



**B.Tech.**

**Computer Science and Engineering**

**(Data Science)**

**(4 Year Program)**

**(Applicable for the Batches admitted from 2023-24)**



**NARASARAOPETA  
ENGINEERING COLLEGE**  
(AUTONOMOUS)

Kotappakonda Road, Yellamanda (Post), Narasaraopet – 522601, Guntur District, AP  
Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada, Code: 47,  
Accredited by NBA & NAAC A+, RTA Approved Pollution test Centre, ISO 9001: 2015 Certified Institution  
Phone: 08647-239905 [Website: www.nrtec.in](http://www.nrtec.in)





## Academic Regulations (R23) for B.Tech. (Regular)

(Effective for the students admitted into I year from the Academic Year 2023-2024 onwards)

### 1. Award of the Degree

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

- (i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gapyear facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).
- (ii) Registers for 160 credits and secures all 160 credits.

### (b) Award of B.Tech. degree with Honors

A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:

- (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 160 credits.
- (ii) Registering for Honors is optional.
- (iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

### 3. Admissions

Admission to the B.Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or

any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

### 4. Program related terms

**Credit:** A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

Credit definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

- a) **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
- b) **Choice Based Credit System (CBCS):** The CBCS provides a choice for





students to select from the prescribed courses.

#### 5. Semester/Credits:

- i) A semester comprises 90 working days and an academic year is divided into two semesters.
- ii) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship / work-based vocational education and training can be carried out during the summer term, especially by students who wish to exit after two semesters or four semesters of study.
- iii) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

#### 6. Structure of the Undergraduate Programme

All courses offered for the undergraduate program (B.Tech.) are broadly classified as follows:

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation(%)
1.	Humanities and Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

#### 7. Course Classification:

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

S.No.	Broad Course Classification	Course Category	Description
1.	Foundation Core Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses
2.	Core Courses	Professional Core Courses (PC) Core	Includes subjects related to the parent discipline/department/branch of Engineering
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	Interdisciplinary/job-oriented/domain courses which are relevant to the industry
4.	Project & Internships	Project	B.Tech. Project or Major Project
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit courses	Covering subjects of developing desired attitude among the learners





## 8. Programme Pattern

- i. Total duration of the of B.Tech (Regular) Programme is four academic years.
- ii. Each academic year of study is divided into two semesters.
- iii. Minimum number of instruction days in each semester is 90 days.
- iv. There shall be mandatory student induction program for freshers, with a three- week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.
- v. Health/wellness/yoga/sports and NCC /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.
- vi. Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.
- vii. Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.
- viii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04 Open Elective courses.
- ix. Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students specializing in emerging areas within the chosen field of study.
- x. A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.
- xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.
- xii. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain/interdisciplinary courses and the other shall be a soft skills course.
- xiii. Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.
- xiv. There shall also be mandatory full internship in the final semester of the programme along with the project work.
- xv. Undergraduate degree with Honors is introduced by the College for the students having good academic record.
- xvi. College will plan to implement Virtual Labs (<https://www.vlab.co.in>) which provide remote access to labs in various disciplines of Engineering and will



help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

- xvii. College will assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/GATE/other competitive exams etc.
- xviii. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

## 9. Evaluation Process

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks, Full Internship & Project work in final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated for 30 mid semester marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together for the theory, practical, design, drawing subject or project etc. In case of a mandatory course, he/she should secure 40% of the total marks.

## THEORY COURSES

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

- i) For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70marks for the End-Examination.
- ii) For practical subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.
- iii) If any course contains two different branch subjects, the syllabus shall be written into two parts with 3 units each (Part-A and Part-B) and external examination question paper shall be set with two parts each for 35 marks.
- iv) If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of "T" for theory subject and "P" for practical subject.

### a) Continuous Internal Evaluation

- i) For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.
- ii) Objective paper shall contain 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

**Note:**



- The objective paper shall be prepared in line with the quality of competitive examinations questions.
  - The subjective paper shall contain 3 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
  - The objective paper shall be conducted either online or offline by the respective department on the day of subjective paper test.
  - If conducted offline, the midterm examination shall be conducted first by distribution of the Objective paper, simultaneously marking the attendance, after 20 minutes the answered objective paper shall be collected back. The student is not allowed to leave the examination hall.  
Then the descriptive question paper and the answer booklet shall be distributed. After 90 minutes the answered booklets are collected back.
  - Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.
  - Assignment Test if conducted like slip tests, the following procedure may be followed: Two assignment tests may be conducted before first and second mid examinations for 5 marks. First assignment test may be conducted after the 1<sup>st</sup> Unit of syllabus. 5 or 6 questions may be announced in advance. On the day of test, 2 questions will be given to each student randomly. The test may be conducted in the first hour for 30 minutes. Second assignment test may be conducted in the similar way after the completion of 3<sup>rd</sup> Unit of syllabus.
- iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.
- iv) First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.
- v) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25 Marks obtained in second mid: 20

Final mid semester Marks:  $(25 \times 0.8) + (20 \times 0.2) = 24$

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other. For Example:

Marks obtained in first mid: Absent Marks obtained in second mid:

25

Final mid semester Marks:  $(25 \times 0.8) + (0 \times 0.2) = 20$

**b) End Examination Evaluation:**

End examination of theory subjects shall have the following pattern:

- i) There shall be 6 questions and all questions are compulsory.







- ii) Question I shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks.
- iii) There shall be 2 short answer questions from each unit.
- iv) In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
- v) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

End examination of theory subjects consisting of two parts of different subjects, for example: Basic Electrical & Electronics Engineering shall have the following pattern:

- i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
- ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.
- iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
- iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

**PRACTICAL COURSES**

Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

- a) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.
- b) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the regularity/record/viva and 15 marks for the internal test.
- c) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and External examiner from the other reputed Institutions.
  - Procedure: 20 marks
  - Experimental work & Results: 30 marks
  - Viva voce: 20 marks.

In a practical subject consisting of two parts (Eg: Basic Electrical & Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours. Mid semester examination shall be evaluated as above for 30 marks in each part and final mid semester marks shall be arrived by considering the average of marks obtained in two parts.

- d) For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for end examination.





Assessment Method	Marks
Continuous Internal Assessment	30
Semester End Examination	70
Total	100

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective papers shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics, shall consist of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing, multiple branches, etc is mentioned along with the syllabus.

10. There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations. Skill oriented Courses
- i) There shall be five skill-oriented courses offered during III to VII semesters.
  - ii) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.
  - iii) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the Principal.
  - iv) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.
  - v) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits





shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades.

- vi) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the concerted department's HOD at the beginning of the semester.
- vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the Principal.

### **11. Massive Open Online Courses (MOOCs):**

A student has to pursue and complete one course compulsorily through MOOCs approved by the HOD. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.

A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the College.

Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

### **12. Credit Transfer Policy**

Adoption of MOOCs is mandatory, to enable Blended model of teaching-learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the College shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

- i) The College shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
- ii) Student registration for the MOOCs shall be only through the respective department, it is mandatory for the student to share necessary information with the department.
- iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.





- iv) The concerned department shall identify the courses permitted for credit transfer.
- v) The concerned department shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
- vi) The department's HOD will designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
- vii) The College will ensure no overlap of MOOC exams with that of the End Semester examination schedule.
- viii) Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
- ix) The Department shall submit the following to the examination section:
  - a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
  - b) Undertaking form filled by the students for credit transfer.
- x) The College shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and State Government.

**Note:** Students shall be permitted to register for MOOCs offered through online platforms approved by the respective Department from time to time.

### 13. Academic Bank of Credits (ABC)

The College has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

- i. provide option of mobility for learners across the universities of their choice
- ii. provide option to gain the credits through MOOCs from approved digital platforms.
- iii. facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
- iv. Execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from student's account.

### 14. Mandatory Internships Summer Internships

Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others.

The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and



evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the College.

**Full Semester Internship and Project work:**

In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

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

The HOD shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

**15. Guidelines for offering a Minor**

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

- i) The Minor program requires the completion of 12 credits in Minor stream chosen.
- ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but may be waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.





iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

**Note:** A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

### 16. Guidelines for offering Honors

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

- i) Honors is introduced in the curriculum of all B.Tech. programs offering a major degree and is applicable to all B.Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
- ii) A student shall earn additional 15 credits (4 theory courses of 3 credits each **And** One MOOC course of 3 credits) for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).
- iii) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum one subject per semester pertaining to the Honors from IV Semester onwards.
- iv) The college will arrange separate class work and timetable of the courses offered under Honors program.
- v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.
- vi) Students can complete the MOOC course in online platforms like SWAYAM with a minimum duration of 12 weeks for 3-credits satisfying the criteria for credit mobility. Student can register for online MOOC course in any semester starting from the 4<sup>th</sup> Semester. Should submit the MOOC certificate before the commencement of 7<sup>th</sup> Semester End Examinations. For the 4 theory courses offered by the college, the teaching and evaluation procedure shall be similar to regular B.Tech courses.
- vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
- viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.
- ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme. Honors courses should be completed in a single attempt otherwise the registration for honors stands cancelled.
- x) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade



- sheet mentioning the additional courses completed by them.
- xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering.
  - xii) Student who registered for Honors should pass all subsequent regular semester courses in a single attempt with a minimum of 7 SGPA.

**Enrolment into Honors:**

- i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline
- ii) The enrolment of student into Honors is based on the SGPA obtained in each semester in the major degree program. 7 SGPA shall be maintained in all semesters up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 SGPA (in all semesters) without any backlog subjects will be permitted to register for Honors.
- iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
- iv) Transfer of credits from Honors to regular B.Tech degree and vice-versa shall not be permitted.
- v) Honors is to be completed simultaneously with a Major degree program.

**Registration for Honors:**

- i) The eligible and interested students shall apply through the HOD of his/her parent department. Selected students shall be permitted to register the courses under Honors.
- ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
- iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
- iv) There is no fee for registration of subjects for Honors program offered in offline mode.

**17. Attendance Requirements:**

- i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
- iii) A stipulated fee shall be payable towards condonation of shortage of attendance to the College.
- iv) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- v) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class



work.

- vi) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
- vii) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.
- viii) For induction programme attendance shall be maintained as per AICTE norms.

### 18. Promotion Rules:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 16.

- i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per College norms.
- ii) A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any *decimal* fraction should be **rounded off to lower** digit) up to in the subjects that have been studied up to III semester.
- iii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any *decimal* fraction should be **rounded off to lower** digit) in the subjects that have been studied up to V semester.

And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

- iv) When a student is detained due to lack of credits/shortage of attendance he/she maybe re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

### 19. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

**Structure of Grading of Academic Performance**

Range in which the marks in the subject fall	Grade	Grade points Assigned
90 & above	S (Superior)	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0







Absent	Ab (Absent)	0
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- i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered in the next supplementary examination.
- ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \frac{\sum (C_i \times G_i)}{\sum C_i}$$

where,  $C_i$  is the number of credits of the  $i$ th subject and  $G_i$  is the grade point scored by the student in the  $i$ th course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \frac{\sum (C_i \times S_i)}{\sum C_i}$$

where "S<sub>i</sub>" is the SGPA of the  $i$ th semester and  $C_i$  is the total number of credits up to that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Semester Grade Point Average (SGPA) for a semester will be computed only for those students, who have successfully passed all the courses of that semester. Similarly Cumulative Grade Point Average (CGPA) will be computed for the current semester only for those candidates who successfully completed all the courses starting from the 1st Semester to the Current Semester.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D, E and F.

**Award of Class:**

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

Class Awarded	CGPA Secured
First Class with Distinction	$\geq 7.5$ (Without any supplementary appearance)
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

- **Note:** Students who have written supplementary examinations to fulfil the credit requirement will not be awarded First Class with Distinction. For such students the highest degree that is awarded will be First Class Only.

**CGPA to Percentage conversion Formula –  $(CGPA - 0.5) \times 10$**

**20. With-holding of Results**

If the candidate has any dues not paid to the College or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

**21. Multiple Entry / Exit Option****(a) Exit Policy:**

The students can choose to exit the four-year programme at the end of first/second/third year.

- i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.
- ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.
- iii) **Bachelor of Science (in Field of study/discipline) i.e., B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

**(b) Entry Policy:**

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.





**Note:** The Universities shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

**22. Gap Year Concept:**

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The HOD of the respective department shall forward such proposals submitted by the students to the Principal. An evaluation committee constituted by the Principal shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

**23. Transitory Regulations**

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B.Tech from the date of commencement of class work, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

**24. Minimum Instruction Days for a Semester:**

The minimum instruction days including exams for each semester shall be 90 days.

**25. Medium of Instruction:**

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

**26. Student Transfers:**

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

**27. General Instructions:**

- a. The academic regulations should be read as a whole for purpose of any interpretation.
- b. Malpractices rules-nature and punishments are appended.
- c. Where the words “he”, “him”, “his”, occur in the regulations, they also include



“she”, “her”, “hers”, respectively.

- d. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- e. The Universities may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
- f. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

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**ACADEMIC REGULATIONS (R23) FOR B.TECH. (LATERAL ENTRY SCHEME)**

*(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2024-2025 onwards)*

**1. Award of the Degree**

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

- (i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).
- (ii) Registers for 120 credits and secures all 120 credits.

(c) **Award of B.Tech. degree with Honors**

A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:

- (i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.
- (ii) Registering for Honors is optional.
- (iii) Honors is to be completed simultaneously with B.Tech. programme.

2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.

**3. Minimum Academic Requirements**

The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.2

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.
- ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.





**4. Course Pattern**

- i) The entire course of study is three academic years on semester pattern.
- ii) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.
- iii) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

- 5. All other regulations as applicable for B.Tech. Four-year degree course (Regular) will hold good for B.Tech. (Lateral Entry Scheme).

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## MALPRACTICES RULES

### DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

- The Principal shall refer the cases of Malpractices in Internal Assessment Test and Semester end examinations to a malpractice prevention committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the students based on the recommendations of the committee.
- Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained here under

	<b>Nature of Malpractices/ Improper conduct</b>	<b>Punishment</b>
	<i>If the candidate:</i>	
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the college.



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 to 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 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.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the Police and a police case is registered against them.





	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.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all 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 college 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 college for further action to award suitable punishment.	

**OTHER MATTERS:**

1. Physically challenged candidates who have availed additional examination time and a scribe during their intermediate / EAPCET examinations will be given similar concessions on production of relevant proof / documents.
2. The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Controller of Examinations and Heads of the departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the departments shall be reported to the Academic Council for ratification.

**GENERAL:**

1. The academic council may, from time to time, revise, amend or change the regulations, schemes of examinations and / or syllabi.
2. Where ever the words “he”, “him”, “his” occur in the regulations, they include “she”, “her”, “hers”.





3. The academic regulation should be read as a whole for the purpose of any interpretation.
4. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.
5. Malpractice cases will be indicated in the grade card with letters 'MP'.








**JAWAHARLAL NEHRU TECHNOLOGICAL  
UNIVERSITY: KAKINADA**  
KAKINADA-533003, Andhra Pradesh (India)  
For Constituent Colleges and Affiliated Colleges of JNTUK

# Ragging

## Prohibition of ragging in educational institutions Act 26 of 1997

### Salient Features

- ⇒ Ragging within or outside any educational institution is prohibited.
- ⇒ Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

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

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

LET US MAKE JNTUK A RAGGING FREE UNIVERSITY





## ANNEXURE-I

### COMMUNITY SERVICE PROJECT

Experiential learning through community engagement

As per the decision of the concerned department BOS

#### Introduction

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

#### Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.
- Implementation of Community Service Project
- Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.







- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty incharge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

### Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one –
- First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
- Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
  - Agriculture
  - Health
  - Marketing and Cooperation
  - Animal Husbandry
  - Horticulture
  - Fisheries
  - Sericulture
  - Revenue and Survey
  - Natural Disaster Management
  - Irrigation
  - Law & Order
  - Excise and Prohibition
  - Mines and Geology





- Energy
- Internet
- Free Electricity
- Drinking Water

## **EXPECTED OUTCOMES**

### **BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS**

#### **Learning Outcomes**

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

#### **Personal Outcomes**

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

#### **Social Outcomes**

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

#### **Career Development**

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

#### **Relationship with the Institution**

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates





### **Benefits of community service project to faculty members**

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

### **Benefits of community service project to colleges and universities**

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

### **Benefits of community service project to community**

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.

## **Suggestive list of programmes under community Service project**

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

### **For Engineering Students**

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries

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**R23 I YEAR COURSE STRUCTURE**  
**INDUCTION PROGRAMME**

S.No	Course Name	Category	L	T	P	CREDITS
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0	0	6	0
2	Career Counselling	MC	2	0	2	0
3	Orientation to all branches -- career options, tools, etc.	MC	3	0	0	0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2	0	3	0
5	Proficiency Modules & Productivity Tools	ES	2	1	2	0
6	Assessment on basic aptitude and mathematical skills	MC	2	0	3	0
7	Remedial Training in Foundation Courses	MC	2	1	2	0
8	Human Values & Professional Ethics	MC	3	0	0	0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2	1	2	0
10	Concepts of Programming	ES	2	0	2	0



**DEPARTMENT OF CSE (DATA SCIENCE)**



**I B.TECH - I SEMESTER**

S.No	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R23CC1101	LINEAR ALGEBRA & CALCULUS	BS&H	30	70	100	3	0	0	3
2	R23CC1102	INTRODUCTION TO PROGRAMMING	ES	30	70	100	3	0	0	3
3	R23CC1106	ENGINEERING PHYSICS	BS&H	30	70	100	2	0	0	3
4	R23CC1107	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	ES	30	70	100	3	0	0	3
5	R23CC1108	ENGINEERING GRAPHICS	ES	30	70	100	3	0	0	3
6	R23CC11L1	COMPUTER PROGRAMMING LAB	ES	30	70	100	0	0	3	1.5
7	R23CC11L5	IT WORKSHOP	ES	30	70	100	0	0	2	1
8	R23CC11L6	ENGINEERING PHYSICS LAB	ES	30	70	100	0	0	3	1
9	R23CC11L7	EEE WORKSHOP	ES	30	70	100	0	0	2	1.5
10	R23CC11MC2	NSS/NCC/SCOUTS & GUIDES/ COMMUNITY SERVICE	BS&H	100	-	100	-	-	1	0.5
<b>TOTAL</b>										<b>20.5</b>



**DEPARTMENT OF CSE (DATA SCIENCE)**



**I B.TECH - II SEMESTER**

S.No	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R23CC1201	DIFFERENTIAL EQUATIONS & VECTOR CALCULUS	BS&H	30	70	100	3	0	0	3
2	R23CC1202	DATA STRUCTURES	PC	30	70	100	3	0	0	3
3	R23CC1206	COMMUNICATIVE ENGLISH	BS&H	30	70	100	1	0	4	2
4	R23CC1207	CHEMISTRY	BS&H	30	70	100	3	0	0	3
5	R23CC1212	BASIC CIVIL AND MECHANICAL ENGINEERING	ES	30	70	100	3	0	0	3
6	R23CC12L1	DATA STRUCTURES LAB	PC	30	70	100	0	0	3	1.5
7	R23CC12L9	ENGINEERING WORKSHOP	ES	30	70	100	0	0	2	1.5
8	R23CC12L10	CHEMISTRY LAB	BS&H	30	70	100	0	0	2	1
9	R23CC12L12	COMMUNICATIVE ENGLISH LAB	ES	30	70	100	0	0	3	1
10	R23CC12MC 1	HEALTH & WELLNESS, YOGA & SPORTS	BS&H	100	-	100	-	-	1	0.5
<b>TOTAL</b>										<b>19.5</b>







**R23 II YEAR COURSE STRUCTURE**

**II YEAR I SEMESTER**

S.No.	Subcode	Category	Title	L	T	P	Credits
1	R23CC2101	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3
2	R23CC2102	BS&H	Universal human values understanding harmony and ethical human conduct	2	1	0	3
3	R23DS2107	Engineering Science	Introduction to Data Science	3	0	0	3
4	R23CC2104	Professional Core	Advanced Data Structures & Algorithms Analysis	3	0	0	3
5	R23CC2105	Professional Core	Object Oriented Programming Through Java	3	0	0	3
6	R23DS21L1	Professional Core	Data Science Lab	0	0	3	1.5
7	R23CC21L2	Professional Core	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	R23CC21L3	Skill Enhancement course	Python programming	0	1	2	2
Total				14	2	8	20





**II YEAR II SEMESTER**

S.No.	Subcode	Category	Title	L	T	P	Credits
1	R23CC2208	Management Course-I	Optimization Techniques	2	0	0	2
2	R23DS2201	Engineering Science/ Basic Science	Statistical Methods for Data Science	3	0	0	3
3	R23DS2202	Professional Core	Data Engineering	3	0	0	3
4	R23CC2204	Professional Core	Database Management Systems	3	0	0	3
5	R23DS2203	Professional Core	Computer Organization and Architecture	3	0	0	3
6	R23DS22L2	Professional Core	Data Engineering Lab	0	0	3	1.5
7	R23CC22L1	Professional Core	DBMS Lab	0	0	3	1.5
8	R23DS22L4	Skill Enhancement course	Exploratory Data Analysis with Python	0	1	2	2
9	R23CC22L3	BS&H	Design Thinking &Innovation	1	0	2	2
10	R23CC21MC	BS&H	Environmental Studies	2	0	0	-
Total				17	1	10	21
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation							



**DEPARTMENT OF CSE (DATA SCIENCE)**



**I B.TECH - I SEMESTER**

S.No	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R23CC1101	LINEAR ALGEBRA & CALCULUS	BS&H	30	70	100	3	0	0	3
2	R23CC1102	INTRODUCTION TO PROGRAMMING	ES	30	70	100	3	0	0	3
3	R23CC1106	ENGINEERING PHYSICS	BS&H	30	70	100	2	0	0	3
4	R23CC1107	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	ES	30	70	100	3	0	0	3
5	R23CC1108	ENGINEERING GRAPHICS	ES	30	70	100	3	0	0	3
6	R23CC11L1	COMPUTER PROGRAMMING LAB	ES	30	70	100	0	0	3	1.5
7	R23CC11L5	IT WORKSHOP	ES	30	70	100	0	0	2	1
8	R23CC11L6	ENGINEERING PHYSICS LAB	ES	30	70	100	0	0	3	1
9	R23CC11L7	EEE WORKSHOP	ES	30	70	100	0	0	2	1.5
10	R23CC11MC2	NSS/NCC/SCOUTS & GUIDES/ COMMUNITY SERVICE	BS&H	100	-	100	-	-	1	0.5
<b>TOTAL</b>										<b>20.5</b>





I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
<b>SUB CODE: R23CC1101</b>	<b>LINEAR ALGEBRA &amp; CALCULUS (Common to All Branches of Engineering)</b>						

**COURSE OBJECTIVES:**

- Grasping fundamental principles in linear algebra, including linear transformations, solving systems of linear equations, and applying matrix calculus.
- To become proficiency in solving computational problems of linear algebra.
- To acquire knowledge on mean value theorems in calculus.
- Familiarization about the techniques in calculus and multivariate analysis.

**COURSE OUTCOMES:**

After completion of the course, the students should be able to:

- CO1:** Solve the system of linear equations and transformations. [K3]  
**CO2:** Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors. [K4]  
**CO3:** Utilize mean value theorems to real life problems. [K3]  
**CO4:** Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering. [K3]  
**CO5:** Identify the area and volume by interlinking them to appropriate double and triple integrals. [K3]

**UNIT-I: Matrices**

Introduction to Linear Transformation-Rank of a matrix by Echelon form and normal form - Cauchy- Binet formulae (without proof) - Inverse of non-singular matrices by Gauss-Jordan method - System of linear equations: Solving system of homogeneous and non-homogeneous equations - Gauss elimination method, Jacobi and Gauss-Seidel iteration methods.

Applications: L-C-R Circuits

**UNIT-II: Eigenvalues, Eigenvectors 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 form and nature of a quadratic form - Reduction of quadratic form to canonical form by orthogonal transformation.





**UNIT-III: Calculus**

Mean Value Theorems (without proofs): Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation - Cauchy's mean value theorem - Taylor's and Maclaurin's theorems with remainders - Problems and applications on the above theorems.

**UNIT-IV: Partial differentiation and Applications (Multi variable calculus)**

Functions of several variables: Continuity and Differentiability - Partial derivatives – Homogeneous function-Euler's Theorem on homogeneous functions-Total derivatives - Chain rule - Taylor's and Maclaurin's series expansion of functions of two variables - Jacobians - Functional dependence - Maxima and minima of functions of two variables - Method of Lagrange's multipliers.

**UNIT-V: Multiple Integrals (Multi variable calculus)**

Double integrals - Triple integrals - Change of order of integration - Change of variables to polar, cylindrical and spherical coordinates - Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

**TEXTBOOKS:**

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44<sup>th</sup> Edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10<sup>th</sup> Edition.

**REFERENCE BOOKS:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14<sup>th</sup> Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5<sup>th</sup> Edition (9<sup>th</sup> reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5<sup>th</sup> Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9<sup>th</sup> edition.
5. Higher Engineering Mathematics, H. K. Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).





I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
<b>SUB CODE : R23CC1102</b>	<b>INTRODUCTION TO PROGRAMMING</b>						

**COURSE OBJECTIVES:**

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

**COURSE OUTCOMES:**

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

**CO1:** Infer the basic concepts of computers, algorithms and Flowcharts [K3].

**CO2:** Develop programs using appropriate control structures [K3].

**CO3:** Write programs using arrays and strings [K3].

**CO4:** Develop programs using structures and pointers. [K3].

**CO5:** Make use of functions and file Operations in C programming for a given application [K3].

**UNIT I: Introduction to Programming and Problem Solving**

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program- Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operators, Type Conversion, and Casting.

**Problem solving techniques:** Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

**UNIT II: Control Structures**

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

**UNIT III: Arrays and Strings**

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Strings: Introduction-Reading Strings-Writing Strings-String Manipulation functions -Array of Strings.





**UNIT IV: Pointers & User Defined Data types**

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

**Functions & File Handling**

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling

**Note:** The syllabus is designed with C Language as the fundamental language of implementation.

**TEXTBOOKS:**

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 2005.
2. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3<sup>rd</sup> edition.
3. How to solve it by Computer, R G Dromey, and Pearson Education.

**REFERENCE BOOKS:**

1. Computing Fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2<sup>nd</sup> edition
3. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1998.







I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
<b>SUB CODE: R23CC1106</b>	<b>ENGINEERING PHYSICS</b>						

**COURSE OBJECTIVES:**

- To bridge the gap between the Physics at 10+2 level and UG level engineering courses
- Identifying the importance of Lasers and optical fibers,
- Enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics,
- Introduce novel concepts of magnetic materials and superconductors, physics of semiconductors and smart materials.

**COURSE OUTCOMES:**

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

**CO 1:** Analyze the intensity variation of Laser light and its propagation in optical fibers. [K4]

**CO 2:** Familiarize with the basics of crystals and their structures. [K3]

**CO 3:** Summarize various types of Magnetic materials and Super conductors. [K2]

**CO 4:** Explain the basic concepts of Quantum Mechanics and the band theory of solids. [K2]

**CO 5:** Identify the type of semiconductor and smart materials. [K3]

**UNIT I: Lasers and Optical Fibers**

**Lasers:** Introduction – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Population inversion - Einstein's coefficients and relation between them - Ruby laser – Helium Neon laser- Semiconductor laser-Applications.

**Optical Fibers:** Introduction- Basic Structure and Principle of optical fiber - Acceptance angle – Acceptance cone - Numerical Aperture - Step Index and Graded index fibers -Applications.

**UNIT II: Crystallography and X-ray diffraction**

**Crystallography:** Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC.

**X-ray diffraction:** Miller indices – separation between successive (hkl) planes.

Bragg's law - crystal structure determination by Laue's and powder methods.

**UNIT III: Magnetic Materials and Superconductivity**

**Magnetic Materials:** Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility, permeability and relation between them - Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials -





Hysteresis - soft and hard magnetic materials.

**Superconductivity:** Introduction- Properties, Meissner effect - Type-I and Type-II superconductors- BCS Theory- AC and DC Josephson effect-Applications

**UNIT IV: Quantum Mechanics and Free electron theory**

**Quantum Mechanics:** de-Broglie's matter Waves – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent wave equation – Particle in a one-dimensional infinite potential well.

**Free Electron Theory:** Classical free electron theory (Qualitative with discussion of merits and demerits) – electrical conductivity based on Classical free electron theory -Quantum free electron theory – Fermi energy- Fermi-Dirac distribution.

**UNIT V: Semiconductors and Smart materials:**

**Semiconductors:** Formation of energy bands – classification of solids – Types of semiconductors - Drift and diffusion currents – Einstein's equation - Hall Effect and its applications.

**Smart materials:** Introduction – properties- types of smart materials- shape memory alloys – piezoelectric materials- magnetostrictive materials – Thermoelectric materials- magneto rheological fluids- electro rheological fluids- Chromic materials – Engineering applications of smart materials.

**TEXTBOOKS:**

1. A Text book of Engineering Physics - M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).

**REFERENCE BOOKS:**

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics – Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).





B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
<b>SUB CODE : R23CC1107</b>	<b>BASIC ELECTRICAL &amp; ELECTRONICS ENGINEERING</b>						

### PART A: BASIC ELECTRICAL ENGINEERING

#### COURSE OBJECTIVES

To expose to the field of electrical & electronics engineering, laws and principles of electrical/electronic engineering and to acquire fundamental knowledge in the relevant field.

#### COURSE OUTCOMES:

After the completion of the course students will be able to

**CO1:** Explore the fundamental laws and concept of DC and AC circuits. [K3]

**CO2:** Demonstrate the working and operating principles of electrical machines, measuring instruments. [K3]

**CO3:** Demonstrate the working and operating principles of different power generation stations. [K3]

**CO4:** Calculate electrical load, electricity bill of residential and commercial buildings and safety measures. [K3]

#### UNIT I: DC & AC Circuits

**DC Circuits:** Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

**AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

#### UNIT II: Machines and Measuring Instruments

**Machines:** Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

**Measuring Instruments:** Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone Bridge.

#### UNIT III: Energy Resources, Electricity Bill & Safety Measures

**Energy Resources:** Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.





**Electricity bill:** Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of “unit” used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

**Equipment Safety Measures:** Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

**TEXTBOOKS:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

**REFERENCE BOOKS:**

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhattacharya, Person Publications, 2018, Second Edition.

