

**COURSE STRUCTURE AND DETAILED SYLLABI FOR  
FOUR YEARS B. TECH  
UNDER ACADEMIC REGULATIONS R23**

**FOR**

**B. Tech Regular (Full-Time) Four Year Degree Courses**  
(For the Batches Admitted from 2023-2024)

**&**

**B. Tech (Lateral Entry Scheme)**  
(For the Batches Admitted From 2024-2025)

**COMPUTER SCIENCE ENGINEERING  
(DATA SCIENCE)**



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
(AUTONOMOUS)

Accredited by NBA, New Delhi & NAAC A<sup>+</sup>, Bengaluru | Affiliated to JNTUA, Ananthapuramu, Recognized by the  
UGC under Section 12(B) and 12(F) | Approved by AICTE, New Delhi.  
R.V.S. NAGAR, TIRUPATI ROAD, CHITTOOR – 517127 (A.P) – INDIA

Website: [www.svcetedu.org](http://www.svcetedu.org)

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# FOREWORD

The autonomy conferred Sri Venkateswara College Engineering and technology by JNT University, Ananthapuramu based on performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms the monitoring bodies UGC and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of college. Thus, an autonomous institution is given the freedom to have its own curriculum, examination system and monitoring mechanism, independent of the affiliating University but under its observance.

Sri Venkateswara College of Engineering and Technology is proud to win the confidence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining the standards and ethics it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education.

As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the College and recommendations of the JNTUA, Ananthapuramu to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, to produce quality engineering graduates to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

**Principal**



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**R.V.S. NAGAR, CHITTOOR-517 127, ANDHRA PRADESH**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**(DATA SCIENCE)**

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## **Vision and Mission of the Institute**

### **Vision**

- Carving the youth as dynamic, competent, valued and knowledgeable professionals who shall lead the Nation to a better future.

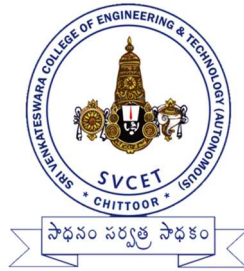
### **Mission**

- Providing quality education, student-centered teaching- learning processes and state-of-art infrastructure for professional aspirants hailing from both rural and urban areas.
- Imparting technical and management education to encourage independent thinking, develop strong domain of knowledge, own contemporary skills and positive attitudes towards holistic growth of young minds.
- Evolving Institution into a Center of Excellence and Research.

### **Quality policies**

Sri Venkateswara College of Engineering and Technology strides towards excellence by adopting a system of quality policies and processes with continued improvements to enhance student's skills and talent for their exemplary contribution to the society, the nation and the world.

**ACADEMIC REGULATIONS-R23**  
**COURSE STRUCTURE AND DETAILED SYLLABI**  
**for**  
**B.Tech Regular (Full - Time) Four Year Degree Program**  
**(For the batches admitted from the Academic Year 2023-24)**  
**and**  
**B.Tech. (Lateral Entry Scheme)**  
**(For the batches admitted from the Academic Year 2024-25)**



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

## **(Regular-Full time)**

(Effective for the students admitted into I year from the Academic Year 2023-24 onwards and

B. Tech. (Lateral Entry Scheme) for the batches admitted from the Academic Year 2024-25 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 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 (Eight years).
    - (ii) Registers for 160 credits and secures all 160 credits.
  - (b) **Award of B.Tech. degree 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 instructional 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 Courses	Foundation courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses
2.	Core Courses	Professional Core Courses (PC)	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 instructional days in each semester is 90 days.
- iv. There shall be mandatory student induction program for fresher's, 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 NSS /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the under graduate 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 eightweeks 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 theprogramme along with the project work.
- xv. Undergraduate degree with Honors is introduced by the Institution for the students having good academic record.
- xvi. The college shall take measures 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 advancedconcept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.
- xvii. The college shall 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 higherstudies/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
<b>Total</b>	<b>100</b>

- i) For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks 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 in 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 for 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 weight age of 10 marks. Any fraction shall be rounded off to the next higher mark.
  - The objective paper shall be conducted by the respective institution on the day of subjective paper test.
  - 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.
- 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% weight age 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% weight age 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. There shall be 2 short answer questions from each unit.
- iii) In each of the questions from 2 to 6
  - a) There shall be either/or type questions of 10 marks each. Student shall answer any one of them.
  - b) 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
<b>Total</b>	<b>100</b>

b) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.

c) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the record/viva and 15 marks for the internal test.

d) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.

- 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.

e) 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
<b>Total</b>	<b>100</b>

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 weight age of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either/or type questions of equal weight age 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 consists 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 withthe syllabus.

f) 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.

g) The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

## **10. 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 andthe 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 continuousassessments 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 for30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shallbe 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 theagency. 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 institution at the beginning of the semester. The principal of the college shall forward such proposals to the University for approval.
- 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 University/institution.

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

A Student has to pursue and complete one course compulsorily through MOOCs approved by the University/institution. 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 university.

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 University/Institution 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 University/Institution 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 of the institution, 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 University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
- vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
- vii) The University/institution shall ensure no overlap of MOOC exams with that of the University/institution examination schedule. In case of delay in results, the University/institution will re-issue the marks sheet for such students.
- 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 institution shall submit the following to the examination section of the university:
  - 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 University / institution 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 University from time to time.

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

The University / institution 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 students' 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 institution.

