.

UNIT-V

Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, Indexes-Intuitions for tree Indexes, Indexed Sequential Access Methods(ISAM), B+ Trees: A Dynamic Index Structure.

TEXT BOOKS:
1. Database System Concepts, Silberschatz, Korth, Mc Graw hill, 5th Edition.
2. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill.

REFERENCE BOOKS:
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J.Date, Pearson Education
4. Oracle for Professionals, The XTeam, S.Shah and V.Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M.L. Gillenson, Wiley Student Edition.

22CS403PC: SOFTWARE ENGINEERING

B.Tech II Year II Sem.   **L   T   P   C**
                                                               3   0   0   3

Course Objectives
- The aim of the course is to provide an understanding of the working knowledge of the techniques for estimation, design, testing and quality management of large software development projects.
- Topics include process models, software requirements, software design, software testing, software process/product metrics, risk management, quality management and UML diagrams

Course Outcomes
1. Ability to translate end-user requirements into system and software requirements, using e.g. UML, and structure the requirements in a Software Requirements Document (SRD).
2. Identifyandapplyappropriatesoftwarearchitecturesandpatternstocarryouthighleveldesignofa system and be able to critically compare alternative choices.
3. Willhaveexperienceand/orawarenessoftestingproblemsandwillbeabletodevelopasimpletestingreport.
4. Recognize the importance of software maintenance and complexities involved in software evolution.
5. Able to learn various processes used in all the phases of the product.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	3	1	-	-	3	2	3	3	2	3
CO2	2	1	2	2	1	-	-	-	2	1	2	2	2	2
CO3	1	3	3	3	2	-	-	-	2	2	3	2	1	2
CO4	2	2	3	3	1	-	-	-	-	-	1	1	1	-
CO5	1	1	1	2	1	-	-	-	-	1	1	2	1	-

UNIT-I
Introduction to Software Engineering: The evolving role of software, changing nature of software, software myths. **A Generic view of process**: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI). **Process models**: The waterfall model, Spiral model and Agile methodology

UNIT-II
Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document.
Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management.

UNIT-III
Design Engineering: Design process and design quality, design concepts, the design model.Creatinganarchitecturaldesign:softwarearchitecture,datadesign,architecturalstylesandpatterns,architecturaldesign,conceptualmodelofUML,basicstructuralmodeling,classdiagrams,sequencediagrams,collaboration diagrams, usecase diagrams, component diagrams.

UNIT-IV
Testing Strategies: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging. Metrics for Process and Products: Software measurement, metrics for software quality.

UNIT-V
Risk management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM.
Quality Management: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO9000 quality standards.

TEXTBOOKS:
1. Software Engineering, A practitioner's Approach-RogerS. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Engineering- Sommerville, 7th edition, Pearson Education.

REFERENCEBOOKS:
1. The unified modeling language user guide Grady Booch, JamesRambaugh, IvarJacobson, Pearson Education.
2. Software Engineering, an Engineering approach-JamesF.Peters, WitoldPedrycz, JohnWiley.
3. Software Engineering principles and practice-WamanSJawadekar, The McGraw-Hill Companies.
4. Fundamentals of object-oriented design using UML Meiler page-Jones: Pearson Education.

22CS404PC: OPERATING SYSTEMS LAB

B.Tech II Year II Sem.   **L   T   P   C**
                                                                              0   0   2   1

Prerequisites: A course on "Programming for Problem Solving",
                         A course on "Computer Organization and Architecture".

Co-requisite: A course on "Operating Systems".

Course Objectives:
1. To provide an understanding of the design aspects of operating system concepts through simulation
2. Introduce basic Unix commands, system call interface for processs management, inter process communication and I/O in Unix

Course Outcomes:
1. Simulate and implement operating system concepts such as scheduling and system calls
2. Illustrating the process of deadlock management, and semaphore
3. Understanding the working IPC mechanisms with an example
4. Implement operating system concepts file management and memory management.
5. Able to implement Page replacement policies.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO-1	3	2	2	2	1	-	-	-	-	-	-	2	2	1
CO-2	3	2	2	2	1	-	-	-	-	-	-	2	2	1
CO-3	2	2	2	2	1	-	-	-	-	-	-	3	2	1
CO-4	3	2	2	2	1	-	-	-	-	-	-	3	3	1
CO-5	3	2	2	2	1	-	-	-	-	-	-	2	2	2

List of Experiments:
1. Write C programs to simulate the following CPU Scheduling algorithms
   a) FCFS b) SJF c) Round Robin d) priority

2. Write programs using the I/O system calls of UNIX/LINUX operating system (open, read, write, close, fcntl, seek, stat, open dir, read dir)

3. Write a C program to simulate Bankers Algorithm for Deadlock Avoidance and Prevention.

4. Write a C program to implement the Producer–Consumer problem using semaphores using UNIX/LINUX system calls.

5. Write C programs to illustrate the following IPC mechanisms

a) Pipes b) FIFOs c) Message Queues d) Shared Memory

6. Write C programs to simulate the following memory management techniques
    a)   Paging b)Segmentation

7. Write C programs to simulate Page replacement policies
    a)   FCFS b) LRU   c) Optimal

TEXT BOOKS:
1. Operating System Principles-Abraham Silberchatz, PeterB.Galvin, GregGagne 7th Edition, JohnWiley
2. Advanced programming in the Unix environment, W.R.Stevens, Pearsoneducation.