**WEB RESOURCES:**

1. <https://nptel.ac.in/courses/108105053>
2. <https://nptel.ac.in/courses/108108076>

**PART B: BASIC ELECTRONICS ENGINEERING**

**COURSE OBJECTIVES:**

- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

**COURSE OUTCOMES:**

After the completion of the course students will be able to

**CO1:** Describe the working of diode and explore the operation of BJT and its applications. [K2]

**CO2:** Describe the working of Rectifiers and amplifiers in electronic circuits. [K2]

**CO3:** Manipulate numeric information in different forms, various codes such as ASCII, Gray, and BCD, simple Boolean expressions and Boolean Theorems [K3]

**CO4:** Design and analyse combinational circuits, sequential circuits, flip flops Registers and Counters. [K4]





### **UNIT I: SEMICONDUCTOR DEVICES**

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

### **UNIT II: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTATION**

Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

### **UNIT III: DIGITAL ELECTRONICS**

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits—Half and Full Adders. Introduction to sequential circuits, Flip flops(S-R, J-K, D and T Flip flops), Registers(4-bit Shift Register - serial input and output) and counters (Ripple Counters, Binary Ripple Counter, Ring Counter) (Elementary Treatment only)

#### **TEXTBOOKS:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4<sup>th</sup> Edition, Tata Mc Graw Hill, 2009

#### **REFERENCE BOOKS:**

1. R. S. Sedha, a Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Salivahanan, N. Suresh Kumar, A. Vallavaraj, “Electronic Devices and Circuits” Tata McGraw-Hill, Second Edition, 2008.
3. Jacob Millman, C. Halkies, C.D. Parikh, Satyabrata Jit, “Integrated Electronics”, Tata McGraw-Hill, Second Edition, 2011.





I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	4	30	70	100	3
<b>SUB CODE : R23CC1108</b>	<b>ENGINEERING GRAPHICS</b>						

**COURSE OBJECTIVES:**

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

**COURSE OUTCOMES:**

After the completion of the course students will be able to

- CO1:** Construct the principles of engineering drawing, including engineering curves, scales, Orthographic and isometric projections. [K3]
- CO2:** Construct orthographic projections of points, lines, planes and solids in front, top and Side views. [K3]
- CO3:** Analyze and draw projection of solids in various positions in first Quadrant. [K4]
- CO4:** Develop the sections of Solids & Development of Surfaces. [K3]
- CO5:** Compare & Draw isometric Views & Orthographic Views. [K2]

**UNIT I**

**Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

**Curves:** construction of ellipse, parabola and hyperbola by general, Cycloids, Involutives, Normal and tangent to Curves.

**Scales:** Plain scales, diagonal scales and vernier scales.

**UNIT II**

**Orthographic Projections:** Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.





**Projections of Straight Lines:** Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes

**Projections of Planes:** regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

### UNIT III

**Projections of Solids:** Types of solids: Polyhedral and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

### UNIT IV

**Sections of Solids:** Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

**Development of Surfaces:** Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

### UNIT V

**Conversion of Views:** Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

**Computer graphics:** Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

### TEXTBOOK:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

### REFERENCE BOOKS:

1. Engineering Drawing, K.L. Narayana and P. Kanniah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc, 2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, TataMcGraw Hill, 2017.







I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
<b>SUB CODE: R23CC11L1</b>	<b>COMPUTER PROGRAMMING LAB</b>						

**COURSE OBJECTIVES:**

- The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

**COURSE OUTCOMES:**

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

**CO1:** Analyze and trace the execution of programs written in C language [K4].

**CO2:** Implement programs with appropriate control structures for solving the problems [K3].

**CO3:** Develop C programs which utilize memory efficiently using programming constructs like pointers [K3].

**CO4:** Code, Debug and Execute programs to demonstrate the applications of arrays, functions, files and various other concepts in C [K3].

**UNIT1**

**WEEK 1**

**Objective:** Getting familiar with the programming environment on the computer and writing the first program.

**Suggested Experiments/Activities:**

**Tutorial 1:** Problem-solving using Computers.

**Lab1:** Familiarization with programming environment

- i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- ii) Basic commands of Linux (sudo, pwd, cd, ls, cat, cp, mv, mkdir, rmdir, rm, touch, locate, find, grep, df, du, head, tail, diff, tar, chmod, chown, kill, ping)
- iii) Exposure to Turbo C, gcc
- iv) Writing simple programs using printf(), scanf()

**WEEK 2**

**Objective:** Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

**Suggested Experiments /Activities:**

**Tutorial 2:** Problem-solving using Algorithms and Flow charts.

**Lab 1:** Converting algorithms/flow charts into C Source code.





Developing the algorithms/flowcharts for the following sample programs

- i) Sum and average of 3 numbers
- ii) Conversion of Fahrenheit to Celsius and vice versa
- iii) Simple interest calculation

### WEEK 3

**Objective:** Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

**Suggested Experiments/Activities:**

**Tutorial 3:** Variable types and type conversions:

**Lab 3:** Simple computational problems using arithmetic expressions.

- i) Finding the square root of a given number
- ii) Finding compound interest
- iii) Area of a triangle using heron's formulae
- iv) Distance travelled by an object

## UNIT II

### WEEK 4

**Objective:** Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

**Suggested Experiments/Activities:**

**Tutorial 4:** Operators and the precedence and as associativity:

**Lab 4:** Simple computational problems using the operator' precedence and associativity

- i) Evaluate the following expressions.
  - a.  $A+B*C+(D*E) + F*G$
  - b.  $A/B*C-B+A*D/3$
  - c.  $A+++B---A$
  - d.  $J= (i++) + (++i)$
- ii) Find the maximum of three numbers using conditional operator
- iii) Take marks of 5 subjects in integers, and find the total, average in float

### WEEK 5

**Objective:** Explore the full scope of different variants of “if construct” namely if-else, null- else, if-else if\*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for “if construct”.

**Suggested Experiments/Activities:**

**Tutorial 5:** Branching and logical expressions:

**Lab 5:** Problems involving if-then-else structures.

- i) Write a C program to find the max and min of four numbers using if-else.





- ii) Write a C program to generate electricity bill.
- iii) Find the roots of the quadratic equation.
- iv) Write a C program to simulate a calculator using switch case.
- v) Write a C program to find the given year is a leap year or not.

### WEEK 6

**Objective:** Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

#### **Suggested Experiments/Activities:**

**Tutorial 6:** Loops, while and for loops

**Lab 6:** Iterative problems e.g., the sum of series

- i) Find the factorial of given number using any loop.
- ii) Find the given number is a prime or not.
- iii) Compute sine and cos series
- iv) Checking a number palindrome
- v) Construct a pyramid of numbers.

## UNIT III

### WEEK 7:

**Objective:** Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

#### **Suggested Experiments/Activities:**

**Tutorial 7:** 1 D Arrays: searching.

**Lab 7:** 1D Array manipulation, linear search

- i) Find the min and max of a 1-D integer array.
- ii) Perform linear search on 1D array.
- iii) The reverse of a 1D integer array
- iv) Find 2's complement of the given binary number.
- v) Eliminate duplicate elements in an array.

### WEEK 8:

**Objective:** Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

#### **Suggested Experiments/Activities:**

**Tutorial 8:** 2 D arrays, sorting and Strings.

**Lab 8:** Matrix problems, String operations, Bubble sort





- i) Addition of two matrices
- ii) Multiplication two matrices
- iii) Sort array elements using bubble sort
- iv) Concatenate two strings without built-in functions
- v) Reverse a string using built-in and without built-in string functions

#### UNIT IV

##### WEEK 9:

**Objective:** Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

##### Suggested Experiments/Activities:

**Tutorial 9:** Pointers, structures and dynamic memory allocation

**Lab 9:** Pointers and structures, memory dereference.

- i) Write a C program to find the sum of a 1D array using malloc()
- ii) Write a C program to find the total, average of n students using structures
- iii) Enter n students data using calloc() and display failed students list
- iv) Read student name and marks from the command line and display the student details alongwith the total.
- v) Write a C program to implement realloc()

##### WEEK 10:

**Objective:** Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

##### Suggested Experiments/Activities:

**Tutorial 10:** Bitfields, Self-Referential Structures, Linked lists

**Lab10:** Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

- i) Create and display a singly linked list using self-referential structure.
- ii) Demonstrate the differences between structures and unions using a C program.
- iii) Write a C program to shift/rotate using bitfields.
- iv) Write a C program to copy one structure variable to another structure of the same type.

#### UNIT V

##### WEEK 11:

**Objective:** Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

##### Suggested Experiments/Activities:





**Tutorial 11:** Functions, call by value, scope and extent,

**Lab 11:** Simple functions using call by value, solving differential equations using Eulerstheorem.

- i) Write a C function to calculate NCR value.
- ii) Write a C function to find the length of a string.
- iii) Write a C function to transpose of a matrix.
- iv) Write a C function to demonstrate numerical integration of differential equations using Euler'smethod

**WEEK 12:**

**Objective:** Explore how recursive solutions can be programmed by writing recursive functionsthat can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

**Suggested Experiments/Activities:**

**Tutorial 12:** Recursion, the structure of recursive calls

**Lab 12:** Recursive functions

- i) Write a recursive function to generate Fibonacci series.
- ii) Write a recursive function to find the lcm of two numbers.
- iii) Write a recursive function to find the factorial of a number.
- iv) Write a C Program to implement Ackermann function using recursion.
- v) Write a recursive function to find the sum of series.

**WEEK 13:**

**Objective:** Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

**Suggested Experiments/Activities:**

**Tutorial 13:** Call by reference, dangling pointers

**Lab 13:** Simple functions using Call by reference, Dangling pointers.

- i) Write a C program to swap two numbers using call by reference.
- ii) Demonstrate Dangling pointer problem using a C program.
- iii) Write a C program to copy one string into another using pointer.
- iv) Write a C program to find no of lowercase, uppercase, digits and othercharacters using pointers.

**WEEK14:**

**Objective:** To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

**Suggested Experiments/Activities:**

**Tutorial 14:** File handling

**Lab 14:** File operations

- i) Write a C program to write and read text into a file.





- ii) Write a C program to write and read text into a binary file using fread() and fwrite()
- iii) Copy the contents of one file to another file.
- iv) Write a C program to merge two files into the third file using command-line arguments.
- v) Find no. of lines, words and characters in a file
- vi) Write a C program to print last n characters of a given file.

**WEEK 15: Virtual Labs:**

<https://ps-iiith.vlabs.ac.in/List%20of%20experiments.html>

**TEXTBOOKS:**

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw Hill

**REFERENCE BOOKS:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, a Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE.





I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	2	30	70	100	1
<b>SUB CODE: R23CC11L5</b>	<b>IT WORKSHOP</b>						

**COURSE OBJECTIVES:**

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, spread sheets and Presentation tools.

**COURSE OUTCOMES:**

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

**CO1:** Identify Hardware components and inter dependencies [K3].

**CO2:** Utilize Antivirus s/w to Safe guard computer systems while using Internet [K3].

**CO3:** Develop a Document or Presentation.

**CO4:** Make use of spreadsheets to perform calculations [K3].

**CO5:** Utilize the AI Tool Chat GPT [K3].

**PC Hardware & Software Installation**

**Task 1:** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**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 (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva







**Task 5:** Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. 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.

**Task 2:** 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 x downloads to avoid viruses and/or worms.

### **LaTeX and WORD**

**Task 1 – Word Orientation:** The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX 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 La TeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

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

**Task 1:** Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

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

## LOOKUP/VLOOKUP

**Task 3:** 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 PowerPoint.

**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.

## AI TOOLS – Chat GPT

**Task 1:** Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- **Ex:** Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

**Task 2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

- **Ex:** Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."





**Task 3:** Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- **Ex:** Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

**REFERENCE BOOKS:**

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2<sup>nd</sup> edition
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, David Anfinson and Ken Quamme. – CISCO Press, Pearson Education, 3<sup>rd</sup> edition IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3<sup>rd</sup> edition





I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	2	30	70	100	1
<b>SUB CODE: R23CC11L6</b>	<b>ENGINEERING PHYSICS LAB</b>						

**COURSE OBJECTIVES:**

- To study the concepts of optical phenomenon like interference, diffraction etc.,
- Recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors
- Study the parameters and applications of dielectric and magnetic materials by conducting experiments.

**COURSE OUTCOMES:**

After completion of the course students will be able to

**CO1:** Operate optical instruments like travelling microscope and spectrometer. [K3]

**CO2:** Estimate the wavelengths of different colors using diffraction grating. [K2]

**CO3:** Plot the intensity of the magnetic field of circular coil carrying current with distance. [K3]

**CO4:** Calculate the band gap of a given semiconductor. [K3]

**List of Experiments:**

1. Determination of radius of curvature of a given plano convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.





12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non-uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

**Note:** Any **TEN** of the listed experiments are to be conducted. Out of which any **TWO** Experiments may be conducted in virtual mode.

**References:** A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

*URL:* [www.vlab.co.in](http://www.vlab.co.in)





I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
<b>SUB CODE : R23CC11L7</b>	<b>EEE WORKSHOP (COMMON TO ALL BRANCHES OF ENGINEERING)</b>						

**PART A: ELECTRICAL ENGINEERING LAB**

**COURSE OBJECTIVES:**

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

**COURSE OUTCOMES:**

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

**CO1:** Measure voltage, current and power in an electrical circuit. **[K3]**

**CO2:** Measure of Resistance using Wheatstone bridge **[K4]**

**CO3:** Discover critical field resistance and critical speed of DC shunt generators. **[K4]**

**CO4:** Investigate the effect of reactive power and power factor in electrical loads. **[K5]**

**ACTIVITIES:**

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
  - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
  - Provide some exercises so that measuring instruments are learned to be used by the students.
- 3.
4. Components:
  - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.





- Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

**LIST OF EXPERIMENTS:**

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheatstone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises
8. Determination of open circuit and short circuit parameters of a 1-phase transformer(Content Beyond syllabus)

**REFERENCE BOOKS:**

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

\*Note: Minimum Six Experiments to be performed.

**PART B: ELECTRONICS ENGINEERING LAB**

**COURSE OBJECTIVES:**

- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

**COURSE OUTCOMES:**

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

- CO1:** Analyze the characteristics of various electronic components. [K4]  
**CO2:** Implement Rectifiers circuits. [K3]  
**CO3:** Design Amplifiers circuit. [K6]  
**CO4:** Examine the operation of Logic gates. [K4]







**LIST OF EXPERIMENTS:**

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.
9. Design a Full Adder Circuit and verify the truth table. (Content beyond syllabus)

**Tools / Equipment Required:** DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

**REFERENCES:**

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education, 2009.

**Note:** Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.





I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	1	100	-	100	0.5
<b>SUB CODE : R23CC11MC2</b>	<b>NSS/NCC/SCOUTS &amp; GUIDES/COMMUNITY SERVICE</b>						

**COURSE OBJECTIVES:**

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

**COURSE OUTCOMES:**

After completion of the course the students will be able to

- CO1:** Understand the importance of discipline, character and service motto. [K3]
- CO2:** Solve some societal issues by applying acquired knowledge, facts, and techniques. [K6]
- CO3:** Explore human relationships by analyzing social problems. [K4]
- CO4:** Determine to extend their help for the fellow beings and downtrodden people. [K5]
- CO5:** Develop leadership skills and civic responsibilities. [K6]

**UNIT I Orientation**

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

**Activities:**

- i)** Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
- ii)** Conducting orientations programs for the students –future plans-activities-releasing road map etc.
- iii)** Displaying success stories-motivational biopics- award winning movies on societal issues etc.
- iv)** Conducting talent show in singing patriotic songs-paintings- any other contribution.

**UNIT II Nature & Care**

**Activities:**

- i)** Best out of waste competition.
- ii)** Poster and signs making competition to spread environmental awareness.
- iii)** Recycling and environmental pollution article writing competition.
- iv)** Organizing Zero-waste day.





- v) Digital Environmental awareness activity via various social media platforms.
- vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
- vii) Write a summary on any book related to environmental issues.

### UNIT III Community Service

#### Activities:

- i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities experts- etc.
- ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
- iii) Conducting consumer Awareness. Explaining various legal provisions etc.
- iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
- v) Any other programmes in collaboration with local charities, NGOs etc.

