



**R.M.K. COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**R.S.M NAGAR, PUDUVAYOL-601 206**  
**(An Autonomous Institution)**



Affiliated to Anna University, Chennai / Approved by AICTE, New Delhi/ Accredited by NAAC with A Grade  
An ISO 9001:2015 Certified Institution / All the Eligible UG Programs are Accredited by NBA, New Delhi

**REGULATIONS 2021**

**CHOICE BASED CREDIT SYSTEM**

**Common to all B.E. / B.Tech. Full-Time Programs**  
**Applicable to the Students admitted to B.E. / B.Tech.**  
**Programs from the AY 2021-22 onwards**

**DEGREE OF BACHELOR OF ENGINEERING / BACHELOR OF TECHNOLOGY**

This set of Regulations is applicable to the students admitted to B.E. / B.Tech. Programs at R.M.K. College of Engineering and Technology, Pudukkottai, from the academic year

**2021-22 onwards.**

**1. PRELIMINARY DEFINITIONS AND NOMENCLATURE**

In these Regulations, unless the context otherwise requires:

- I) "**Program**" means Degree Program that is B.E. / B.Tech. Degree Program.
- II) "**Discipline**" means specialization or branch of B.E. / B.Tech. Degree Program, like Electronics and Communication Engineering, Artificial Intelligence and Data Science, etc.
- III) "**Course**" means a theory or practical subject that is normally studied in a semester, like Mathematics, Physics, etc.
- IV) "**Chairman, Academic Council**" means the authority of the Autonomous Institution who is responsible for all academic activities of the Institute/Departments for implementation of relevant Rules and Regulations.
- V) "**Head of the Institution**" means the Principal of the College.
- VI) "**BoS Chairman**" means Chairperson of Board of Studies of each department / Division (S&H)

- VII) **"Head of the Department"** means the head of the Department concerned.
- VIII) **"Controller of Examinations"** means the authority of the Autonomous Institute who is responsible for all activities of the End semester Examinations.
- IX) **"Credit"** means a numerical value allocated for each course to describe the student's workload required per week.
- X) **"Grade"** means the letter grade assigned to each course based on the range of marks specified.
- XI) **"Grade Point"** means a numerical value (0 to 10) allocated based on the grade assigned to each course.
- XII) **"University"** means ANNA UNIVERSITY, CHENNAI.

## 2. **ADMISSION**

Candidates seeking admission to the first semester of the eight semesters B.E. / B.Tech. Degree Program:

Should have passed the Higher Secondary Examinations of (10+2) Curriculum (Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics and Chemistry as three of the four subjects of study under Part-III or any examination of any other University or authority accepted by the Syndicate of Anna University as equivalent thereto.

**(OR)**

Should have passed the Higher Secondary Examination of Vocational Stream (Vocational groups in Engineering / Technology) as prescribed by the Government of Tamil Nadu.

### **Lateral entry admission**

- (i) The candidates who possess the Diploma in Engineering / Technology awarded by the State Board of Technical Education, Tamil Nadu or its equivalent are eligible to apply for Lateral entry admission to the third semester of B.E. / B.Tech. in the branch corresponding to the branch of study.

**(OR)**

- (ii) The candidates who possess the Degree in Science (B.Sc.,) (10+2+3 stream) with Mathematics as a subject at the B.Sc. Level are eligible to

apply for Lateral entry admission to the third semester of B.E. / B.Tech.

Such candidates shall undergo two additional Engineering subject(s) in the **third and fourth semesters** as prescribed by the Institution/College.

### 3. **PROGRAMS OFFERED**

A candidate may be offered admission to any one of the following program / disciplines of study approved by the Academic Council of Institution. The total credits for each B.E. / B.Tech. Degree program are prescribed as follows.