REFERENCE BOOKS:
1. OperatingSystems–InternalsandDesignPrinciples,WilliamStallings,FifthEdition–2005,PearsonEducation/PHI
2. Operating System-A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew STanenbaum, 2nd edition,Pearson/PHI
4. UNIX Programming Environment, Kernighan and Pike, PHI/Pearson Education
5. UNIX Internals: Th eNew Frontiers, U.Vahalia, Pearson Education

22CS405PC: DATABASE MANAGEMENT SYSTEMS LAB

B.Tech II Year II Sem.   **L   T   P   C**
                                                                              0   0   2   1

 Co-requisites:"Database Management Systems"

 Course Objectives:
1. Introduce ER data model, database design and normalization
2. Learn SQL basics for data definition and data manipulation

 Course Outcomes:
6. Design a database schema for given problem data.
7. Build a GUI application.
8. Apply the normalization techniques for development of application software to realistic problems.
9. Formulate queries using SQL DML/DDL/DCL commands.
10. Implement triggers to raise as per real time data and also Implement concurrency control mechanisms.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2	2										2	
CO2		1	2										1	
CO3		3	2	2									1	
CO4		1	2	3									2	
CO5		1	2	2	1								2	

 List of Experiments:

1. Concept design with E-R Model

2. Relational Model

3. Normalization

4. Practicing DDL commands

5. Practicing DML commands

6. A. Querying(using ANY, ALL, UNION, INTERSECT, JOIN, Constraints etc.)

   B. Nested, Correlated subqueries

7. Queries using Aggregate functions, GROUPBY, HAVING and Creation and dropping of Views.

8. Triggers (Creation of insert trigger, delete trigger, update trigger)

9. Procedures

10. Usage of Cursors

TEXTBOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc GrawHill, 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw Hill, Vedition.

REFERENCEBOOKS:

1. Database Systems design, Implementation, and Management, PeterRob & Carlos Coronel 7thEdition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C.J.Date, Pearson Education
4. Oracle for Professionals, The XTeam, S.Shah andV.Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL, Shah, PHI.
6. Fundamentals of Database Management Systems, M.L. Gillenson, Wiley Student Edition

22CS401PW: Real-time Research Project/ Societal Related Project

B.Tech II Year II Sem.   **L   T   P   C**
                                                                                  0   0   4   2

Course Objectives:

Mini Project is a short project intended to train students to identify a problem of practical significance

Experiments:

1. Software design process

 2. Various Tools used in the industry

 3. Application/ software development

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

1. Enable the Students to undertake short research projects in a team under the direction of members of the faculty.
2. Enable the students to identify a topic of interest and complete the preliminary work of undertaking case studies, data collection and feasibility studies .
3. Produce, improve and/or refine technical aspects for engineering products or components.
4. Enable the students to undertake fabrication work of new experimental set up/devices or develop software packages
5. Communicate their components by making an oral presentation before an evaluation committee

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1											1
CO2	2		3	1									1	
CO3			3			2					1			3
CO4				1										
CO5		2	3						1				2	

Project Intended to train the students to identify a problem of practical significance related
to
i) Software design process
ii) Research in specific domain
iii) Application/ software development
The student is encouraged to study of literature based on the guidance received by a project
supervisor and identify a specific problem and works for a solution. At the end he is expected to
submit a report based on his findings.
The project can be done as a group consisting maximum of four persons

22CS406PC: SKILL DEVELOPMENT COURSE (NODE JS/ REACT JS/ DJANGO)

B.Tech II Year II Sem.   **L   T   P   C**
                                                                                    0   0   2   1

Prerequisites: Object Oriented Programming through Java, HTML Basics
Course Objectives:

- To implement the static web pages using HTML and do client side validation using JavaScript.
- To design and work with databases using Java
- To develop an end to end application using java full stack.
- To introduce Node JS implementation for server side programming.
- To experiment with single page application development using React.