#### REFERENCE BOOKS:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme*, Vol.:I, Vidya Kutir Publication, 2021 ( ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., “Introduction to Environmental Engineering”, McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. “Introduction to Environmental Engineering and Science”, Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

#### GENERAL GUIDELINES:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

#### EVALUATION GUIDELINES:

1. Evaluated for a total of 100 marks.
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.





**I B.TECH - II SEMESTER**

S.No	Subject Code	Subject	Cat. Code	Internal Marks	External Marks	Total Marks	L	T	P	Credits
1	R23CC1201	DIFFERENTIAL EQUATIONS & VECTOR CALCULUS	BS&H	30	70	100	3	0	0	3
2	R23CC1202	DATA STRUCTURES	PC	30	70	100	3	0	0	3
3	R23CC1206	COMMUNICATIVE ENGLISH	BS&H	30	70	100	1	0	4	2
4	R23CC1207	CHEMISTRY	BS&H	30	70	100	3	0	0	3
5	R23CC1212	BASIC CIVIL AND MECHANICAL ENGINEERING	ES	30	70	100	3	0	0	3
6	R23CC12L1	DATA STRUCTURES LAB	PC	30	70	100	0	0	3	1.5
7	R23CC12L9	ENGINEERING WORKSHOP	ES	30	70	100	0	0	2	1.5
8	R23CC12L10	CHEMISTRY LAB	BS&H	30	70	100	0	0	2	1
9	R23CC12L12	COMMUNICATIVE ENGLISH LAB	ES	30	70	100	0	0	3	1
10	R23CC12MC1	HEALTH & WELLNESS, YOGA & SPORTS	BS&H	100	-	100	-	-	1	0.5
<b>TOTAL</b>										<b>19.5</b>





I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
<b>SUB CODE : R23CC1201</b>	<b>DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (COMMON TO ALL ENGINEERING BRANCHES)</b>						

**COURSE OBJECTIVES:**

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

**COURSE OUTCOMES:**

After completion of the course, the students should be able to

**CO 1:** First order ordinary differential equations to real life situations. [K3]

**CO 2:** Identify and apply suitable methods in solving the higher order differential equations [K3]

**CO 3:** Solve the partial differentiation equations. [K3]

**CO4:** Interpret the physical meaning of different operators as gradient, curl and divergence. [K3]

**CO 5:** Estimate the work done against a field, circulation and flux using vector calculus. [K5]

**UNIT-I: Differential equations of first order and first degree**

Linear differential equations - Bernoulli's equations - Exact equations and equations reducible to exact form - Applications: Newton's law of cooling - Law of natural growth and decay - Electrical circuits.

**UNIT-II: Linear differential equations of higher order (constant coefficients)**

Definitions, homogenous and non-homogenous, complimentary function, particular integral, general solution - Wronskian, Method of variation of parameters - Simultaneous linear equations - Applications to L-C-R circuit problems and Simple harmonic motion.

**UNIT-III: Partial differential equations**

Introduction and formation of partial differential equations by elimination of arbitrary constants and arbitrary functions - Solutions of first order linear equations using Lagrange's method - Homogeneous and Non-homogeneous linear partial differential equations with constant coefficients.

**UNIT-IV: Vector differentiation**

Scalar and vector point functions - Vector operator del - Del applied to scalar point functions - Gradient, Directional derivative - Del applied to vector point functions - Divergence and Curl - Solenoidal vector-Irrotational-scalar potential of vector - Vector identities.





**UNIT-V: Vector integration**

Line integral - Circulation - Work done - Surface integral, flux - Green's theorem in the plane (without proof) - Stoke's theorem (without proof) - Volume integral - Gauss divergence theorem (without proof) and related problems.

**TEXTBOOKS:**

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44<sup>th</sup> Edition.
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10<sup>th</sup> Edition.

**REFERENCE BOOKS:**

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14<sup>th</sup> Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5<sup>th</sup> Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5<sup>th</sup> Edition (9<sup>th</sup> reprint). Higher Engineering Mathematics, B. V. Ramana, Mc Graw Hill Education, 2017





I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUB CODE : R23CC1202	<b>DATA STRUCTURES</b>						

**COURSE OBJECTIVES:**

- To provide the knowledge of basic data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.
- To develop skills to apply appropriate data structures in problem solving.

**COURSE OUTCOMES:**

After completion of the course, the students should be able to

- CO1:** Analyze the role of linear data structures in organizing and accessing data efficiently [K4].
- CO2:** Design, implement, and apply linked lists for dynamic data storage [K6].
- CO3:** Analyze the implementation of stacks queues and dequeues using arrays and linked lists [K3].
- CO4:** Identify and implement novel solutions to small scale programming challenges involving data structures such as Graphs and Trees [K3].
- CO5:** Identify scenarios where hashing is advantageous, and design hash-based solutions for specific problems [K3].

**UNIT I**

**Introduction to Data Structures:** Definition and importance of data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity, analysis of data structures. Searching Techniques: Linear, Binary & Fibonacci Search. Sorting Techniques: Bubble sort, Selection sort, Insertion Sort, Quick Sort, Merge Sort.

**UNIT II**

**Linked Lists:** Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

**UNIT III**

**Stacks:** Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists. Applications of stacks in expression evaluation, backtracking, reversing list etc.

**Queues:** Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.





**Deque:** Introduction to deque (double-ended queues), Operations on deque and their applications.

**UNIT IV**

**Trees:** Introduction to Trees, Binary Tree traversals, Binary Search Tree – Insertion, Deletion & Traversal, AVL tree and Operations on AVL tree, Heap Tree, Heap Sort.

**UNIT V**

**Graphs:** Introduction to Graphs, representation of graphs, Graph traversals, Topological Sort.

**Hashing:** Brief introduction to hashing and hash functions, Hash tables: basic implementation and operations, Collision resolution techniques: chaining and open addressing.

**TEXTBOOKS:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2<sup>nd</sup> Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

**REFERENCE BOOKS:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick







I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	30	70	100	2
<b>SUB CODE: R23CC1206</b>	<b>COMMUNICATIVE ENGLISH (COMMON TO ALL BRANCHES)</b>						

**COURSE OBJECTIVES:**

The main objective of introducing this course, *Communicative English*, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

**COURSE OUTCOMES:**

After completion of course student will be able to

- CO1:** Summarize texts based on the comprehension of the material provided. [K3]
- CO2:** Create coherent and well-structured paragraphs, essays, and letters on a range of familiar topics. [K5]
- CO3:** Utilize a diverse array of grammatical structures with flexibility, striving to minimize errors. [K3]
- CO4:** Use vocabulary adequately and appropriately to express and write on a variety of topics. [K3]

**UNIT I**

**Lesson: HUMAN VALUES: Gift of Magi (Short Story)**

- Listening:** Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
- Speaking:** Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
- Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information.
- Writing:** Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
- Grammar:** Parts of Speech, Basic Sentence Structures-forming questions
- Vocabulary:** Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.





## UNIT II

### Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

- Listening:** Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
- Speaking:** Discussion in pairs/small groups on specific topics followed by short structure talks.
- Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
- Writing:** Structure of a paragraph - Paragraph writing (specific topics)
- Grammar:** Cohesive devices - linkers, use of articles and zero article; repositions.
- Vocabulary:** Homonyms, Homophones, Homographs.

## UNIT III

### Lesson: BIOGRAPHY: Elon Musk

- Listening:** Listening for global comprehension and summarizing what is listened to.
- Speaking:** Discussing specific topics in pairs or small groups and reporting what is discussed
- Reading:** Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
- Writing:** Summarizing, Note-making, paraphrasing
- Grammar:** Verbs - tenses; subject-verb agreement; Compound words, Collocations
- Vocabulary:** Compound words, Collocations

## UNIT IV

### Lesson: INSPIRATION: The Toys of Peace by Saki

- Listening:** Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
- Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
- Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
- Writing:** Letter Writing: Official Letters, Resumes
- Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice
- Vocabulary:** Words often confused, Jargons





**UNIT V**

**Lesson: MOTIVATION:** The Power of Intrapersonal Communication (An Essay)

**Listening:** Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

**Speaking:** Formal oral presentations on topics from academic contexts

**Reading:** Reading comprehension.

**Writing:** Writing structured essays on specific topics.

**Grammar:** Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

**Vocabulary:** Technical Jargons

**TEXTBOOKS:**

1. Pathfinder: Communicative English for Undergraduate Students, 1<sup>st</sup> Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

**REFERENCE BOOKS:**

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.





I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
<b>SUB CODE: R23CC1207</b>	<b>CHEMISTRY</b>						

**COURSE OBJECTIVES:**

- To familiarize chemistry and its applications
- To train the students on the principles and applications of electrochemistry, polymers and modern engineering materials
- To introduce instrumental methods.

**COURSE OUTCOMES:**

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

**CO 1:** Explain the concept of electron delocalization and its importance in chemical bonding. [K2]

**CO 2:** Solve problems and utilize modern materials in practical engineering scenarios. [K6]

**CO 3:** Apply scientific concepts, experimental findings and applications related to electrochemistry. [K3]

**CO 4:** Explore the synthesis of polymers, with specific polymer structures, properties and applications. [K3]

**CO 5:** Summarize the concepts of Instrumental methods. [K2]

**UNIT I: Structure and Bonding Models**

Molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O<sub>2</sub> and CO, etc. calculation of bond order,  $\pi$ -molecular orbitals of butadiene and benzene,. Hydrogen Bonding-Inter molecular hydrogen bonding with examples -Intra molecular hydrogen bonding with examples.

**UNIT II: Modern Engineering materials**

**Modern Engineering materials** Semiconductors – Introduction, preparation (zone refining process and czochralski process), applications.

**Super conductors:** Introduction, types -applications.

**Supercapacitors:** Introduction, Basic Concept-Classification – Applications.





**Nano materials:** Introduction, Preparation (arc discharge and laser ablation methods), properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

### **UNIT-III: Electrochemistry and Applications**

Electrochemical cell, Electrochemical series –applications, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductometric titrations (acid-base titrations).

**Electrochemical sensors:** potentiometric sensors with examples.

Primary cells – Zinc-air battery-Secondary cells –lithium-ion -Sodium –ion batteries - Fuel cells- hydrogen-oxygen fuel cell, working of the batteries including cell reactions; Polymer Electrolyte Membrane Fuel cells (PEMFC).

### **UNIT-IV: Polymer Chemistry**

Introduction to polymers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of free radical polymerisation.

Plastics –Thermo plastics and thermosetting plastics, Moulding Techniques-Compression moulding, injection moulding, preparation, properties and applications of PVC and Bakelite.

Elastomers–Preparation, properties and applications of Buna-S, Buna-N.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA)

### **UNIT V: Instrumental Methods and Applications**

Electromagnetic spectrum, Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transitions, Instrumentation, and applications. FT-IR Instrumentation and applications. NMR principle–Instrumentation –applications.

### **TEXTBOOKS:**

- Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
- Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

### **REFERENCE BOOKS:**

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5<sup>th</sup> Edition, Wiley Publications, Feb.2008
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition





I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
<b>SUB CODE: R23CC1212</b>	<b>BASIC CIVIL AND MECHANICAL ENGINEERING</b>						

### PART A: BASIC CIVIL ENGINEERING

#### COURSE OBJECTIVES:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

#### COURSE OUTCOMES:

After completion of the course, the student should be able to:

**CO1:** Acquire knowledge on various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society. [K3]

**CO2:** Apply the concepts of surveying to calculate distances, angles and levels. . [K3]

**CO3:** Realize the importance of transportation in nation's economy and to identify the importance of Water Storage and Conveyance Structures. . [K2]

#### UNIT I

**Basics of Civil Engineering:** Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate - Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

#### UNIT II

**Surveying:** Objectives of Surveying- Horizontal Measurements- Angular Measurements-





Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

### UNIT III

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

**Water Resources and Environmental Engineering:** Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

### TEXTBOOKS:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

### REFERENCE BOOKS:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.





## PART B: BASIC MECHANICAL ENGINEERING

### COURSE OBJECTIVES:

The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

### COURSE OUTCOMES:

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

- CO1:** Illustrate the role of mechanical engineering and its technologies in various sectors and knowledge of engineering materials. [K2]
- CO2:** Explain the basics of various manufacturing processes and thermal engineering and its applications. [K2]
- CO3:** Describe the working of different powerplants, mechanical power transmission systems and basics of robotics and its applications. [K3]

### UNIT I

**Introduction to Mechanical Engineering:** Role of Mechanical Engineering in Industries and Society - Mechanical Engineering Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace and Marine Engineering.

**Engineering Materials – Basics of Metals** (Ferrous & Non-ferrous), Ceramics, Composites, Smart materials.

### UNIT II

**Manufacturing Processes:** Basics of - Principles of Casting, Forming and joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

**Thermal Engineering:** Basics of - working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

### UNIT III

**Power plants:** Basics of - Working principle of Steam, Diesel, Hydro, Nuclear power plants.

**Mechanical Power Transmission:** Basics of - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

**Introduction to Robotics:** Basics of - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)







**TEXTBOOKS:**

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engineering by Jonathan Wicker and Kemper Lewis, Cengagelearning India Pvt. Ltd.

**REFERENCE BOOKS:**

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.





I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
<b>SUB CODE: R23CC12L1</b>	<b>DATA STRUCTURES LAB</b>						

**COURSE OBJECTIVES:**

- The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

**COURSE OUTCOMES:**

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

- CO1:** Analyze and develop the role of linear data structures in organizing and accessing data efficiently in algorithms [K4].
- CO2:** Design, implement and apply linked lists for dynamic data storage [K6].
- CO3:** Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems [K3].
- CO4:** Apply queue-based algorithms for efficient task scheduling and distinguish between dequeues and priority queues and apply them appropriately to solve data management challenges [K3].
- CO5:** Develop hash-based solutions for specific problems [K3].

**LIST OF EXPERIMENTS****Exercise 1: Array Manipulation**

- Write a program to reverse an array.
- C Programs to implement the Searching Techniques – Linear & Binary Search
- C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

**Exercise 2: Linked List Implementation**

- Implement a singly linked list and perform insertion and deletion operations.
- Develop a program to reverse a linked list iteratively and recursively.
- Solve problems involving linked list traversal and manipulation.

**Exercise 3: Linked List Applications**

- Create a program to detect and remove duplicates from a linked list.
- Implement a linked list to represent polynomials and perform addition.
- Implement a double-ended queue (deque) with essential operations.

**Exercise 4: Double Linked List Implementation**

- Implement a doubly linked list and perform various operations to understand its





properties and applications.

- ii) Implement a circular linked list and perform insertion, deletion, and traversal.

**Exercise 5: Stack Operations**

- i) Implement a stack using arrays and linked lists.
- ii) Write a program to evaluate a postfix expression using a stack.
- iii) Implement a program to check for balanced parentheses using a stack.

**Exercise 6: Queue Operations**

- i) Implement a queue using arrays and linked lists.
- ii) Develop a program to simulate a simple printer queue system.
- iii) Solve problems involving circular queues.

**Exercise 7: Stack and Queue Applications**

- i) Use a stack to evaluate an infix expression and convert it to postfix.
- ii) Create a program to determine whether a given string is a palindrome or not.
- iii) Implement a stack or queue to perform comparison and check for symmetry.

**Exercise 8: Binary Tree**

- A) Implement following Operations on a Binary Tree
  - i) Create ii) In-order traversal iii) Pre-order traversal iv) Post-order traversal
- B) Implementing a BST using Linked List. and Traversing of BST.
- C) Implement operations of AVL tree

**Exercise 9: Graphs and Hashing**

- i) Represent Graphs using adjacency list and adjacency matrix
- ii) Implement various traversals on graphs (DFS, BFS)
- iii) Implement topological sort on Graphs.
- iv) Implement a hash table with collision resolution techniques.
- v) Write a program to implement a simple cache using hashing.

**Exercise - 10** Virtual Lab: <http://cse01-iiith.vlabs.ac.in/> Any three programs must be submitted with result from the above link.

**TEXT BOOKS:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2<sup>nd</sup> Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008.