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

The college shall facilitate and monitor the student internship programs. Completion of internships

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

## **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 maybe 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 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 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 two subjects per semester pertaining to the Honors from V Semester onwards.
- iv) The Principal of the college shall 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 courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then 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.
- 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

### **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 CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA 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. The whole process should be completed within one week before the start of every semester. 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 at the respective institutions.

### **17. Attendance Requirements:**

- i) A student shall be eligible to appear for the institution 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 institution.
- 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. Conduct of Semester End Examination and Evaluation:**

**18.1** Semester end examination shall be conducted by the Controller of Examination (COE) by inviting 50% Question Papers from the External and 50% Question papers from the Internal Subject Experts. Principal will decide the External and Internal subject experts.

**18.2** The answer papers of semester end examination should be evaluated externally / internally.

**18.3** The marks for the internal evaluation components will be added to the external evaluation marks secured in the Semester – End examinations, to arrive at total marks for any subject in that semester.

**18.4** Performance in all the subjects is tabulated program-wise and will be scrutinized by the office of the Controller of Examinations. Total marks obtained in each subject are converted into letter grades. Finally subject-wise marks and grades details, subject-wise and branch-wise pass percentages are calculated through software.

**18.5 Results Committee:** Results Committee comprising of Principal, Controller of Examinations, Additional Controller of Examinations (Confidential), One Senior Professor nominated by the Principal and the University Nominee will oversee the details of marks, grades and pass percentages of all the subjects and branch-wise pass percentages.

**18.6** Office of the Controller of Examinations will generate student-wise result sheets and the same will be published through college website.

**18.7** Student-wise Grade Sheets are generated and issued to the students.

## **19. 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 University / Institution 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 may be 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.

## 20. 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

- 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 the next supplementary examination.
- 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 point 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.,

$$SGPA = \Sigma(C_i \times G_i) / \Sigma C_i$$

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.,

$$CGPA = \Sigma(C_i \times S_i) / \Sigma C_i$$

Where “ $S_i$ ” 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.

While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

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 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:

<b>Class Awarded</b>	<b>CGPA Secured</b>
First Class with Distinction	$\geq 7.5$
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

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

### **21. With-holding of Results**

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

### **22. Personal Verification /Recounting / Revaluation / Final Valuation**

#### **22.1 Personal Verification of Answer Scripts:**

Candidates appear in a particular semester end examinations may appeal for verification of their answer script(s) for arithmetic correction in totaling of marks and any omission / deletion in evaluation within 7 days from the date of declaration of results at the office of the Controller of Examinations on the prescribed proforma and by paying the prescribed fee per answer script.

It is clarified that personal verification of answer script shall not tantamount to revaluation of answer script. This is only a process of reverification by the candidate. Any mistake / deficiency with regard to arithmetic correction in totaling of marks and any omission / deletion in evaluation if found, the institution will correct the same.

## **22.2 Recounting / Revaluation:**

Students shall be permitted for request for recounting/revaluation of the Semester-End examination answer scripts within a stipulated period after payment of prescribed fee. After recounting or revaluation, records are updated with changes if any and the student will be issued a revised grade sheet. If there are no changes, the same will be intimated to the students.

## **22.3 Final Valuation:**

Students shall be permitted for request for final valuation of the Semester-End Examination answer scripts within a stipulated period after the publication of the revaluation results by paying the necessary fee. The final valuation shall be carried out by an expert not less than Associate Professor as per the scheme of valuation supplied by the examination branch in the presence of the student, Controller of Examinations and Principal. However students are not permitted to discuss / argue with the examiner. If the increase in marks after final valuation is equal to or more than 15% of the previous valuation marks, the marks obtained after final valuation shall be treated as final. If the variation of marks after final valuation is less than 15% of the previous valuation marks, then the earlier valuation marks shall be treated as the final marks.

## **23. 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 University / institution 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.

## **24. 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 start-ups. 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 principal of the college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the institution 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

## **25. 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.

## **26. Minimum Instruction Days for a Semester:**

The minimum instructional days excluding exams for each semester shall be 90 days.

## **27. 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.

## **28. Student Transfers:**

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

## **29. General Instructions:**

- i. The academic regulations should be read as a whole for purpose of any interpretation.
- ii. Malpractices rules-nature and punishments are appended.
- iii. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
- iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor / Head of the Institution is final.
- v. The University / institution 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.

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

*(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year 2024-25 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.
- (b) Award of B.Tech. degree 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).

## RULES FOR DISCIPLINARY ACTION FOR MALPRACTICE / IMPROPER CONDUCT IN EXAMINATIONS

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

		course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	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 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 for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
6.	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 of seat.
7.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he will be handed over to the police and a case is registered against him.
8.	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	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

	outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction or 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.	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.
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.	<p>Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.</p> <p>Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.</p>
10.	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.
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 Examination committee for further action to award suitable punishment.	





**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**

**(AUTONOMOUS)**

**R.V.S. NAGAR, CHITTOOR-517 127, ANDHRA PRADESH**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**(DATA SCIENCE)**

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## **Vision and Mission of the Department under R23 Regulations**

### **Department Vision:**

Evolve as centre of Proficiency in Data Analytics and develop ingenious professional as data analytics and researchers.

### **Department Mission:**

M1: To empower students with innovative and cognitive skills to expertise in the field of Data science.

M2: To Inculcate the seed of knowledge by providing industry conducive environment and excel in data driven world.

M3: To provide an excellent infrastructure, facilities and ambience to nurture the young professionals.

M4: Committed to provide professionals with socio-disciplinary attitude and acquire professional ethics.