#### **I Faculty of Computer Science and Engineering and Information Technology**

**1. B.E. Computer Science and Engineering**

**2. B.Tech. Artificial Intelligence and Data Science**

#### **II Faculty of Electronics and Communication Engineering**

**3. B.E. Electronics and Communication Engineering**

#### **III Faculty of Mechanical Engineering**

**4. B.E. Mechanical Engineering**

### 4. **STRUCTURE OF PROGRAMS**

#### **Categorization of Courses**

Every B.E. / B. Tech. Program will have a curriculum with syllabi consisting of theory and practical courses that shall be categorized as follows:

- i. **Humanities and Social Sciences (HS)** courses include Technical English, Engineering Ethics and Human Values, Communication skills, Environmental Science and Engineering.
- ii. **Basic Sciences (BS)** courses include Mathematics, Physics, Chemistry, Biology, etc.
- iii. **Engineering Sciences (ES)** courses include Engineering practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering, Instrumentation etc.
- iv. **Professional Core (PC)** courses include the core courses relevant to the chosen specialization/branch.
- v. **Professional Elective (PE)** courses include the elective courses relevant to the chosen specialization/branch.
- vi. **Open Elective (OE)** courses include the courses from other branches which a student can choose from the list specified in the curriculum of the B.E./ B.Tech. Program approved by BoS and Academic Council.
- vii. **Employability Enhancement Courses (EEC)** include Project Work and/or Industry Internship, Seminar, Professional Practices, Case

Study, Placement Training Courses and Industrial/Practical Training.

- viii. **Mandatory Courses (MC)** should be studied compulsorily by all the students irrespective of the program which includes Induction Program.

### **Personality and Character Development**

All students shall enroll, on admission, in any one of the personality and character development programmes (NSS/YRC) and undergo training for about 40 hours (20 hours for lateral entry). The training shall include classes on hygiene and health awareness and also training in first aid.

**National Service Scheme (NSS)** will have social service activities in and around the College / Institution.

**Youth Red Cross (YRC)** will have activities related to social services in and around College/Institution.

While the training activities will normally be during weekends, the camp will normally be during the vacation period.

### **Number of courses per semester**

Each semester, the curriculum shall normally have a blend of lecture courses not exceeding **7** and Laboratory courses and Employability Enhancement Course(s) not exceeding **4**. Each Employability Enhancement Course may have credits assigned as per clause 4.4. However, the total number of courses per semester shall not exceed **10**.

### **Credit Assignment**

Each course is assigned certain number of credits based on the following:

<b>Contact period per week</b>	<b>CREDITS</b>
1 Lecture Period	1
2 Tutorial Periods	1
2 Laboratory Periods	1
2 Periods of EEC courses like / Seminar / Project Work / Case study / etc.)	1

The Contact Periods per week for Tutorials and Practical can only be in multiples of 2.

Total of 170 to 183 credits distributed among various subjects grouped under different categories are as follows:

<b>S.No.</b>	<b>Category</b>	<b>Credits</b>	<b>Course CategoryCode (CCC)</b>
1.	Humanities and Social Sciences	6 – 12	HS
2.	Basic Sciences	24 – 28	BS
3.	Engineering Sciences	18 – 22	ES
4.	Professional Core	79 – 81	PC
5.	Professional Elective	15 – 18	PE
6.	Open Elective	6 – 8	OE
7.	Employability Enhancement Courses	20 – 24	EEC
8.	Mandatory Courses	-	MC
<b>Total Credits</b>		<b>170 –183</b>	

### **Industrial Training / Internship**

The students may undergo Industrial training for a period as specified in the Curriculum during summer/winter vacation. In this case, the training has to be undergone continuously for the entire period.

The students may undergo Internship at Research organization / University (after due approval from the HoD) for the period prescribed in the curriculum during summer/winter vacation, in lieu of Industrial training.

### **Industrial Visit**

Every student is required to go for at least two Industrial Visits every year starting from the second year of the Program. The Heads of Departments shall ensure the necessary arrangement made in this regard.

### **Value Added Courses**

The students may optionally undergo Value Added Courses and the credits earned through the Value - Added Courses shall be over and above the total credit requirement prescribed in the curriculum for the award of the degree. One / Two credit courses shall be offered by the Department of the institution **with the prior approval of BoS and Academic Council**. The details of the syllabus, time table and faculty may be sent to the **Head of the Institution** in advance (atleast one month before) for the approval before the course is offered. **Students can take a maximum of four one- credit courses / two two-credit course** during the entire duration of the Program.