**REFERENCE BOOKS:**

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures" by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms by Robert Sedgewick





I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
<b>SUB CODE: R23CC12L9</b>	<b>ENGINEERING WORKSHOP</b>						

**COURSE OBJECTIVES:**

- To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

**COURSE OUTCOMES:**

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

**CO1:** Identify workshop tools and their operational capabilities. **[K3]**

**CO2:** Compare Manufacturing Components used in workshop trades including fitting, carpentry, foundry, welding and Plumbing. **[K2]**

**CO3:** Apply fitting operations in various applications. **[K3]**

**CO4:** Apply basic electrical engineering knowledge for House Wiring Practice **[K3]**

**LIST OF EXPERIMENTS:**

**ENGINEERING WORKSHOP TRADES FOR EXERCISE:**

**1. Demonstration:** Safety practices and precautions to be observed in workshop.

**2. Wood Working:** Familiarity with different types of woods and tools used in wood

Working and make following joints.

a) Half – Lap joint

b) Dovetail joint

**3. Sheet Metal Working:** Familiarity with different types of tools used in sheet metal

Working, Developments of following sheet metal job from GI sheets.

a) Conical funnel

b) Brazing

**4. Fitting:** Familiarity with different types of tools used in fitting and do the following

Fitting exercises.

a) V-fit

b) Bicycle tire puncture





- 
- 5. Electrical Wiring:** Familiarity with different types of basic electrical circuits and make  
The following connections.
    - a) Parallel and Series
    - b) Tube light
  - 6. Foundry Trade:** Demonstration and practice on Moulding tools and processes,  
Preparation of Green Sand Moulds for given Patterns.
  - 7. Welding Shop:** Demonstration and practice on Arc Welding and Gas welding.  
Preparation of Lap joint and Butt joint.
  - 8. Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints  
With coupling for same diameter and with reducer for different diameters.
  - 9.** Demonstration and basic repair works of two wheeler vehicle



I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1
<b>SUB CODE: R23CC12L10</b>	<b>CHEMISTRY LAB</b>						

**COURSE OBJECTIVES:**

- Verify the fundamental concepts with experiments.

**COURSE OUTCOMES:**

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

**CO 1:** Develop and perform analytical chemistry techniques to address the water related problems.

[K6]

**CO 2:** Determine the strength of an acid, cell constant, potentials and conductance of solutions.

[K5]

**CO 3:** Prepare advanced polymer Bakelite and nanomaterials. [K4]

**CO 4:** Explain the functioning of different analytical instruments. [K3]

**LIST OF EXPERIMENTS:**

1. Determination of hardness of water sample by EDTA method
2. Determination of alkalinity of water sample
3. Estimation of Dissolved Oxygen by Winkler's method
4. Estimation of Ferrous Iron by Dichrometry
5. Determination of Strength of an acid in Pb-Acid battery
6. Estimation of Mg in Antacid
7. Estimation of Vitamin C
8. Preparation of a polymer (Bakelite)/urea formaldehyde resin.
9. Preparation of nanomaterials by precipitation method
10. Conductometric titration of strong acid vs. strong base
11. Conductometric titration of weak acid vs. strong base
12. Determination of cell constant and conductance of solutions
13. Potentiometry - determination of redox potentials and emfs
14. Verify Lambert-Beer's law
15. Wavelength measurement of sample through UV-Visible Spectroscopy

**Note: Any TEN of the listed experiments are to be conducted.**

**REFERENCE:** "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar





<b>I B.Tech I SEMESTER</b>	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	2	30	70	100	1
<b>SUB CODE: R23CC12L12</b>	<b>COMMUNICATIVE ENGLISH LAB</b>						

**COURSE OBJECTIVES:**

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

**COURSE OUTCOMES:**

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

- CO 1:** Use connected speech, applying a range of phonological features like rhythm, stress and intonation to convey clear meaning. [K3]
- CO 2:** Create a compelling resume, cover letter and Sop. [K6]
- CO 3:** Make formal presentations and engage effectively in debates and group discussions in academic and professional contexts. [K3]
- CO 4:** Apply employability skills to confidently navigate job interviews. [K3]

**LIST OF TOPICS:**

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills





**SUGGESTED SOFTWARE:**

- Walden Infotech
- Young India Films

**REFERENCE BOOKS:**

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2<sup>nd</sup> Ed),Kindle, 2013.

**WEB RESOURCES:**

**SPOKEN ENGLISH:**

1. [www.esl-lab.com](http://www.esl-lab.com)
2. [www.englishmedialab.com](http://www.englishmedialab.com)
3. [www.englishinteractive.net](http://www.englishinteractive.net)
4. <https://www.britishcouncil.in/english/online>
5. <http://www.letstalkpodcast.com/>
6. [https://www.youtube.com/c/mmmEnglish\\_Emma/featured](https://www.youtube.com/c/mmmEnglish_Emma/featured)
7. <https://www.youtube.com/c/ArnelsEverydayEnglish/featured>
8. <https://www.youtube.com/c/engvidAdam/featured>
9. <https://www.youtube.com/c/EnglishClass101/featured>
10. <https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists>
11. [https://www.youtube.com/channel/UCV1h\\_cBE0Drdx19qkTM0WNw](https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw)

**VOICE & ACCENT:**

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. [https://www.youtube.com/channel/UC\\_OskgZBoS4dAnVUgJVexc](https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc)
4. [https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp\\_IA](https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA)







<b>I B.TECH II SEMESTER</b>	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	1	100	-	100	0.5
<b>SUB CODE: R23CC12MC1</b>	<b>HEALTH AND WELLNESS, YOGA AND SPORTS</b>						

**COURSE OBJECTIVES:**

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

**COURSE OUTCOMES:**

After completion of the course the student will be able to

**CO1:** Understand the importance of yoga and sports for Physical fitness and sound health. [K2]

**CO2:** Demonstrate an understanding of health-related fitness components. [K2]

**CO3:** Compare and contrast various activities that help enhance their health. [K2]

**CO4:** Assess current personal fitness levels. [K5]

**CO5:** Develop Positive Personality. [K6]

**UNIT I**

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity  
Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

**ACTIVITIES:**

- i) Organizing health awareness programmes in community
- ii) Preparation of health profile
- iii) Preparation of chart for balance diet for all age groups

**UNIT II**

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

**ACTIVITIES:**

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar





### UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

#### ACTIVITIES:

- i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics
- ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

#### REFERENCE BOOKS:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022.
2. T.K.V.Desikachar. the Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993.
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014.
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014.

#### GENERAL GUIDELINES:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

#### EVALUATION GUIDELINES:

1. Evaluated for a total of 100 marks.
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.



DEPARTMENT OF CSE (DATA SCIENCE)



II YEAR I SEMESTER

S.No.	Subcode	Category	Title	L	T	P	Credits
1	R23CC2101	BS&H	Discrete Mathematics & Graph Theory	3	0	0	3
2	R23CC2102	BS&H	Universal human values understanding harmony and ethical human conduct	2	1	0	3
3	R23DS2107	Engineering Science	Introduction to Data Science	3	0	0	3
4	R23CC2104	Professional Core	Advanced Data Structures & Algorithms Analysis	3	0	0	3
5	R23CC2105	Professional Core	Object Oriented Programming Through Java	3	0	0	3
6	R23DS21L1	Professional Core	Data Science Lab	0	0	3	1.5
7	R23CC21L2	Professional Core	Object Oriented Programming Through Java Lab	0	0	3	1.5
8	R23CC21L3	Skill Enhancement course	Python programming	0	1	2	2
Total				14	2	8	20





II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:	<b>DISCRETE MATHEMATICS &amp; GRAPH THEORY</b>						

**COURSE OBJECTIVES:**

- To introduce the students to the topics and techniques of discrete methods and combinatorial reasoning.
- To introduce a wide variety of applications. The algorithmic approach to the solution of problems is fundamental in discrete mathematics, and this approach reinforces the close ties between this discipline and the area of computer science.

**COURSE OUTCOMES:** At the end of the course students will be able to

**CO1:** Apply the logical statements, connectivity among the statements and different types of normal forms. [K3]

**CO2:** Analyze the operations, properties and functions of sets. [K4].

**CO3:** Solve mathematical problems with recurrence relations using different methods. [K3].

**CO4:** Classify the types of graphs to formulate and solve computational problems. [K4].

**UNIT-I: Mathematical Logic:**

**Propositional Calculus:** Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, Indirect Method of Proof, Predicate Calculus: Predicates, Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

**UNIT-II: Set Theory:**

**Sets:** Operations on Sets, Principle of Inclusion-Exclusion, **Relations:** Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, **Functions:** Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties.

**UNIT-III: Combinatorics and Recurrence Relations:**

Basis of Counting, Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Binomial and Multinomial Coefficients and Theorems.

**Recurrence Relations:** Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, and Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relations.





**UNIT-IV: Graph Theory:**

Basic Concepts, Graph Theory and its Applications, Subgraphs, Graph Representations: Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs.

**UNIT-V: Multi Graphs:**

Multigraphs, Bipartite and Planar Graphs, Euler's Theorem, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

**TEXT BOOKS:**

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.
2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L.Liu and D. P. Mohapatra, 3rd Edition, Tata McGraw Hill.
3. Theory and Problems of Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz and Marc Lars Lipson, 3rd Edition, McGraw Hill.

**REFERENCE BOOKS:**

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L.Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India publishers.
2. Discrete Mathematics, S. K. Chakraborty and B. K. Sarkar, Oxford press, 2011.
3. Discrete Mathematics and its Applications with Combinatorics and GraphTheory, K.H. Rosen, 7th Edition, Tata McGraw Hill.





II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	0	30	70	100	3
SUBCODE:	<b>UNIVERSAL HUMAN VALUES UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT</b>						

**COURSE OBJECTIVES:**

- To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

**COURSE OUTCOMES:**

At the end of the course students will be able to

- CO1:** Analyze various Value Education methods. [K2]
- CO2:** Compare and Contrast various types of Harmony in the Human Being. [K4]
- CO3:** Compare and Contrast various types of Harmony in the Family and Society [K4]
- CO4:** Compare and Contrast various types of Harmony in the Nature/Existence. [K4]
- CO5:** Analyze the various consequences of professional ethics. [K2]

**COURSE TOPICS**

- The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.
- The Teacher’s Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

**UNIT I**

Introduction to Value Education (6 lectures and 3 tutorials for practice session)

**Lecture 1:** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

**Lecture 2:** Understanding Value Education

**Tutorial 1:** Practice Session PS1 Sharing about Oneself

**Lecture 3:** Self-exploration as the Process for Value Education

**Lecture4:** Continuous Happiness and Prosperity – the Basic Human Aspirations

**Tutorial 2:** Practice Session PS2 Exploring Human Consciousness

**Lecture 5:** Happiness and Prosperity – Current Scenario





**Lecture 6:** Method to Fulfill the Basic Human Aspirations

**Tutorial 3:** Practice Session PS3 Exploring Natural Acceptance

## UNIT II

Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

**Lecture 7:** Understanding Human being as the Co-existence of the self and the body.

**Lecture 8:** Distinguishing between the Needs of the self and the body

**Tutorial 4:** Practice Session PS4 Exploring the difference of Needs of self and body.

**Lecture 9:** The body as an Instrument of the self

**Lecture 10:** Understanding Harmony in the self

**Tutorial 5:** Practice Session PS5 Exploring Sources of Imagination in the self

**Lecture 11:** Harmony of the self with the body

**Lecture 12:** Programme to ensure self-regulation and Health

**Tutorial 6:** Practice Session PS6 Exploring Harmony of self with the body

## UNIT III

Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)

**Lecture 13:** Harmony in the Family – the Basic Unit of Human Interaction

**Lecture 14:** 'Trust' – the Foundational Value in Relationship

**Tutorial 7:** Practice Session PS7 Exploring the Feeling of Trust

**Lecture 15:** 'Respect' – as the Right Evaluation

**Tutorial 8:** Practice Session PS8 Exploring the Feeling of Respect

**Lecture 16:** Other Feelings, Justice in Human-to-Human Relationship

**Lecture 17:** Understanding Harmony in the Society

**Lecture 18:** Vision for the Universal Human Order

**Tutorial 9:** Practice Session PS9 Exploring Systems to fulfil Human Goal

## UNIT IV

Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)

**Lecture 19:** Understanding Harmony in the Nature

**Lecture 20:** Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature

**Tutorial 10:** Practice Session PS10 Exploring the Four Orders of Nature

**Lecture 21:** Realizing Existence as Co-existence at All Levels

**Lecture 22:** The Holistic Perception of Harmony in Existence

**Tutorial 11:** Practice Session PS11 Exploring Co-existence in Existence.

## UNIT V

Implications of the Holistic Understanding-a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)

**Lecture 23:** Natural Acceptance of Human Values

**Lecture 24:** Definitiveness of (Ethical) Human Conduct

**Tutorial 12:** Practice Session PS12 Exploring Ethical Human Conduct

**Lecture 25:** A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order

**Lecture 26:** Competence in Professional Ethics





**Tutorial 13:** Practice Session PS13 Exploring Humanistic Models in Education

**Lecture 27:** Holistic Technologies, Production Systems and Management Models-Typical Case Studies

**Lecture 28:** Strategies for Transition towards Value-based Life and Profession

**Tutorial 14:** Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

**Practice Sessions for UNIT I –**

Introduction to Value Education

**PS1** Sharing about Oneself

**PS2** Exploring Human Consciousness

**PS3** Exploring Natural Acceptance

**Practice Sessions for UNIT II –**

Harmony in the Human Being

**PS4** Exploring the difference of Needs of self and body

**PS5** Exploring Sources of Imagination in the self

**PS6** Exploring Harmony of self with the body

**Practice Sessions for UNIT III –**

Harmony in the Family and Society

**PS7** Exploring the Feeling of Trust

**PS8** Exploring the Feeling of Respect

**PS9** Exploring Systems to fulfil Human Goal

**Practice Sessions for UNIT IV –**

Harmony in the Nature (Existence)

**PS10** Exploring the Four Orders of Nature

**PS11** Exploring Co-existence in Existence

**Practice Sessions for UNIT V –**

Implications of the Holistic Understanding – a Look at Professional Ethics

**PS12** Exploring Ethical Human Conduct

**PS13** Exploring Humanistic Models in Education

**PS14** Exploring Steps of Transition towards Universal Human Order

**READINGS:**

**Textbook and Teachers Manual**

**a. The Textbook**

R R Gaur, R Asthana, G P Bagaria, a Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

**b. The Teacher's Manual**

R R Gaur, R Asthana, G P Bagaria, Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2







### REFERENCE BOOKS

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F. Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – Pandit Sunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

### MODE OF CONDUCT:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than "extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting. Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.