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**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**  
**(DATA SCIENCE)**

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**Program Educational Objectives (PEOs) under R23 Regulations**

***Program Educational Objectives (PEOs):***

PEO1: Adapt new emerging technologies to analyze complex engineering problems reaching substantiated conclusions in their respective fields.

PEO 2: The graduates will engage in skill enhancement, that would help to work in their own area of interest, individually or in a team.

PEO 3: Demonstrate ownership and responsiveness with strong technical skills to address social and environmental issues.



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**(DATA SCIENCE)**

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**Program Specific Outcomes (PSOs) under R23 Regulations**

***Program Specific Outcomes (PSOs):***

***After successful completion of the program the graduates will be able to:***

**PSO 1:** Apply learned skills to excel optimized solutions in software development with expertise skills in Data Science, Data Processing and Data Analytics.

**PSO 2:** Exhibit proficiency in analytics for providing solutions to real world problems in Industry and Research establishments.

**B.TECH. - COURSE STRUCTURE – R23**  
**(Applicable from the academic year 2023-24 onwards)**

**INDUCTION PROGRAMME**

<b>S. No.</b>	<b>Course Name</b>	<b>Category</b>	<b>L-T-P-C</b>
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



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
(AUTONOMOUS)  
**DEPARTMENT OF CIVIL ENGINEERING**

**Course Structure and Scheme of Examination**

**I B. Tech I Semester – CSE (DS)**

**Regulations: R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L/D	T	P		CIA	SEE	Total
1.	BS & H	23AHS01	Communicative English	2	0	0	2	30	70	100
2.	BS & H	23AHS02	Chemistry	3	0	0	3	30	70	100
3.	ES	23ACE01	Basic Civil and Mechanical Engineering	3	0	0	3	30	70	100
4.	ES	23ACS01	Introduction to Programming	3	0	0	3	30	70	100
5.	BS & H	23AHS04	Linear Algebra and Calculus	3	0	0	3	30	70	100
6.	ES	23AME02	Engineering Workshop	0	0	3	1.5	30	70	100
7.	BS & H	23AHS06	Communicative English Lab	0	0	2	1	30	70	100
8.	BS & H	23AHS07	Chemistry Lab	0	0	2	1	30	70	100
9.	ES	23ACS02	Computer Programming Lab	0	0	3	1.5	30	70	100
10	MC	23AHS10	Health and Wellness, Yoga and Sports	0	0	1	0.5	100	0	100
<b>TOTAL</b>				<b>14</b>	<b>0</b>	<b>11</b>	<b>19.5</b>	<b>370</b>	<b>630</b>	<b>1000</b>

**I B. Tech II Semester – CSE (DS)**

**Regulations : R23**

S. No	Category	Course Code	Course Name	Hours/week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		CIA	SEE	Total
1.	BS & H	23AHS05	Engineering Physics	3	0	0	3	30	70	100
2.	ES	23AEE01	Basic Electrical and Electronics Engineering	3	0	0	3	30	70	100
3.	ES	23AME01	Engineering Graphics	1	0	4	3	30	70	100
4.	BS & H	23AHS11	Differential Equations and vector calculus	3	0	0	3	30	70	100
5.	ES	23AEE02	Electrical and Electronics Engineering Workshop	0	0	3	1.5	30	70	100
6.	ES	23AIT01	IT Workshop	0	0	2	1	30	70	100
7.	PC	23ACS03	Data Structures	3	0	0	3	30	70	100
8.	BS & H	23AHS09	Engineering Physics Lab	0	0	2	1	30	70	100
9.	PC	23ACS04	Data Structures Lab	0	0	3	1.5	30	70	100
10	MC	23AHS12	NSS /NCC/Scouts and Guides/Community Service	0	0	1	0.5	100	0	100
<b>TOTAL</b>				<b>13</b>	<b>0</b>	<b>15</b>	<b>20.5</b>	<b>370</b>	<b>630</b>	<b>1000</b>



**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)**

**I B.Tech I Semester (Common to CSE, CSD, CSM, CE & ME)**

**I B.Tech II Semester (Common to ECE, EEE, CSC, IT, CAI, CSO, CSBS & EBM)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**23AHS01- COMMUNICATIVE ENGLISH**

**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:**

- CO1:** Understand the context, topic, and pieces of specific information from social or Transactional dialogues.
- CO2:** Apply grammatical structures to formulate sentences and correct word forms.
- CO3:** Analyze discourse markers to speak clearly on a specific topic in informal discussions.
- CO4:** Evaluate reading / listening texts and to write summaries based on global comprehension of these texts.
- CO5:** Create a coherent paragraph, essay, and resume.

**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.
<b>Writing</b>	: Structure of a paragraph - Paragraph writing (specific topics)
<b>Grammar</b>	: Cohesive devices - linkers, use of articles and zero article; prepositions.
<b>Vocabulary</b>	: Homonyms, Homophones, Homographs.

### UNIT III

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

### UNIT IV

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

### UNIT V

<b>Lesson</b>	: <b>MOTIVATION: The Power of Intrapersonal Communication (An Essay)</b>
<b>Listening</b>	: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
<b>Speaking</b>	: Formal oral presentations on topics from academic contexts
<b>Reading</b>	: Reading comprehension.
<b>Writing</b>	: Critical Writing - Writing structured essays on specific topics.
<b>Grammar</b>	: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
<b>Vocabulary</b>	: Technical Jargons

### Text books:

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.