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

1. Build a custom website with HTML, CSS, and Bootstrap and little JavaScript.
2. Demonstrate Advanced features of JavaScript and learn about JDBC
3. Develop Server – side implementation using Java technologies like
4. Develop the server – side implementation using Node JS.
5. Design a Single Page Application using React.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	1	-	-	2	-	-	2	3	2
CO2	3	3	3	2	-	1	-	-	3	-	2	3	3	3
CO3	3	3	3	2	-	-	-	-	3	-	2	3	3	3
CO4	3	3	3	3	2	2	-	1	3	-	3	2	3	3
CO5	3	3	3	3	3	2	-	1	3	-	3	2	3	3

Exercises:

1. Build a responsive web application for shopping cart with registration, login, catalog and cart pages using CSS3 features, flex and grid.
2. Make the above web application responsive web application using Bootstrap framework.
3. Use JavaScript for doing client – side validation of the pages implemented in experiment 1 andexperiment 2.
4. Explore the features of ES6 like arrow functions, callbacks, promises, async/await. Implement an application for reading the weather information from openweathermap.org and display the information in the form of a graph on the web page.
5. Develop a java stand alone application that connects with the database (Oracle / mySql) and perform the CRUD operation on the database tables.
6. Create an xml for the bookstore. Validate the same using both DTD and XSD.
7. Design a controller with servlet that provides the interaction with application developed inexperiment 1 and the database created in experiment 5.

8. Maintaining the transactional history of any user is very important. Explore the various sessiontracking mechanism (Cookies, HTTP Session)
9. Create a custom server using http module and explore the other modules of Node JS like OS,path, event.
10. Develop an express web application that can interact with REST API to perform CRUDoperations on student data. (Use Postman)
11. For the above application create authorized end points using JWT (JSON Web Token).
12. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
13. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation usingchart.js
14. Create a TODO application in react with necessary components and deploy it into github.

REFERENCE BOOKS:
1. Jon Duckett, Beginning HTML, XHTML, CSS, and JavaScript, Wrox Publications, 2010
2. Bryan Basham, Kathy Sierra and Bert Bates, Head First Servlets and JSP, O'Reilly Media, 2ndEdition, 2008.
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo,Express, React, and Node, 2nd Edition, A Press.

22MC410: CONSTITUTION OF INDIA

B.Tech II Year II Sem.   **L   T   P   C**
                                                                                                     3   0   0   0

Course Objectives: Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin 1917 and its impact on the initial drafting of the Indian Constitution.

Course Outcomes: Students will be able to:

CO1: Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.

CO2: Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.

CO3: Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP]under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution

CO4: Discuss the passage of the Hindu Code Bill of 1956.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	3	2	-	2	3	2	1	3	-	2	1	1
CO2	1	2	1	2	-	2	2	2	2	2	1	2	2	1
CO3	1	3	3	3	1	2	3	1	2	3	1	2	3	2
CO4	-	2	2	2	-	2	3	2	3	3	1	2	1	3

Unit - 1 History of Making of the Indian Constitution- History of Drafting Committee.

Unit - 2 Philosophy of the Indian Constitution- Preamble Salient Features

Unit - 3 Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy

- Fundamental Duties.

Unit - 4 Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

Unit - 5 Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

Unit - 6 Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Suggested Reading:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Program Educational Objectives (PEO's):

PEO1: The students of the program will have strong foundation in the fundamental principles and gain advanced knowledge in the Basic Sciences, Mathematics and other application of Advanced Computer Engineering.

PEO2: The students of the program will be prepared for their successful careers in the software industry / seek higher studies and continue to develop.

PEO3: The students of the program will prepare to engage in professional development through self-study, graduate and professional studies in engineering & business.

PEO4: Graduates shall have good communication skills, leadership skills, professional, ethical and social responsibilities.

Programme Outcomes (PO's) :

PO1.Engineering knowledge: Ability to obtain and apply the knowledge of science and engineering essentials in problem solving.

PO2.Problem Analysis: Ability to undertake problem recognition ,formulation and providing ideal solution.

PO3.Design/ development of solutions: An ability to design, implement a computer based system, with desire program to meet the needs of social and environmental considerations.

PO4.Conduct investigations of complex problems: An ability to apply mathematical formulas, algorithmic principles and computational theory to develop a model and design of computer based system.

PO5. Modern tool usage: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PO6.Engineer and society: An ability to analyze the impact of computing in different organizations, society including the varying policy issues that are taken care off.

PO7.Environment and sustainability: understanding of impact of engineering solutions on the environment and this attains sustainability with responsibility.

PO8.Ethics: An ability to lead a strong professionalism and the ethical values.

PO9.Individual and team work: An ability to function effectively on multidisciplinary environments leads to leadership and member of team work.

PO10. Communication: An ability to communicate effectively in both verbal and written form which enables to prepare well documentation for report writing and a project.

PO11.Project management and finance: Apply project management practices to the launch of new programs, initiatives, products, services, and events relative to the stakeholder needs including – finance.

PO12.Life-long learning: RRecognition of the need for higher studies and inspires to update the latest technologies by the way of life long learning process from time to time.

Program Specific Outcomes: (PSO's):

PSO1: Acquired knowledge will be used to design and modify principles in the development of software and hardware systems to get a better quality product.

PSO2: An ability to identify the state of professional development in preparing for competitive examinations that offer successful career and career building.

Institutes Under

TKR EDUCATIONAL SOCIETY

Teegala Krishna Reddy Engineering College(TKEM)

TKR College of Engineering and Technology(TKRC)

TKR Institute of Management and Science(TKRB)

TKR College of Pharmacy(TKRP)