**ONLINE RESOURCES:**

1. <https://fdp-si.aicte-india.org/UHV>  
II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-  
Introduction%20to%20Value%20Education.pdf
2. <https://fdp-si.aicte-india.org/UHV>  
II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-  
Harmony%20in%20the%20Human%20Being.pdf
3. <https://fdp-si.aicte-india.org/UHV>  
II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-  
Harmony%20in%20the%20Family.pdf
4. <https://fdp-si.aicte-india.org/UHV>  
%201%20Teaching%20Material/D3- S2%20Respect%20July%202023.pdf
5. <https://fdp-si.aicte-india.org/UHV>  
II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-  
Harmony%20in%20the%20Nature%20and%20Existence.pdf
6. <https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf>
7. <https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf>
8. <https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385>
9. [https://onlinecourses.swayam2.ac.in/aic22\\_ge23/preview](https://onlinecourses.swayam2.ac.in/aic22_ge23/preview)





II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:	<b>INTRODUCTION TO DATA SCIENCE</b>						

**COURSE OBJECTIVES:** From the course the student will learn

- Knowledge and expertise to become a data scientist.
- Essential concepts of statistics and machine learning that are vital for data science;
- Significance of exploratory data analysis (EDA) in data science.
- Critically evaluate data visualizations presented on the dashboards
- Suitability and limitations of tools and techniques related to data science process

**COURSE OUTCOMES:**

At the end of the course students will be able to

**CO1:** Understand and articulate the foundational concepts of data science, and the overall data science process. [K2]

**CO2:** Apply machine learning techniques using Python tools Analyze case studies on predicting malicious URLs and building. [K4]

**CO3:** Apply NoSQL databases for managing big data. [K3]

**CO4:** Make use of advanced data science tools for graph databases. [K3]

**CO5:** Develop interactive dashboards for data visualization. [K3]

**UNIT I:**

Introduction to Data science, benefits and uses, facets of data, data science process in brief, big data ecosystem and data science

**Data Science process:** Overview, defining goals and creating project charter, retrieving data, cleansing, integrating and transforming data, exploratory analysis, model building, presenting findings and building applications on top of them

**UNIT II:**

Applications of machine learning in Data science, role of ML in DS, Python tools like sklearn, modelling process for feature engineering, model selection, validation and prediction, types of ML, semi-supervised learning

**Handling large data:** problems and general techniques for handling large data, programming tips for dealing large data, case studies on DS projects for predicting malicious URLs, for building recommender systems.

**UNIT III:**

**NoSQL movement for handling Bigdata:** Distributing data storage and processing with Hadoop framework, case study on risk assessment for loan sanctioning, ACID principle of relational databases, CAP theorem, base principle of NoSQL databases, types of NoSQL databases, case study on disease diagnosis and profiling





**UNIT IV:**

**Tools and Applications of Data Science:** Introducing Neo4j for dealing with graph databases, graph query language Cypher, Applications graph databases, Python libraries like nltk and SQLite for handling Text mining and analytics, case study on classifying Reddit posts

**UNIT V:**

**Data Visualization and Prototype Application Development:** Data Visualization options, Crossfilter, Creating an interactive dashboard with dc.js, Dashboard development tools. Applying the Data Science process for real world problem solving scenarios as a detailed case study.

**TEXTBOOK:**

1. Davy Cielen, Arno D.B.Meysman, and Mohamed Ali, “Introducing to Data Science using Python tools”, Manning Publications Co, Dreamtech press, 2016
2. Prateek Gupta, “Data Science with Jupyter” BPB publishers, 2019 for basics

**REFERENCE BOOKS:**

1. Joel Grus, “Data Science From Scratch”, OReilly, 2019
2. Doing Data Science: Straight Talk From The Frontline, 1 st Edition, Cathy O’Neil and Rachel Schutt, O’Reilly, 2013





II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:	<b>ADVANCED DATA STRUCTURES &amp; ALGORITHM ANALYSIS</b>						

**COURSE OBJECTIVES:**

The main objectives of the course is to

- provide knowledge on advance data structures frequently used in Computer Science domain
- Develop skills in algorithm design techniques popularly used
- Understand the use of various data structures in the algorithm design

**COURSE OUTCOMES:**

At the end of the course students will be able to

- CO1:** Apply asymptotic notations to measure the performance of algorithms [K3]
- CO2:** Applying divide and conquer parading when an algorithmic design situation calls for it. [K3]
- CO3:** Construct greedy algorithms and dynamic programming techniques to solve problems [K3]
- CO4:** Utilize backtracking and branch and bound algorithms to solve combinatorial problems construct [K3]
- CO5:** Classifying computational problems into NP, NP-Hard, and NP-Complete. [K4]

**UNIT – I:**

Introduction to Algorithm Analysis, Space and Time Complexity analysis, Asymptotic Notations. AVL Trees – Creation, Insertion, Deletion operations and Applications B-Trees – Creation, Insertion, Deletion operations and Applications

**UNIT – II:**

Heap Trees (Priority Queues) – Min and Max Heaps, Operations and Applications  
 Graphs – Terminology, Representations, Basic Search and Traversals, Connected Components and Biconnected Components, applications Divide and Conquer: The General Method, Quick Sort, Merge Sort, Strassen’s matrix multiplication.

**UNIT – III:**

**Greedy Method:** General Method, Job Sequencing with deadlines, Knapsack Problem, Minimum cost spanning trees, Single Source Shortest Paths

**Dynamic Programming:** General Method, All pairs shortest paths, Single Source Shortest Paths – General Weights (Bellman Ford Algorithm), Optimal Binary Search Trees, 0/1 Knapsack, String Editing, Travelling Salesperson problem





**UNIT – IV:**

**Backtracking:** General Method, 8-Queens Problem, Sum of Subsets problem, Graph Coloring, 0/1 Knapsack Problem

**Branch and Bound:** The General Method, 0/1 Knapsack Problem, Travelling Salesperson problem

**UNIT – V:**

**NP Hard and NP Complete Problems:** Basic Concepts, Cook's theorem

**NP Hard Graph Problems:** Clique Decision Problem (CDP), Chromatic Number Decision Problem (CNDP), Traveling Salesperson Decision Problem (TSP)

**NP Hard Scheduling Problems:** Scheduling Identical Processors, Job Shop Scheduling

**TEXTBOOKS:**

1. Fundamentals of Data Structures in C++, Horowitz, Ellis; Sahni, Sartaj; Mehta, Dinesh 2nd Edition Universities Press
2. Computer Algorithms/C++ Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran 2nd Edition University Press

**REFERENCE BOOKS:**

1. Data Structures and program design in C, Robert Kruse, Pearson Education Asia
2. An introduction to Data Structures with applications, Trembley & Sorenson, McGraw Hill
3. The Art of Computer Programming, Vol.1: Fundamental Algorithms, Donald E Knuth, Addison-Wesley, 1997.
4. Data Structures using C & C++: Langsam, Augenstein & Tanenbaum, Pearson, 1995
5. Algorithms + Data Structures & Programs:, N.Wirth, PHI
6. Fundamentals of Data Structures in C++: Horowitz Sahni & Mehta, Galgottia Pub.
7. Data structures in Java:, Thomas Standish, Pearson Education Asia

**ONLINE LEARNING RESOURCES:**

1. [https://www.tutorialspoint.com/advanced\\_data\\_structures/index.asp](https://www.tutorialspoint.com/advanced_data_structures/index.asp)
2. <http://peterindia.net/Algorithms.html>
3. Abdul Bari, [1. Introduction to Algorithms \(youtube.com\)](#)





II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:	<b>OBJECT-ORIENTED PROGRAMMING THROUGH JAVA</b>						

**COURSE OBJECTIVES:**

The learning objectives of this course are to:

- Identify Java language components and how they work together in applications
- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java APIs for program development

**COURSE OUTCOMES:**

After completion of this course, the students would be able to:

**CO1:** Interpret the syntax and semantics of java programs language and OOPs concepts. [K2]

**CO2:** Make use of different predefined classes and packages and interfaces to develop programs using OOPs concepts. [K3]

**CO3:** Apply exception handling and FILE I/O operations on java programs.[K3]

**CO4:** Make use of Multithreading and String handling Functions on java. [K3]

**CO5:** Make use of Java FX in the design of GUI Applications, Event-Handling to develop GUI and JDBC connections. [K3]

**UNIT I:**

**Object Oriented Programming:** Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

**Data Types, Variables, and Operators :**Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator ( = ), Basic Arithmetic Operators, Increment (++) and Decrement ( - - ) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

**Control Statements:** Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?., Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

**UNIT II:**

**Classes and Objects:** Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing





Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

**Methods:** Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

### UNIT III:

**Arrays:** Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three dimensional Arrays, Arrays as Vectors.

**Inheritance:** Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class-Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

**Interfaces:** Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

### UNIT IV:

**Packages and Java Library:** Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto-unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

**Exception Handling:** Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

**Java I/O and File:** Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java (Text Book 2)

### UNIT V:

**String Handling in Java:** Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

**Multithreaded Programming:** Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

**Java Database Connectivity:** Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, Result Set Interface

**Java FX GUI:** Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)







**TEXT BOOKS:**

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, DebasisSamanta, MonalisaSarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4<sup>th</sup> Edition, Pearson.

**REFERENCES BOOKS:**

1. The complete Reference Java, 11<sup>th</sup> edition, Herbert Schildt, TMH
2. Introduction to Java programming, 7<sup>th</sup> Edition, Y Daniel Liang, Pearson

**ONLINE RESOURCES:**

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_012880464547618816347\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview)





II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUBCODE:	<b>DATA SCIENCE LAB</b>						

**COURSE OBJECTIVES:**

The main objective of the course is to inculcate the basic understanding of Data Science and its practical implementation using Python.

**COURSE OUTCOMES:**

- CO1:** Perform various operations on numpy arrays. [K3]
- CO2:** Apply various techniques to extract data from websources and usage of Pandas for different file formats. [K3]
- CO3:** Explore various preprocessing techniques to handle Data Sets. [K3]
- CO4:** Draw different types of charts using matplotlib. [K4]

**List of Experiments**

1. Creating a NumPy Array
  - a. Basic ndarray
  - b. Array of zeros
  - c. Array of ones
  - d. Random numbers in ndarray
  - e. An array of your choice
  - f. Imatrix in NumPy
  - g. Evenly spaced ndarray
2. The Shape and Reshaping of NumPy Array
  - a. Dimensions of NumPy array
  - b. Shape of NumPy array
  - c. Size of NumPy array
  - d. Reshaping a NumPy array
  - e. Flattening a NumPy array
  - f. Transpose of a NumPy array
3. Expanding and Squeezing a NumPy Array
  - a. Expanding a NumPy array
  - b. Squeezing a NumPy array





- c. Sorting in NumPy Arrays
4. Indexing and Slicing of NumPy Array
  - a. Slicing 1-D NumPy arrays
  - b. Slicing 2-D NumPy arrays
  - c. Slicing 3-D NumPy arrays
  - d. Negative slicing of NumPy arrays
5. Stacking and Concatenating Numpy Arrays
  - a. Stacking ndarrays
  - b. Concatenating ndarrays
  - c. Broadcasting in Numpy Arrays
6. Perform following operations using pandas
  - a. Creating dataframe
  - b. concat()
  - c. Setting conditions
  - d. Adding a new column
7. Perform following operations using pandas
  - a. Filling NaN with string
  - b. Sorting based on column values
  - c. groupby()
8. Read the following file formats using pandas
  - a. Text files
  - b. CSV files
  - c. Excel files
  - d. JSON files
9. Read the following file formats
  - a. Pickle files
  - b. Image files using PIL
  - c. Multiple files using Glob
  - d. Importing data from database
10. Demonstrate web scraping using python
11. Perform following preprocessing techniques on loan prediction dataset
  - a. Feature Scaling





- b. Feature Standardization
  - c. Label Encoding
  - d. One Hot Encoding
12. Perform following visualizations using matplotlib
- e. Bar Graph
  - f. Pie Chart
  - g. Box Plot
  - h. Histogram
  - i. Line Chart and Subplots
  - j. Scatter Plot
13. Getting started with NLTK, install NLTK using PIP
14. Python program to implement with Python Sci Kit-Learn & NLTK
15. Python program to implement with Python NLTK/Spicy/Py NLPI.

**WEB REFERENCES:**

1. <https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-datascience-beginners/>
2. <https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutesguide-to-key-concepts/>
3. <https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formatspython/>
4. <https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessingpython-scikit-learn/>
5. <https://www.analyticsvidhya.com/blog/2020/02/beginner-guide-matplotlib-datavisualization-exploration-python/>
6. <https://www.nltk.org/book/ch01.html>





II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUBCODE:	<b>OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB</b>						

**COURSE OBJECTIVES:**

The aim of this course is to

- Practice object oriented programming in the Java programming language
- Implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handling mechanism
- Illustrate inheritance, Exception handling mechanism, JDBC connectivity
- Construct Threads, Event Handling, implement packages, Java FX GUI

**EXPERIMENTS COVERING THE TOPICS:**

- Object Oriented Programming fundamentals- data types, control structures
- Classes, methods, objects, Inheritance, polymorphism,
- Exception handling, Threads, Packages, Interfaces
- Files, I/O streams, JavaFX GUI

**COURSE OUTCOMES:**

At the end of the course students will be able to

**CO1:** Develop Java program, by using OOP concepts. [K3]

**CO2:** Make use of inheritance and interface concepts in Java programs. [K3]

**CO3:** Make use of Exception handling and Multithreading concepts in Java Programs. [K3]

**CO4:** Develop GUIs with JavaFX and JDBC programs. [K3]

**SAMPLE EXPERIMENTS:**

**Exercise – 1:**

- Write a JAVA program to display default value of all primitive data type of JAVA
- Write a java program that display the roots of a quadratic equation  $ax^2+bx=0$ . Calculate the discriminate D and basing on value of D, describe the nature of root.

**Exercise - 2**

- Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
- Write a JAVA program to sort for an element in a given list of elements using bubble sort
- Write a JAVA program using StringBuffer to delete, remove character.

**Exercise - 3**

- Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
- Write a JAVA program implement method overloading.
- Write a JAVA program to implement constructor.
- Write a JAVA program to implement constructor overloading.





**Exercise - 4**

- a) Write a JAVA program to implement Single Inheritance
- b) Write a JAVA program to implement multi-level Inheritance
- c) Write a JAVA program for abstract class to find areas of different shapes

**Exercise - 5**

- a) Write a JAVA program give example for “super” keyword.
- b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?
- c) Write a JAVA program that implements Runtime polymorphism

**Exercise - 6**

- a) Write a JAVA program that describes exception handling mechanism
- b) Write a JAVA program Illustrating Multiple catch clauses
- c) Write a JAVA program for creation of Java Built-in Exceptions
- d) Write a JAVA program for creation of User Defined Exception

**Exercise - 7**

- a) Write a JAVA program that creates threads by extending Thread class. First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display “Welcome” every 3 seconds, (Repeat the same by implementing Runnable)
- b) Write a program illustrating is Alive and join ()
- c) Write a Program illustrating Daemon Threads.
- d) Write a JAVA program Producer Consumer Problem

**Exercise – 8**

- a) Write a JAVA program that import and use the user defined packages
- b) Without writing any code, build a GUI that display text in label and image in an ImageView (use JavaFX)
- c) Build a Tip Calculator app using several JavaFX components and learn how to respond to user interactions with the GUI

**Exercise – 9**

- a) Write a java program that connects to a database using JDBC
- b) Write a java program to connect to a database using JDBC and insert values into it.
- c) Write a java program to connect to a database using JDBC and delete values from it

**Virtual Lab:** <http://ps-iiith.vlabs.ac.in/>, [www.w3schools.com](http://www.w3schools.com)

Any three programs must be submitted with result from the above link.





II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	1	2	30	70	100	2
SUBCODE:	<b>PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE)</b>						

**COURSE OBJECTIVES:**

The main objectives of the course are to

- Introduce core programming concepts of Python programming language.
- Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
- Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

**COURSE OUTCOMES:**

At the end of the course students will be able to

**CO1:** Make use of control flow statements and functions to develop python programs.[K3].

**CO2:** Develop Python programs using strings, Lists, dictionaries, tuples and sets. [K3].

**CO3:** Develop Python programs on object oriented programming and regular expressions. [K3].

**CO4:** Develop Python programs using Numpy and Pandas. [K3].

**UNIT-I:**

**History of Python Programming Language,** Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

**Parts of Python Programming Language:** Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

**Control Flow Statements:** if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

**Sample Experiments:**

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
  - i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers





6. Write a program to print multiplication table of a given number.

#### UNIT-II:

**Functions:** Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, \*args and \*\*kwargs, Command Line Arguments.

**Strings:** Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

**Lists:** Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

#### Sample Experiments:

1. Write a program to define a function with multiple return values.
2. Write a program to define a function using default arguments.
3. Write a program to find the length of the string without using any library functions.
4. Write a program to check if the substring is present in a given string or not.
5. Write a program to perform the given operations on a list:
  - i. Addition
  - ii. Insertion
  - iii. Slicing
6. Write a program to perform any 5 built-in functions by taking any list.