**Web Resources:****GRAMMAR:**

1. [www.bbc.co.uk/learningenglish](http://www.bbc.co.uk/learningenglish)
2. <https://dictionary.cambridge.org/grammar/british-grammar/>
3. [www.eslpod.com/index.html](http://www.eslpod.com/index.html)
4. <https://www.learngrammar.net/>
5. <https://english4today.com/english-grammar-online-with-quizzes/>
6. <https://www.talkenglish.com/grammar/grammar.aspx>

**VOCABULARY**

1. <https://www.youtube.com/c/DailyVideoVocabulary/videos>
2. [https://www.youtube.com/channel/UC4cmBAit8i\\_NJZE8qK8sfpA](https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA)



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**I B.Tech I SEM (Common to CSE, CSD & CSM)  
II SEM (Common to EEE, ECE, EBM, CAI, CSO, CSC & IT)**

**23AHS02: CHEMISTRY**

**L T P C  
3 - - 3**

**Course Objectives:**

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

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

**CO1:** Compare the materials of construction for battery and electrochemical sensors.

**CO2:** Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers.

**CO3:** Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.

**CO4:** Apply the principle of Band diagrams in the application of conductors and semiconductors.

**CO5:** Summarize the concepts of Instrumental methods.

**UNIT I        Structure and Bonding Models:**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of  $\Psi$  and  $\Psi^2$ , particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O<sub>2</sub> and CO, etc.  $\pi$ -molecular orbitals of butadiene and benzene, calculation of bond order.

**UNIT II        Modern Engineering materials:**

Semiconductors – Introduction, basic concept, application

Super conductors-Introduction, basic concept, applications.

Supercapacitors: Introduction, Basic Concept - Classification – Applications.

Nanomaterials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphenes nanoparticles.

**UNIT III        Electrochemistry and Applications**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

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

**UNIT IV        Polymer Chemistry**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of

polymer formation.

Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

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 transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

#### **Textbooks:**

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. 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. Billmeyer Jr, 3rd Edition

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**I B.Tech - I Semester (Common to All Branches)**

**23ACE01 BASIC CIVIL AND MECHANICAL ENGINEERING**

**Course Outcomes:** On completion of the course, the student should be able to:

- CO1.** Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
- CO2.** Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
- CO3.** Realize the importance of Transportation in nation's economy and the engineering measures related to highways in terms of geometrics.
- CO4.** Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated.
- CO5.** Understand the different manufacturing processes and explain the basics of thermal engineering and its applications.
- CO6.** Describe the working of different mechanical power transmission systems and powerplants; learn basics of robotics.

**PART A: BASIC CIVIL ENGINEERING**

**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-Tests on these materials.

Factors to be considered in Building Planning- Nature of Buildings- Typical Layouts of a Residential Building- Industrial Building- Commercial Building like a Supermarket / Hotel / Theatre.

**UNIT II**

**Surveying:** Objectives of Surveying- Horizontal Measurements- Vertical Measurements- Angular Measurements- Levelling instruments used for levelling- Introduction to Bearings- Simple problems on levelling and bearings-Contour mapping.

**UNIT III**

**Transportation Engineering, Water Resources and Environmental Engineering:** Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences - Basic geometric design elements of a highway- Camber- Stopping Sight Distance- Super elevation- Introduction.

**Water Resources and Environmental Engineering:** Sources of water- Quality of water- Specifications and Tests- Introduction to Hydrology- Hydrograph –Rain water Harvesting- Rain water runoff- Water Storage Structures (Simple introduction to Dams and Reservoirs).

**Textbooks:**

1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata Mcgraw Hill publications (India) Pvt. Ltd.

2. Basic Civil Engineering, S.S. Bhavikatti, New Age International Publishers.
3. Engineering Materials, Dr. S.C. Rangwala, Charotar Publishing House.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications.
5. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi.
6. Building Construction, Dr. B. C. Punmia, Lakshmi Publications, Delhi.

**Reference Books:**

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi.

## **PART B: BASIC MECHANICAL ENGINEERING**

### **UNIT I**

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

**Engineering Materials** - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

### **UNIT II**

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

**Thermal Engineering** – 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** – working principle of Steam, Diesel, Hydro, Nuclear power plants. **Mechanical Power Transmission** - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

**Introduction to Robotics** - 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 Text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, cengage learning 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.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**  
**I B.Tech I Semester ,CSE**  
**(Common to all branches )**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**23ACS01: INTRODUCTION TO PROGRAMMING**

**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.

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

1. Understand basics of computers, the concept of algorithm and algorithmic thinking.
2. Develop the ability to analyze a problem, develop an algorithm to solve it.
3. Proficiently use the C programming language to implement various algorithms.
4. Understand more advanced features of C language.
5. Develop problem-solving skills and the ability to debug and optimize the code.

**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.

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

**Overview of C:** History Of C, Basic Structure of C Program, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

**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**

Definition of Arrays, Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Multidimensional Arrays, Introduction to Strings, operations on strings

**UNIT IV Functions**

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, Recursion.