## **Online Courses**

Students may be permitted to credit **online course subject to a maximum of 3 credits**

- 8 weeks course -1 credit
- 12 weeks course -1.5 credit

The approved list of online courses will be provided by the concerned Department. The student needs to obtain certification or credit to become eligible for writing the End Semester Examination to be conducted by Controller of Examinations of the Institution.

## **Medium of Instruction**

The medium of instruction is English for all courses, examinations, seminar presentations and project / thesis / dissertation reports.

## **5 DURATION OF THE PROGRAM**

A student is ordinarily expected to complete the B.E. / B.Tech. Program in 8 semesters (four academic years) but, in any case not more than 14 Semesters for HSC (or equivalent) candidates and not more than 12 semesters for Lateral Entry Candidates.

Each semester shall normally consist of 80 working days or 540 periods of 50 minutes each. The Head of the Institution shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

The Head of the Institution may permit to conduct additional classes for improvement, special coaching, conduct of model test etc., over and above the specified periods. But for the purpose of calculation of attendance requirement for writing the end semester examinations (as per clause 7) by the students, the following method shall be used. Percentage of Attendance =

$$\frac{[(\text{Total no. of periods attended in all the courses per semester}) /$$

$$\{(\text{No. of periods / week as prescribed in the curriculum}) \times \text{No. of Weeks taken together for all courses of the semester}\}] \times 100$$

The University Examination will ordinarily follow immediately after the last working day of the semester commencing from I semester as per the academic schedule prescribed from time to time.

The total period for completion of the program reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5.1 irrespective of the period of break of study (vide clause 18) so that he/she may be eligible for the award of the degree (vide clause 16).

## 6 COURSE REGISTRATION

Each student has to register for all courses to be undergone in the curriculum of a particular semester (with the facility to drop courses to a maximum of 6 credits (vide clause 6.2)). The student can also register for courses for which the student has failed in the earlier semesters.

The registration details of the candidates may be approved by the Head of the Institution and forwarded to the Controller of Examinations. This registration is to undergo the course as well as for writing the End Semester Examinations. No Elective course shall be offered by any department unless a minimum of 10 students registers for the course. However, if the students admitted in the associated Branch and Semester is less than 10, this minimum will not be applicable.

### **The courses that a student registers in a particular semester may include**

- i. Courses of the current semester.
- ii. The core (Theory/Lab /EEC) courses that the student has not cleared in the previous semesters.
- iii. Elective courses which the student failed.

### **Flexibility to Drop courses**

A student has to earn the total number of credits specified in the curriculum of the respective Program of study in order to be eligible to obtain the degree.

From the III to final semesters, the student has the option of dropping existing courses in a semester during registration. The total number of credits of such courses cannot exceed 6.

The student shall register for the project work in the final semester only.

## 7. ATTENDANCE REQUIREMENTS FOR COMPLETION OF THE SEMESTER

A Candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester.

Ideally, every student is expected to attend all classes of all the courses and secure 100% attendance. However, to give provision for certain unavoidable reasons such as Medical/participation in sports, the student is expected to attend at least 80% of the classes.

Therefore, he/she shall **secure not less than 80%** (after rounding off to the nearest integer) of overall attendance as calculated as per clause 5.3.

However, a candidate who **secures overall attendance between 65% and 79%** in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) / participation in sports events may be permitted to appear for the current semester examinations subject to the

condition that the candidate shall submit the medical certificate/ sports participation certificate attested by the Head of the Institution. The same shall be forwarded to the Controller of Examinations for record purposes.

Candidates who **secure less than 65% overall attendance and candidates who do not satisfy clause 7.1 and 7.2** shall not be permitted to write the end semester examination and not permitted to move to the next semester. They are required to repeat the incomplete semester in the next academic year, as per the norms prescribed.