#### UNIT-III:

**Dictionaries:** Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

**Tuples and Sets:** Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

#### Sample Experiments:

1. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
2. Write a program to count the number of vowels in a string (No control flow allowed).
3. Write a program to check if a given key exists in a dictionary or not.
4. Write a program to add a new key-value pair to an existing dictionary.
5. Write a program to sum all the items in a given dictionary.

#### UNIT-IV:

**Files:** Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.







**Object-Oriented Programming:** Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

**Sample Experiments:**

1. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
2. Python program to print each line of a file in reverse order.
3. Python program to compute the number of characters, words and lines in a file.
4. Write a program to create, display, append, insert and reverse the order of the items in the array.
5. Write a program to add, transpose and multiply two matrices.
6. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

**UNIT-V:**

**Introduction to Data Science:** Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

**Sample Experiments:**

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
  - 1 Apply head () function to the pandas data frame
  - 2 Perform various data selection operations on Data Frame
7. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

**REFERENCE BOOKS:**

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2<sup>nd</sup> Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

**ONLINE LEARNING RESOURCES / VIRTUAL LABS:**

1. <https://www.coursera.org/learn/python-for-applied-data-science-ai>
2. <https://www.coursera.org/learn/python?specialization=python#syllabus>





**II YEAR II SEMESTER**

S.No.	Subcode	Category	Title	L	T	P	Credits
1	R23CC2208	Management Course- I	Optimization Techniques	2	0	0	2
2	R23DS2201	Engineering Science/ Basic Science	Statistical Methods for Data Science	3	0	0	3
3	R23DS2202	Professional Core	Data Engineering	3	0	0	3
4	R23CC2204	Professional Core	Database Management Systems	3	0	0	3
5	R23DS2203	Professional Core	Computer Organization and Architecture	3	0	0	3
6	R23DS22L2	Professional Core	Data Engineering Lab	0	0	3	1.5
7	R23CC22L1	Professional Core	DBMS Lab	0	0	3	1.5
8	R23DS22L4	Skill Enhancement course	Exploratory Data Analysis with Python	0	1	2	2
9	R23CC22L3	BS&H	Design Thinking & Innovation	1	0	2	2
10	R23CC21MC	BS&H	Environmental Studies	2	0	0	-
Total				17	1	10	21
Mandatory Community Service Project Internship of 08 weeks duration during summer Vacation							





II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:	<b>OPTIMIZATION TECHNIQUES</b>						

**Pre-requisite:****COURSE OBJECTIVES:**

- To define an objective function and constraint functions in terms of design variables, and then state the optimization problem.
- To state single variable and multi variable optimization problems, without and with constraints.
- To explain linear programming technique to an optimization problem, define slack and surplus variables, by using Simplex method.
- To state transportation and assignment problem as a linear programming problem to determine Simplex method.
- To study and explain nonlinear programming techniques, unconstrained or constrained, and define exterior and interior penalty functions for optimization problems.

**COURSE OUTCOMES:**

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

- CO1:** Apply the optimization problem, without and with constraints, by using design variables from an engineering design problem. [K3]
- CO2:** Apply classical optimization techniques to minimize or maximize a multi-variable objective function, without or with constraints, and arrive at an optimal solution. [K3]
- CO3:** Apply and Solve transportation and assignment problem by using Linear programming Simplex method. [K3]
- CO4:** Apply gradient and non-gradient methods to nonlinear optimization problems and use interior or exterior penalty functions for the constraints to derive the optimal solutions. [K3]
- CO5:** Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution. [K3]

**UNIT I: Introduction and Classical Optimization Techniques:**

Statement of an Optimization problem, design vector, design constraints, constraint surface, objective function, objective function surfaces, classification of Optimization problems.

**Classical Optimization Techniques:** Single variable Optimization, multi variable Optimization without constraints, necessary and sufficient conditions for





minimum/maximum, multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers, multivariable Optimization with inequality constraints, Kuhn – Tucker conditions.

**UNIT II: Linear Programming:**

Standard form of a linear programming problem, geometry of linear programming problems, definitions and theorems, solution of a system of linear simultaneous equations, pivotal reduction of a general system of equations, motivation to the simplex method, simplex algorithm

**UNIT III: Transportation Problem:**

Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel’s approximation method, testing for optimality of balanced transportation problems, Special cases in transportation problem.

**UNIT IV: Nonlinear Programming:**

Unconstrained cases, one – dimensional minimization methods: Classification, Fibonacci method, Univariate method, steepest descent method. Constrained cases– Characteristics of a constrained problem, Classification, Basic approach of PenaltyFunction method, Basic approaches of Interior and Exterior penalty function methods,

**UNIT V: Dynamic Programming:**

Dynamic programming multistage decision processes, types, concept of sub optimization and the principle of optimality, computational procedure in dynamic programming, examples illustrating the calculus method of solution, examples illustrating the tabular method of solution.

**TEXTBOOKS:**

1. “Engineering optimization: Theory and practice”, S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. “Introductory Operations Research”, H.S. Kasene& K.D. Kumar, Springer (India),Pvt.LTd.

**REFERENCE BOOKS:**

1. “Optimization Methods in Operations Research and systems Analysis”, by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research, Dr.S.D.Sharma, Kedarnath, Ramnath& Co





II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:	<b>STATISTICAL METHODS FOR DATA SCIENCE</b>						

**COURSE OBJECTIVES:**

This course aims at providing knowledge on basic concepts of Statistics, Estimation and testing of hypotheses for large and small samples.

**COURSE OUTCOMES:**

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

- CO1:** Analyze data and draw conclusion about collection of data and fitting of distributions [K4]
- CO2:** Analyzing the testing of hypothesis for Large and Small samples.[K4]
- CO3:** Applying skills in problem solving of the regression analysis [K3]
- CO4:** Applying the significance of Time Series data in various fields [K3]
- CO5:** Understanding the classification using Logistic Regression [K2]

**UNIT – I : Data Visualization and Distributions**

**Data Visualization Techniques:** Introduction to Statistical methods- Exploratory Data Analysis- Charts (Line, Pie, Bar); Plots (Bubble, Scatter); Maps (Heat, Dot Distribution); Diagrams (Trees and Matrices)-Principal Components Analysis.  
Introduction to Data Distributions - Probability Distributions – discrete (binomial, Poisson), Continuous Distributions (Normal, exponential).

**UNIT – II : Hypothesis Testing**

Introduction to Parametric Estimation-Parametric Confidence Intervals  
Choosing a Statistic - Hypothesis Testing - Parametric test: the T-test - Applications to Hypothesis Tests-Pair wise comparisons.

**UNIT- III : Linear Regression and Multiple Regression**

**Regression:** Linear Regression, Curvilinear Regression: Exponential Regression- Polynomial Regression- Power Model.  
Practical Examples - The nature of the ‘relationship’ - Multiple Linear Regression - Important measurements of the regression estimate - Multiple Regression with Categorical Explanatory Variables - Inference in Multiple Regression - Variable Selection.

**UNIT -IV: Time Series**

**Time series:** Significance of Time series analysis, Components of Time series, Secular trend: Graphic method, Semi-average method, Method of moving averages, Method of least squares: straight line and non-linear trends, Logarithmic methods – Exponential trends, Growth curves,  
**Seasonal Variations:** Method of simple averages, Ratio-to-trend method, ratio-to-moving





average method, Link relative method.

**UNIT-V: Logistic Regression**

The classification problem - Logistic Regression Setup - Interpreting the Results - Comparing Models - Classification Using Logistic Regression.

**TEXTBOOKS:**

1. Elizabeth Purdom, "Statistical methods for Data science"
2. K.Murugesan, P.Gurusamy , "Probability, Statistics and Random Processes"

**REFERENCE BOOKS:**

1. Manoj Kumar Srivastava and Namita Srivastava, Statistical Inference – Testing of Hypotheses, Prentice Hall of India, 2014.
2. Robert V Hogg, Elliot A Tannis and Dale L.Zimmerman, Probability and Statistical Inference,9<sup>th</sup> edition, Pearson publishers,2013.
3. Chris Chatfield, "The analysis of time series an introduction," 5<sup>th</sup> edition, Chapman & Hall/CRC.
4. Peter J. Brockwell, Richard A.Davis, "Introduction to Time series and Forecasting," Second edition, Springer





II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:	<b>DATA ENGINEERING</b>						

**COURSE OBJECTIVES:**

- Explain basic concepts of Data Engineering
- Discuss about Data Engineering Life Cycle
- How to design Good Data Architecture

**COURSE OUTCOMES:**

After Completion of the course, Students are able to:

- CO1:** Interpret the fundamental concepts and roles within data engineering. [K2]  
**CO2:** Analyze the stages and major considerations of the data engineering life cycle. [K4]  
**CO3:** Analyze data structures and generate data from various source systems. [K4]  
**CO4:** Evaluate and implement effective data storage and ingestion strategies. [K5]  
**CO5:** Analyze and optimize data queries and serve data analytics for machine learning. [K4]

**UNIT-I:**

**Introduction to Data Engineering:** Definition, Data Engineering Life Cycle, Evolution of Data Engineer, Data Engineering Versus Data Science, Data Engineering Skills and Activities, Data Maturity, Data Maturity Model, Skills of a Data Engineer, Business Responsibilities, Technical Responsibilities, Data Engineers and Other Technical Roles.

**UNIT-II:**

**Data Engineering Life Cycle:** Data Life Cycle Versus Data Engineering Life Cycle, Generation: Source System, Storage, Ingestion, Transformation, Serving Data.  
**Major undercurrents across the Data Engineering Life Cycle:** Security, Data Management, DataOps, Data Architecture, Orchestration, Software Engineering.

**UNIT-III:**

**Designing Good Data Architecture:** Enterprise Architecture, Data Architecture, Principles of Good Data Architecture, Major Architecture Concepts.  
**Data Generation in Source Systems:** Sources of Data, Files and Unstructured Data, APIs, Application Databases (OLTP), OLAP, Change Data Capture, Logs, Database Logs, CRUD, Source System Practical Details.

**UNIT-IV:**

**Storage:** Raw Ingredients of Data Storage, Data Storage Systems, Data Engineering Storage Abstractions, Data warehouse, Data Lake, Data Lakehouse.  
**Ingestion:** Data Ingestion, Key Engineering considerations for the Ingestion Phase, Batch Ingestion Considerations, Message and Stream Ingestion Considerations, Ways to Ingest Data





**UNIT-V:**

**Queries, Modeling and Transformation:** Queries, Life of a Query, Query Optimizer, Queries on Streaming Data, Data Modelling, Modeling Streaming Data, Transformations, Streaming Transformations and Processing.

**Serving Data for Analytics, Machine Learning and Reverse ETL:** General Considerations for serving Data, Business Analytics, Operational Analytics, Embedded Analytics, Ways to serve data for analytics and ML, Reverse ETL.

**TEXT BOOKS:**

1. Joe Reis, Matt Housley, Fundamentals of Data Engineering, O'Reilly Media, Inc., June 2022, ISBN: 9781098108304

**REFERENCE BOOKS:**

1. Paul Crickard , Data Engineering with Python, Packt Publishing, October 2020.
2. Ralph Kimball, Margy Ross, The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, Wiley, 3rd Edition, 2013
3. James Densmore, Data Pipelines Pocket Reference: Moving and Processing Data for Analytics, O'Reilly Media, 1st Edition, 2021







II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:	<b>DATABASE MANAGEMENT SYSTEMS</b>						

**COURSE OBJECTIVES:**

The main objectives of the course is to

- Introduce database management systems and to give a good formal foundation on the relational model of data and usage of Relational Algebra
- Introduce the concepts of basic SQL as a universal Database language
- Demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization
- Provide an overview of physical design of a database system, by discussing Database indexing techniques and storage techniques

**COURSE OUTCOMES:**

After Completion of the course, Students are able to:

**CO 1:** Interpret the fundamentals of DBMS. [K2]

**CO 2:** Analyzing relational database designing. [K4]

**CO 3:** Developing queries in RDBMS [K3]

**CO 4:** Analyzing database design methodology and normalization process [K4].

**CO 5:** Analyze transaction concepts and File indexing. [K2]

**UNIT I:**

**Introduction:** Database system, Characteristics (Database Vs File System), Database Users, Advantages of Database systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, environment, Centralized and Client Server architecture for the database.

**Entity Relationship Model:** Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

**UNIT II:**

**Relational Model:** Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance, Relational Algebra, Relational Calculus. BASIC SQL: Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update).

**UNIT III:**

**SQL:** Basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions(Date and Time, Numeric, String conversion). Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation,





ordering, implementation of different types of joins, view (updatable and non-updatable), relational set operations.

**UNIT IV:**

**Schema Refinement** (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency Lossless join and dependency preserving decomposition, (1NF, 2NF and 3NF), concept of surrogate key, Boyce-Codd normal form (BCNF), MVD, Fourth normal form (4NF), Fifth Normal Form (5NF).

**UNIT V:**

**Transaction Concept:** Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for Serializability, lock based, time stamp based, optimistic, concurrency protocols, Deadlocks, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm. Introduction to Indexing Techniques: B+ Trees, operations on B+ Trees, Hash Based Indexing:

**TEXT BOOKS:**

1. Database Management Systems, 3<sup>rd</sup> edition, Raghurama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts, 5<sup>th</sup> edition, Silberschatz, Korth, Sudarsan, TMH (For Chapter 1 and Chapter 5)

**REFERENCE BOOKS:**

1. Introduction to Database Systems, 8<sup>th</sup> edition, C J Date, Pearson.
2. Database Management System, 6<sup>th</sup> edition, Ramez Elmasri, Shamkant B. Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

**WEB-RESOURCES:**

1. <https://nptel.ac.in/courses/106/105/106105175/>
2. [https://infyspringboard.onwingspan.com/web/en/app/toc/lex\\_auth\\_0127580666728202\\_2456\\_shared/overview](https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0127580666728202_2456_shared/overview)





II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	30	70	100	3
SUBCODE:	<b>COMPUTER ORGANIZATION AND ARCHITECTURE</b>						

**COURSE OBJECTIVES:**

The purpose of the course is

- Discuss about principles of computer organization and the basic architectural concepts.
- Explain in depth understanding of basic organization, design, programming of a simple digital computer, computer arithmetic, instruction set design, micro programmed control unit, pipelining and vector processing, memory organization and I/O systems.

**COURSE OUTCOMES:**

After Completion of the course, Students are able to:

- CO1:** Demonstrate an understanding of the different number systems, codes and relate postulates of Boolean algebra and minimize combinational functions. [K2]
- CO2:** Evaluate and learn different combinational circuits, sequential circuits and able to design them. [K5]
- CO3:** Organize, determine and learns basic structure of components register through language, micro operations and able to write micro programs. [K3]
- CO4:** Determine and able to learn micro programme control and central processing unit. [K3]
- CO5:** Able to learns the internal organization of computers and able to analyze performance of them. [K4]

**UNIT I:**

**Digital Computers and Data Representation:** Introduction, Numbering Systems, Decimal to Binary Conversion, Binary Coded Decimal Numbers, Weighted Codes, Self-Complementing Codes, Cyclic Codes, Error Detecting Codes, Error Correcting Codes, Hamming Code for Error Correction, Alphanumeric Codes, ASCII Code Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

**Boolean Algebra and Logical gates:** Boolean Algebra :Theorems and properties, Boolean functions, canonical and standard forms , minimization of Boolean functions using algebraic identities; Karnaugh map representation and minimization using two and three variable Maps; Logical gates ,universal gates and Two- level realizations using gates : AND-OR, OR-AND, NAND-NAND and NOR-NOR structures.