**UNIT V User Defined Data types, File Handling, Pointers**

User-defined data types-Structures- Introduction, Nested Structures, Array of Structures, Structures and Functions, and Unions, pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers. Operations on file handling Self-Referential structures, Linked List (creation and display)

**Text Books:**

1. B. A. Forouzan and R. F. Gilberg, Computer Science: A Structured Programming Approach Using C, 3/e, Cengage Learning, 2007.
2. Problem solving with C, M.T.Somashekara, PHI
3. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie
4. Schaum's Outline of Programming with C by Byron S Gottfried (1996), McGraw-HillEducation (ISBN:978-0070240353)

**Reference Books:**

1. Balagurusamy, E. (2008). Computing fundamentals and C Programming. McGraw-HillEducation.
2. Programming in C Rema Theraja-2<sup>nd</sup> edition 2016
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE
4. Jeri R. Hanly, Elliot B. Koffman, Problem Solving and Program Design in C, 5/e, Pearson

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**I B.Tech I Semester (Common to All Branches)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**23AHS04 LINEAR ALGEBRA & CALCULUS**

**Course Objectives:**

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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

**CO1:** Develop and use of matrix algebra techniques that are needed by engineers for practical applications.

**CO2:** Utilize mean value theorems to real life problems.

**CO3:** Familiarize with functions of several variables which is useful in optimization.

**CO4:** Learn important tools of calculus in higher dimensions.

**CO5:** Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.

**UNIT I Matrices**

Rank of a matrix by echelon form, 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 by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

**UNIT II Eigenvalues, Eigenvectors and Orthogonal Transformation**

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

**UNIT III Calculus**

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), 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, total derivatives, chain rule, Directional derivative, 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 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, AlphaScience International Ltd., 2021 5<sup>th</sup> Edition(9th 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)



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,  
CHITTOOR  
(AUTONOMOUS)**

<b>23AME02</b>	<b>ENGINEERING WORKSHOP</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>(Common to All branches of Engineering)</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Outcomes:**

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

**CO1:** Identify workshop tools and their operational capabilities.

**CO2:** Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.

**CO3:** Apply fitting operations in various applications.

**CO4:** Apply basic electrical engineering knowledge for House Wiring Practice.

**SYLLABUS**

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) Mortise and Tenon joint      c) Corner Dovetail joint or Bridle 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) Tapered tray                      b) Conical funnel      c) Elbow pipe                      d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
  - a) V-fit                      b) Dovetail fit                      c) Semi-circular fit      d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
  - a) Parallel and series      b) Two-way switch      c) Go down lighting                      d) Tube light
  - e) Three phase motor      f) Soldering of wires
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.

**Textbooks:**

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019.
- Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co.,2015&2017.

**Reference Books:**

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007,14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P. A.; Atul Prakashan,2021-22.



## SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

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0	0	2	1

### 20AHS06 - COMMUNICATIVE ENGLISH LAB

**I B.Tech I Semester (Common to CSE, CSD, CSM, CE & ME)**

**I B.Tech II Semester (Common to ECE, EEE, CSC, IT, CAI, CSO, CSBS & EBM)**

#### 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:

**CO1:** Understand the different aspects of the English language proficiency with emphasis on LSRW skills.

**CO2:** Apply communication skills through various language learning activities.

**CO3:** Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.

**CO4:** Evaluate and exhibit professionalism in participating in debates and group discussions. **CO5:** Create effective Course Objectives:

#### 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:

- Young India Films
- Walden Infotech

#### 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)  
[https://www.youtube.com/channel/UCNfm92h83W2i2jc5Xwp\\_IA](https://www.youtube.com/channel/UCNfm92h83W2i2jc5Xwp_IA)

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**I B.Tech I SEM (Common to CSE, CSD, CSM  
II SEM (Common to EEE, ECE, EBM, CAI, CSO, CSC, IT)**

**23AHS07**

**CHEMISTRY LAB**

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0 0 2 1**

**Course Objectives:** Verify the fundamental concepts with experiments.

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

**CO1:** Determine the cell constant and conductance of solutions.

**CO2:** Prepare advanced polymer Bakelite materials.

**CO3:** Measure the strength of an acid present.

**CO4:** Analyse the IR spectra of some organic compounds.

**CO5:** Calculate strength of acid in Pb-Acid battery.

**List of Experiments: (Any 10 experiments)**

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry
13. pH metric Titration of strong acid vs. strong base
14. Determination of Viscosity of a polymer solution using Ostwald Viscometer

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**  
**I B.Tech I Semester**  
**(Common to all branches)**

**L   T   P   C**  
**-   -   3   1.5**

**23ACS02: COMPUTER PROGRAMMING LAB**

**Course Objectives:**

1. To use basic data types, operators, expressions and expression evaluation mechanisms using C Programming Language.
2. To implement control flows, construct in C Programming Language and understand the syntax, semantics and usability contexts of these different constructs.
3. To develop composite data types in C and constructs available to develop their datatypes, utilize them to model things and dealing with data from and to external files.
4. To design programs with different variations of the constructs available for practicing modular programming and understand the pros and cons of using different variants and apply optimization.

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

- CO1.** Read, understand and trace the execution of programs written in C language.  
**CO2.** Select the right control structure for solving the problem.  
**CO3.** Develop C programs which utilize the memory efficiently using programming constructs like pointers.  
**CO4.** Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

**List of Experiments:**

**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.

Familiarization with programming environment

- i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
- ii) Exposure to Turbo C, gcc
- iii) 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.

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:

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

### 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:**

**Tutorial4:** Operators and the precedence and as associativity:

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:

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

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.

### **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.

D 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.

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

### **WEEK 9:**

**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 9:** Functions, call by value, scope and extent,

Simple functions using call by value, solving differential equations using Euler's theorem

- 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's method

### **WEEK 10:**

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



**Suggested Experiments/Activities:****Tutorial 10:** Recursion, the structure of recursive calls

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 11:**

**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 11:** Call by reference, dangling pointers

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 other characters using pointers.

**WEEK12:**

**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 12:** Pointers, structures and dynamic memory allocation 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 along with the total.
- v) Write a C program to implement realloc()

**WEEK 13:**

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

**Suggested Experiments/Activities:****Tutorial 13:** Bitfields, Self-Referential Structures, Linked lists 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.