**UNIT II:**

**Digital logic circuits:** Combinatorial Circuits: Introduction, Combinatorial Circuit Design Procedure, Implementation using universal gates, Multi-bit adder, Multiplexers, De-multiplexers, Decoders Sequential Switching Circuits: Latches and Flip-Flops, Ripple counters using T flip-flops;

**Synchronous counters:** Shift Registers; Ring counters





**UNIT III: Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Booth multiplication algorithm, Division Algorithms, Floating – point Arithmetic Operations. Register Transfer language and microinstructions: Bus memory transfer, arithmetic and logical micro-operations, shift and rotate micro-operations.

**Basic Computer Organization and Design:** Stored program concept, computer Registers, common bus system, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input–Output configuration and program Interrupt.

**UNIT IV: Microprogrammed Control:**

Control memory, Address sequencing, microprogram example, design of control unit.

**Central Processing Unit:** General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation.

**Program Control:** conditional Flags and Branching.

**UNITV:**

**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

**Input-Output Organization:** Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

**TEXT BOOKS:**

1. Digital Logic and Computer Design, Moriss Mano, 11th Edition, Pearson.
2. Computer System Architecture,3rd Edition, M.Morris Mano, PHI

**REFERENCE BOOKS:**

1. Digital Logic and Computer Organization, Rajaraman, Radha krishnan, PHI, 2006
2. Computer Organization, 5Th Edition, Hamacher, Vranesic, Zaky, TMH, 2002
3. Computer Organization & Architecture: Designing for Performance, 7th Edition, William Stallings, PHI, 2006





II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUBCODE:	<b>DATA ENGINEERING LAB</b>						

**COURSE OBJECTIVES:**

The main objective of this course is to teach how build data engineering infrastructure and data pipelines.

**COURSE OUTCOMES:**

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

- CO1:** Build our Data Engineering Infrastructure
- CO2:** Demonstrate Reading and Writing files
- CO3:** Build Data Pipelines and integrate with Dashboard
- CO4:** Deploy the Data Pipeline in production

**EXPERIMENTS:**

1. Installing and configuring Apache NiFi, Apache Airflow
2. Installing and configuring Elasticsearch, Kibana, PostgreSQL, pgAdmin 4
3. Reading and Writing files
  - a. Reading and writing files in Python
  - b. Processing files in Airflow
  - c. NiFi processors for handling files
  - d. Reading and writing data to databases in Python
  - e. Databases in Airflow
  - f. Database processors in NiFi
2. Working with Databases
  - a. Inserting and extracting relational data in Python
  - b. Inserting and extracting NoSQL database data in Python
  - c. Building database pipelines in Airflow
  - d. Building database pipelines in NiFi
3. Cleaning, Transforming and Enriching Data
  - a. Performing exploratory data analysis in Python
  - b. Handling common data issues using pandas
  - c. Cleaning data using Airflow
4. Building the Data Pipeline
5. Building a Kibana Dash Board





6. Perform the following operations
  - a. Staging and validating data
  - b. Building idempotent data pipelines
  - c. Building atomic data pipelines
  
7. Version Control with the NiFi Registry
  - a. Installing and configuring the NiFi Registry
  - b. Using the Registry in NiFi
  - c. Versioning your data pipelines
  - d. Using git-persistence with the NiFi Registry
  
8. Monitoring Data Pipelines
  - a. Monitoring NiFi in the GUI
  - b. Monitoring NiFi using processors
  - c. Monitoring NiFi with Python and the REST API
  
9. Deploying Data Pipelines
  - a. Finalizing your data pipelines for production
  - b. Using the NiFi variable registry
  - c. Deploying your data pipelines
  
10. Building a Production Data Pipeline
  - a. Creating a test and production environment
  - b. Building a production data pipeline
  - c. Deploying a data pipeline in production

**REFERENCE BOOKS:**

1. Paul Crickard, Data Engineering with Python, Packt Publishing, October 2020





II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	30	70	100	1.5
SUBCODE:	<b>DATABASE MANAGEMENT SYSTEMS LAB</b>						

**COURSE OBJECTIVES:**

This Course will enable students to

- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers,

**EXPERIMENTS COVERING THE TOPICS:**

- DDL, DML, DCL commands
- Queries, nested queries, built-in functions,
- PL/SQL programming- control structures
- Procedures, Functions, Cursors, Triggers,
- Database connectivity- ODBC/JDBC

**COURSE OUTCOMES:**

After Completion of this course student must be able to

- CO1:** Apply SQL commands like DDL, DML, DCL and Indexing to perform different Database operations [K3].
- CO2:** Develop PL/SQL block statements, control statements and cursors. [K3]
- CO3:** Develop PL/SQL programs using functions and procedures. [K3]
- CO4:** Develop PL/SQL programs using packages and Triggers. [K3]
- CO5:** Develop a Java Program to connect to a database. [K3].

**SAMPLE EXPERIMENTS:**

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints. Example:- Select the roll number and name of the student who secured fourth rank in the class.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries using Conversion functions (to\_char, to\_number and to\_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next\_day, add\_months, last\_day, months\_between, least, greatest, trunc, round, to\_char, to\_date)
- 5.





- i. Create a simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
- ii. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.
6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE- APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
11. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers
12. Create a table and perform the search operation on table using indexing and nonindexing techniques.
13. Write a Java program that connects to a database using JDBC
14. Write a Java program to connect to a database using JDBC and insert values into it
15. Write a Java program to connect to a database using JDBC and delete values from it

**TEXT BOOKS/SUGGESTED READING:**

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007







II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	1	2	30	70	100	1.5
SUBCODE:	<b>EXPLORATORY DATA ANALYSIS USING PYTHON (SKILL DEVELOPMENT COURSE)</b>						

**COURSE Objectives:**

- This course introduces the fundamentals of Exploratory Data Analysis
- It covers essential exploratory techniques for understanding multivariate data by summarizing it through statistical methods and graphical methods.

**COURSE OUTCOMES:**

After Completion of this course student must be able to

**CO1:** Enumerate the fundamentals of Exploratory Data Analysis.

**CO2:** Visualize the data using basic graphs and plots.

**CO3:** Apply different Data Transformation Techniques.

**CO4:** Summarize the data using descriptive statistics, evaluate and select the best model.

**UNIT-I**

**Exploratory Data Analysis Fundamentals:** Understanding data science, The significance of EDA, Steps in EDA, Making sense of data, Numerical data, Categorical data, Measurement scales, Comparing EDA with classical and Bayesian analysis, Software tools available for EDA, Getting started with EDA.

**Sample Experiments:**

1. a) Download Dataset from Kaggle using the following link :  
<https://www.kaggle.com/datasets/sukhmanibedi/cars4u>
- b) Install python libraries required for Exploratory Data Analysis (numpy, pandas, matplotlib,seaborn)
2. Perform Numpy Array basic operations and Explore Numpy Built-in functions.
3. Loading Dataset into pandas dataframe
4. Selecting rows and columns in the dataframe

**UNIT-II**

**Visual Aids for EDA:** Technical requirements, Line chart, Bar charts, Scatter plot using seaborn, Polar chart, Histogram, Choosing the best chart

**Case Study:** EDA with Personal Email, Technical requirements, Loading the dataset, Data transformation, Data cleansing, Applying descriptive statistics, Data refactoring, Data analysis.

**Sample Experiments:**

1. Apply different visualization techniques using sample dataset
  - a) Line Chart
  - b) Bar Chart
  - c) Scatter Plots
  - d) Bubble Plot
2. Generate Scatter Plot using seaborn library for iris dataset





3. Apply following visualization Techniques for a sample dataset
  - a) Area Plot b) Stacked Plot c) Pie chart d) Table Chart
4. Generate the following charts for a dataset.
  - a) Polar Chart b) Histogram c) Lollipop chart
5. Case Study: Perform Exploratory Data Analysis with Personal Email Data

### UNIT-III

**Data Transformation:** Merging database-style dataframes, Concatenating along with an axis, Merging on index, Reshaping and pivoting, Transformation techniques, Handling missing data, Mathematical operations with NaN, Filling missing values, Discretization and binning, Outlier detection and filtering, Permutation and random sampling, Benefits of data transformation, Challenges.

#### Sample Experiments:

1. Perform the following operations
  - a) Merging Dataframes
  - b) Reshaping with Hierarchical Indexing
  - c) Data Deduplication
  - d) Replacing Values
2. Apply different Missing Data handling techniques
  - a) NaN values in mathematical Operations
  - b) Filling in missing data
  - c) Forward and Backward filling of missing values
  - d) Filling with index values
  - e) Interpolation of missing values
3. Apply different data transformation techniques
  - a) Renaming axis indexes
  - b) Discretization and Binning
  - c) Permutation and Random Sampling
  - d) Dummy variables

### UNIT-IV

**Descriptive Statistics:** Distribution function, Measures of central tendency, Measures of dispersion, Types of kurtosis, Calculating percentiles, Quartiles, Grouping Datasets, Correlation, Understanding univariate, bivariate, multivariate analysis, Time Series Analysis

#### Sample Experiments:

1. Study the following Distribution Techniques on a sample data
  - a) Uniform Distribution
  - b) Normal Distribution
  - c) Gamma Distribution
  - d) Exponential Distribution
  - e) Poisson Distribution
  - f) Binomial Distribution
2. Perform Data Cleaning on a sample dataset.
3. Compute measure of Central Tendency on a sample dataset
  - a) Mean b) Median c) Mode





4. Explore Measures of Dispersion on a sample dataset
  - a) Variance b) Standard Deviation c) Skewness d) Kurtosis
5.
  - a) Calculating percentiles on sample dataset
  - b) Calculate Inter Quartile Range (IQR) and Visualize using Box Plots
6. Perform the following analysis on automobile dataset.
  - a) Bivariate analysis b) Multivariate analysis
7. Perform Time Series Analysis on Open Power systems dataset

#### UNIT-V

**Model Development and Evaluation:** Unified machine learning workflow, Data preprocessing, Data preparation, Training sets and corpus creation, Model creation and training, Model evaluation, Best model selection and evaluation, Model deployment

**Case Study:** EDA on Wine Quality Data Analysis

#### Sample Experiments:

1. Perform hypothesis testing using statsmodels library
  - a) Z-Test b) T-Test
2. Develop model and Perform Model Evaluation using different metrics such as prediction score, R2 Score, MAE Score, MSE Score.

**Case Study:** Perform Exploratory Data Analysis with Wine Quality Dataset

#### TEXT BOOK:

1. Suresh Kumar Mukhiya, Usman Ahmed, Hands-On Exploratory Data Analysis with Python, Packt Publishing, 2020.

#### REFERENCES:

1. Ronald K. Pearson, Exploratory Data Analysis Using R, CRC Press, 2020
2. Radhika Datar, Harish Garg, Hands-On Exploratory Data Analysis with R: Become an expert in exploratory data analysis using R packages, 1st Edition, Packt Publishing, 2019

#### WEB REFERENCES:

1. <https://github.com/PacktPublishing/Hands-on-Exploratory-Data-Analysis-withPython>
2. <https://www.analyticsvidhya.com/blog/2022/07/step-by-step-exploratory-dataanalysis-eda-using-python/#h-conclusion>
3. <https://github.com/PacktPublishing/Exploratory-Data-Analysis-with-PythonCookbook>





II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	0	2	30	70	100	2
SUBCODE:	<b>DESIGN THINKING &amp; INNOVATION</b>						

**COURSE OBJECTIVES:**

The objectives of the course are to

- Bring awareness on innovative design and new product development.
- Explain the basics of design thinking.
- Familiarize the role of reverse engineering in product development.
- Train how to identify the needs of society and convert into demand.
- Introduce product planning and product development process.

**COURSE OUTCOMES:**

After Completion of the course, Students are able to:

- CO1:** Define the concepts related to design thinking. [L1]
- CO2:** Explain the fundamentals of Design Thinking and innovation. [L2]
- CO3:** Apply the design thinking techniques for solving problems in various sectors. [L3]
- CO4:** Analyse to work in a multidisciplinary environment. [L4]
- CO5:** Evaluate the value of creativity. [L5]

**UNIT – I: Introduction to Design Thinking**

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

**UNIT – II: Design Thinking Process**

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, customer, journey map, brainstorming, product development

**Activity:** Every student presents their idea in three minutes, every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

**UNIT – III: Innovation**

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

**Activity:** Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.





**UNIT – IV: Product Design**

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

**Activity:** Importance of modeling, how to set specifications, Explaining their own product design.

**UNIT – V: Design Thinking in Business Processes**

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

**Activity:** How to market our own product, about maintenance, Reliability and plan for startup.

**TEXTBOOKS:**

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

**REFERENCE BOOKS:**

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

**ONLINE LEARNING RESOURCES:**

- <https://nptel.ac.in/courses/110/106/110106124/>
- <https://nptel.ac.in/courses/109/104/109104109/>
- [https://swayam.gov.in/nd1\\_noc19\\_mg60/preview](https://swayam.gov.in/nd1_noc19_mg60/preview)
- [https://onlinecourses.nptel.ac.in/noc22\\_de16/preview](https://onlinecourses.nptel.ac.in/noc22_de16/preview)





II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0				
SUBCODE:	<b>ENVIRONMENTAL STUDIES</b>						

**COURSE OBJECTIVES:**

- To make the students to get awareness on environment
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- To save earth from the inventions by the engineers.

**COURSE OUTCOMES:**

After Completion of the course, Students are able to:

- CO1:** Understand multi-disciplinary nature of environmental studies and analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources. [L2]
- CO2:** Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web. Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity. [L2]
- CO3:** Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management [L2]
- CO4:** Understand the rainwater harvesting, watershed management, ozonolayer depletion and waste land reclamation. [L2]
- CO5:** Illustrate the causes of population explosion, value education and welfare programmes. [L3]

**UNIT – I**

**Multidisciplinary Nature of Environmental Studies:** – Definition, Scope and Importance – Need for Public Awareness.

**Natural Resources :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems –

**Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

**UNIT – II**

**Ecosystems:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers,





consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**Biodiversity and Its Conservation :** Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### UNIT – III

**Environmental Pollution:** Definition, Cause, effects and control measures of:

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution

**Solid Waste Management:** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

### UNIT – IV

**Social Issues and the Environment:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies –

**Environmental ethics:** Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

### UNIT – V

**Human Population And The Environment:** Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information





Technology in Environment and human health – Case studies.

**Field Work:** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

**TEXTBOOKS:**

1. Erach Bharucha, Text book of Environmental Studies for Undergraduate Courses, Universities Press (India) Private Limited, 2019.
2. Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, SciTech Publications (India), Pvt. Ltd, 2010.

**REFERENCE BOOKS:**

1. Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
2. M.Anji Reddy, “Textbook of Environmental Sciences and Technology”, BS Publication, 2014.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
4. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
5. G.R. Chatwal, a Text Book of Environmental Studies, Himalaya Publishing House, 2018.
6. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

**ONLINE LEARNING RESOURCES:**

- [https://onlinecourses.nptel.ac.in/noc23\\_hs155/preview](https://onlinecourses.nptel.ac.in/noc23_hs155/preview)
- [https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science+Part+3%3A+Pollution+and+Resources&source=edX&product\\_category=course&placement\\_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental-science](https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-8388-1b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science+Part+3%3A+Pollution+and+Resources&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental-science)
- <http://ecoursesonline.iasri.res.in/Courses/Environmental%20Science-I/Data%20Files/pdf/lec07.pdf>
- <https://www.youtube.com/watch?v=5QxxaVfgQ3k>