**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

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.

**Text Books**

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**I B.Tech I Semester (Common to All Branches)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>1</b>	<b>0.5</b>

**23AHS10: HEALTH AND WELLNESS, YOGA AND SPORTS**

**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.
- CO2:** Demonstrate an understanding of health-related fitness components.
- CO3:** Compare and contrast various activities that help enhance their health.
- CO4:** Assess current personal fitness levels.
- CO5:** Develop Positive Personality

**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. HumanKinetics, 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 manyas Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- 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, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting vivavoce on the subject.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**I B. Tech I Semester (Common to EEE, ECE, IT, CAI, CSO, CSC, EBM & CSBS)**

**I B. Tech II Semester (Common to CE, ME, CSE, CSE (DS) & CSE(AI & ML))**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**23AHS05 ENGINEERING PHYSICS**

**COURSE OBJECTIVES**

1. Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses.
2. To identify the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications.
3. Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law – Learning the structural analysis through X-ray diffraction techniques.
4. Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of de Broglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals.
5. To Understand the Physics of Semiconductors and their working mechanism, Concepts utilization of transport phenomenon of charge carriers in semiconductors. To give an impetus on the subtle mechanism of superconductors using the concept of BCS theory and their fascinating applications.
6. To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.

**COURSE OUTCOMES**

**CO1: Explain** the need of coherent sources and the conditions for sustained interference (L2). **Identify** the applications of interference in engineering (L3). **Analyze** the differences between interference and diffraction with applications (L4). **Illustrate** the concept of polarization of light and its applications (L2). **Classify** ordinary refracted light and extraordinary refracted rays by their states of polarization (L2)

**CO2: Interpret** various crystal systems (L2) and **Analyze** the characterization of materials by XRD (L4). **Identify** the important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction technique (L3). **Analysis** of structure of the crystals by Laue's method (L2).

**CO3: Describe** the dual nature of matter (L1). **Explain** the significance of wave function (L2). **Identify** the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). **Identify** the role of classical and quantum free electron theory in the study of electrical conductivity (L3).

**CO4: Classify** the crystalline solids (L2). **Outline** the properties of charge carriers in semiconductors (L2). **Identify** the type of semiconductor using Hall effect (L2). **Classify** superconductors based on Meissner's effect (L2). **Explain** Meissner's effect, BCS theory & Josephson effect in superconductors (L2).

**CO5: Explain** the concept of dielectric constant and polarization in dielectric materials (L2). **Summarize** various types of polarization of dielectrics (L2). **Interpret** Lorentz field

and Claussius-Mosotti relation in dielectrics (L2). **Classify** the magnetic materials based on susceptibility (L2).

### **Unit-I: Wave Optics**

**Interference-** Principle of superposition – Interference of light – Conditions for sustained interference - Interference in thin films (Reflection Geometry) – Colors in thin films – Newton's Rings – Determination of wavelength and refractive index.

**Diffraction-** Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit and N-slits (qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

**Polarization-** Introduction – Types of polarization – Polarization by reflection, refraction and double refraction - Nicol's Prism - Half wave and Quarter wave plates.

### **Unit II: Crystallography and X-ray diffraction**

**8hrs**

**Crystallography:** Space lattice, Basis, Unit Cell and lattice parameters – Crystal systems - Bravais Lattices — Coordination number - Packing fraction of SC, BCC & FCC - Miller indices – Separation between successive (h k l) planes.

**X-ray diffraction:** Bragg's law - X-ray Diffractometer – Crystal structure determination by Laue's method.

### **Unit-III: Quantum Mechanics and Free Electron Theory**

**9hrs**

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

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

### **Unit – IV: Semiconductors and Superconductors**

**8hrs**

**Semiconductors:** Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers - Drift and diffusion currents – Einstein's equation - Hall effect and its Applications.

**Superconductors:** Introduction – Properties of superconductors – Meissner effect– Type I and Type II superconductors – AC and DC Josephson effects – BCS theory (qualitative treatment) – High T<sub>c</sub> superconductors – Applications of superconductors.

### **Unit–V: Dielectric and Magnetic Materials**

**8hrs**

**Dielectric Materials-** Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) -Lorentz field - Clausius-Mossotti equation - Dielectric loss.

**Magnetic Materials-** Introduction – Magnetic dipole moment – Magnetization – Magnetic susceptibility and Permeability – Atomic origin of magnetism – Classification of magnetic materials: Dia, Para, Ferro, Ferri & Antiferro – Domain concept of Ferromagnetism (Qualitative) – Hysteresis – Soft and Hard magnetic materials.

**Text books:**

1. Engineering Physics by M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy S.ChandPublications, 11<sup>th</sup> Edition 2019.
2. Engineering Physics” by D.K. Bhattacharya and Poonam Tandon, Oxford press (2018).
3. Applied Physics by P.K. Palanisamy ,SciTech publications (2018)

**Reference Books:**

1. “Engineering Physics” - B.K. Pandey and S. Chaturvedi, Cengage Learning
2. “Fundamentals of Physics” - Halliday, Resnick and Walker, John Wiley & Sons.
3. “Fundamentals of Physics with Applications”, Arthur Beiser, Samarjit Sengupta, Schaum Series.
4. “Engineering Physics” - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
5. “Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
6. “Semiconductor physics and devices: Basic principle” - A. Donald, Neamen, Mc GrawHill.
7. “Solid state physics” – A.J.Dekker , Pan Macmillan publishers
8. “Introduction to Solid State Physics” -Charles Kittel ,Wiley

**Mapping between Course Outcomes and Programme Outcomes**

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,  
(AUTONOMOUS)**

**I B.Tech I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**23AEE01 BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

**(Common to All branches of 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.

**PART A: BASIC ELECTRICAL ENGINEERING**

**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.

### **COURSE OUTCOMES:**

After the completion of the course students will be able to

**CO1:** Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.

**CO2:** Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.

**CO3:** Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.

**CO4:** Analyze different electrical circuits, performance of machines and measuring instruments.

**CO5:** Evaluate different circuit configurations, Machine performance and Power systems operation

### **Text 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

### **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>

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**  
(Common to All branches of Engineering)

**23AME01 ENGINEERING GRAPHICS**

	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Course Outcomes:</b> After completion of this course, the student will be able to	<b>1</b>	<b>0</b>	<b>4</b>	<b>3</b>

**CO1:** Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.

**CO2:** Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.

**CO3:** Understand and draw projection of solids in various positions in first quadrant.

**CO4:** Explain principles behind development of surfaces.

**CO5:** Prepare isometric and perspective sections of simple solids.

**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, Involute, 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: Polyhedra 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*).

**Note:** The practice will be carried out by using AutoCAD software.

**Text Books:**

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

**Reference Books:**

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, 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, Tata McGraw Hill, 2017.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
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**I B.Tech II Semester (Common to All Branches)**

L	T	P	C
3	0	0	3

**23AHS11 DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**

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

**CO1:** Solve the differential equations related to various engineering fields.

**CO2:** Identify solution methods for partial differential equations that model physical processes.

**CO3:** Interpret the physical meaning of different operators such as gradient, curl and divergence.

**CO4:** Estimate the work done against a field, circulation and flux using vector calculus.

**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- Orthogonal trajectories.

**UNIT II Linear differential equations of higher order (Constant Coefficients)**

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, 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 Linear Partial differential equations with constant coefficients.

**UNIT IV Vector differentiation**

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, 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, Divergence theorem (without proof) and related problems.

**Textbooks:**

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th 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).
5. Higher Engineering Mathematics, B. V. R Ramana, , McGraw Hill Education, 2017

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY,  
(AUTONOMOUS)**

**I B.Tech I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**23AEE02 ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP**

**(Common to All branches of Engineering)**

**Course Objectives:**

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

**COURSE OUTCOMES:**

At the end of this course students will demonstrate the ability to

**Course Outcomes:**

**CO1:** Understand the Electrical circuit design concept; measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer.

**CO2:** Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor.

**CO3:** Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.

**CO4:** Analyse various characteristics of electrical circuits, electrical machines and measuring instruments.

**CO5:** Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.

**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.
3. Provide some exercises so that measuring instruments are learned to be used by the students.
4. Components:
5. Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
6. 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

**PART A: ELECTRICAL ENGINEERING LAB**

**List of experiments:**

1. Verification of KCL and KVL
2. Verification of Superposition theorem

3. Measurement of Resistance using Wheat stone 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

**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.

**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

**SRI VENKATESWARA COLLEGE OF ENGINEERING & TECHNOLOGY**  
**(Autonomous)**

**I B.Tech I Semester**  
**23AIT01 IT WORKSHOP**

(Common to all branches)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Course Objectives**

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
2. To teach basic command line interface commands on Linux.
3. To teach the usage of Internet for productivity and self-paced life-long learning
4. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

**Course Outcomes:**

- CO1.** Perform Hardware troubleshooting.
- CO2.** Understand Hardware components and inter dependencies.
- CO3.** Safeguard computer systems from viruses/worms.
- CO4.** Document/ Presentation preparation.
- CO5.** Perform calculations using spreadsheets.

**PC HARDWARE**

**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. Differentiate RAM & ROM.

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

**Task 4:** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**INTERNET & WORLD WIDE WEB**

**Task 1:** 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 TeXand 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.

**Task 3:** Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting Power point

### **LOOKUP/VLOOKUP**

**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 – ChatGPT**

**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:** Code Generation: Test the model's ability to generate code by giving it partial code snippets and asking it to complete them. You can also ask the model to explain programming concepts or help you debug code.

- Ex: Prompt: "Complete the following Python code to swap the values of two variables:

```
\npython\na = 5\nb = 10\ntemp = a\na = b\nb = temp\n"
```

**Task 4:** 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?'"

**Task 5:** Summarization: Provide a long piece of text, such as an article or a blog post, and ask the model to summarize it. Compare the model's summary with the original text to assess its ability to condense information effectively.

- Ex: Prompt: "Summarize the article titled 'Ramayanam' in 3-4 sentences."

**Task 6:** Futuristic Predictions: Have fun by asking the model to predict future technological advancements, societal changes, or even hypothetical scenarios. Compare its responses with your own ideas.

- Ex: Prompt: "Predict how artificial intelligence will transform everyday life in the next 20 years."

**Task 7:** Technical Explanations: Challenge the model with technical questions from different domains. Ask it to explain scientific concepts, mathematical theorems, or complex algorithms in simple terms.

- Ex: Prompt: "Explain the concept of neural networks in machine learning, including their layers and the process of backpropagation."

### **Reference Books:**

1. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dream tech.
2. The Complete Computer upgrade and repair book, 3rd edition Cheryl A Schmidt, WILEY Dream tech.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. PC Hardware - A Handbook – Kate J. Chase PHI (Microsoft).

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**  
**I B.Tech II Semester**  
**(Common to CSE,CSD,CSM,CSC,CAI,CSO,IT,CSBS))**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>-</b>	<b>-</b>	<b>3</b>

**DATA STRUCTURES**

**23ACS03:**

**Course Objectives:**

1. Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis.
2. Create and manage linked lists to efficiently organize and manipulate data, emphasizing memory efficiency.
3. Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking.
4. Utilize queues to model real-world scenarios, such as process scheduling and breadth- first search algorithms and understand the versatility of dequeues and prioritize data management using priority queues.
5. Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

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

- CO1.** Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
- CO2.** Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
- CO3.** Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
- CO4.** Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between dequeues and priority queues, and apply them appropriately to solve data management challenges.
- CO5.** Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

**UNIT I**

**Introduction to Data Structures:**

**Linear Data Structures-** Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. **Non- Linear Data Structures-** Definition and importance of nonlinear data structures, Types and properties of nonlinear data structures

**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.

**. Searching Techniques:** Linear & Binary Search, **Sorting Techniques:** Bubble sort, Selection sort, Insertion Sort

### UNIT III

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

**Trees:** Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal, AVL Trees.

### UNIT IV

**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 queue), Operations on deque and their applications.

### UNIT V

**Graph Theory:** Data Structures for Graphs- Adjacency Matrix Structure, Graph Traversals, Shortest Paths, Minimum Spanning Trees- Prim's Algorithm, Kruskal's Algorithm.

**Hashing:** Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.

#### Text Books:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta.
3. Classic Data Structures, Debasis Samanta, Second Edition, 2009, PHI

#### 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.
6. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Second Edition, 2002, Pearson.

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY  
(AUTONOMOUS)**

**I B.Tech I Semester (Common to EEE, ECE, IT, CAI, CSO, CSC, EBM & CSBS)**

**I B.Tech II Semester (Common to CE, ME, CSE, CSE(DS) & CSE(AI & ML))**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**23AHS09 ENGINEERING PHYSICS LAB**

**Course Objectives:**

- Understands the concepts of interference, diffraction and their applications.
- Understand the role of optical fiber parameters in communication.
- Recognize the importance of energy gap in the study of conductivity and Hall Effect in semiconductor.
- Illustrates the magnetic and dielectric materials applications.
- Apply the principles of semiconductors in various electronic devices.

**Course Outcomes:**

*The students will be able to*

**CO1. Operate** optical instruments like microscope and spectrometer

**CO2. Estimate** the wavelength of different colors using diffraction grating and resolving power

**CO3. Plot** the intensity of the magnetic field of circular coil carrying current with distance

**CO4. Determine** the resistivity of the given semiconductor using four probe method

**CO5. Identify** the type of semiconductor i.e., n-type or p-type using hall effect

**Calculate** the band gap of a given semiconductor

(Any **TEN** of the following listed experiments)

**List of Engineering Physics 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. Determination of dispersive power of prism.
4. Verification of Brewster's law
5. Determination of the resistivity of semiconductor by four probe method.
6. Determination of energy gap of a semiconductor using p-n junction diode.
7. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
8. Determination of dielectric constant using charging and discharging method.
9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method.
11. Determination of wavelength of Laser light using diffraction grating.
12. Estimation of Planck's constant using photoelectric effect.
13. Determination of temperature coefficients of a thermistor.
14. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
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.

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

**References:** 1. S. Balasubramanian, M.N. Srinivasan “A Text book of Practical Physics”- S.Chand Publishers, 2017.

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

**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**  
**I B.Tech II Semester**  
**(Common to CSE,CSD,CSM,CSC,CAI,CSO,IT,CSBS ))**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
-	-	3	1.5

**23ACS04: DATA STRUCTURES LAB**

**Course Objectives:**

1. Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis.
2. Create and manage linked lists to efficiently organize and manipulate data, emphasizing memory efficiency.
3. Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking.
4. Utilize queues to model real-world scenarios, such as process scheduling and breadth- first search algorithms and understand the versatility of dequeues and prioritize data management using priority queues.
5. Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

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

- CO1.** Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
- CO2.** Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
- CO3.** Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
- CO4.** Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between dequeues and priority queues, and apply them appropriately to solve data management challenges.
- CO5.** Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

**List of Experiments:**

**1: Array Manipulation**

- i) Implement basic operations on arrays: insertion, deletion, searching.
- ii) Create a program to find the maximum and minimum elements in an array.
- iii) Write a program to reverse an array.

**2: Linked List Implementation**

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

**3: Linked List Applications**

- i) Create a program to detect and remove duplicates from a linked list.
- ii) Implement a linked list to represent polynomials and perform addition.

- iii) Implement a double-ended queue (deque) with essential operations.

#### **4: Doubly Linked List Implementation**

- i) 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.

#### **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.

#### **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.

#### **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.

#### **8: Hashing**

- i) Implement a hash table with collision resolution techniques.
- ii) Write a program to implement a simple cache using hashing.

#### **Text Books:**

1. Data Structures and algorithm analysis in C, Mark Allen Weiss.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta.

#### **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.



**SRI VENKATESWARA COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AUTONOMOUS)**

**I B.Tech II Semester (Common to All Branches)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>1</b>	<b>0.5</b>

**23AHS12 : NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE**

**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.
- CO2:** Solve some societal issues by applying acquired knowledge, facts, and techniques.
- CO3:** Explore human relationships by analyzing social problems.
- CO4:** Determine to extend their help for the fellow beings and downtrodden people.
- CO5:** Develop leadership skills and civic responsibilities.

**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) Organising 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:**

- Evaluated for a total of 100 marks.
- 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, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.