#### **8. FACULTY Class Advisor**

There shall be a class advisor for each class. The class advisor will be one of the course-instructors of the class. He / She will be appointed by the HoD of the department concerned. The class advisor is the ex-officio member and the Convener of the class committee. The responsibilities of the class advisor shall be:

- To act as the channel of communication between the HoD and the students of the respective class.
- To collect and maintain various statistical details of students.
- To help the chairperson of the class committee in the planning and conduct of the class committee meetings.
- To monitor the academic performance of the students including attendance and to inform the class committee.
- To attend to the students' welfare activities like awards, medals, scholarships and industrial visits.

#### **Counselor**

The Counselor shall advise and guide their counseling students in registering of courses, the reappearance of courses, monitor their attendance and progress, and counsel them periodically. The Counselor shall discuss/inform to the parents about the progress/performance of the students concerned.

#### **9. CLASS COMMITTEE**

Every class shall have a class committee consisting of teachers of the class concerned, student representatives, and a chairperson who is not teaching the class. It is like the 'Quality Circle' (more commonly used in industries) with the overall goal of improving the teaching- learning process. The functions of the class committee include

- Solving problems experienced by students in the classroom and in the laboratories. Clarifying the regulations of the degree program and the details of rules therein particularly (clause 5 and 7).
- Informing the student representatives, the academic schedule



including the dates of assessments and the syllabus coverage for each assessment.

- Informing the student representatives, the details of Regulations regarding weightage used for each assessment. In the case of practical courses (laboratory/drawing/project work/seminar etc.) the breakup of marks for each experiment/exercise/module of work should be clearly discussed in the class committee meeting and informed to the students.
- Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.
- Identifying the slow learners, if any, and requesting the teachers concerned to provide some additional help or guidance or coaching to such slow learners.

The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in a class (like the first semester which is generally common to all/some branches), the class committee is to be constituted by the Head of the Institution.

The class committee shall be constituted within the first week of each semester.

At least 4 student representatives (usually 2 boys (one day scholar, one hosteller) and 2 girls (one day scholar, one hosteller)) shall be included in the class committee.

The Chairperson of the class committee may invite the Class advisor(s) and the Head of the Department to the class committee meeting.

The Head of the Institution may participate in any class committee of the institution.

The Chairperson is required to prepare the minutes of every meeting, submit the same to Head of the Institution within two days of the meeting and arrange to circulate it among the students and teachers concerned. If there are some points in the minutes requiring action by the management, the same shall be brought to the notice of the Management by the Head of the Institution.

The first meeting of the class committee shall be held within a week from the date of commencement of the semester, to inform the students about the nature and weightage of assessments within the framework of the Regulations. Two or three subsequent meetings may be held in a semester at suitable intervals. During these meetings, the student members representing the entire-class shall meaningfully interact and express the opinions and suggestions of the other students of the class to improve the effectiveness of the teaching-learning process.

### **Online Feedback**

Online Feedback from students shall be collected for every subject about the faculty for various parameters and the consolidated Feedback Information shall also be conveyed to the concerned faculty member through respective

HoD to improve the Teaching Process by the Faculty members.

#### **10. COURSE COMMITTEE FOR COMMON COURSES**

Each common theory course offered to more than one discipline or group shall have a "Course Committee" comprising all the teachers teaching the common course with one of them nominated as Course Coordinator. The nomination of the Course Coordinator shall be made by the Head of the Department / Head of the Institution depending upon whether all the teachers teaching the common course belong to a single department or several departments. The 'Course committee' shall meet to arrive at a common scheme of evaluation for the test and shall ensure a uniform evaluation of the tests. Wherever feasible, the course committee may also prepare a common question paper for the internal assessment test(s).

#### **11. SYSTEM OF EXAMINATION**

Performance in each course of study shall be evaluated based on (i) continuous internal assessment throughout the semester and (ii) End Semester Examination.

Each course, both theory and practical (including project work & viva voce Examinations) shall be evaluated for a maximum of 100 marks.

For all theory and practical courses including project work, the continuous internal assessment will carry **40 marks** while the End - Semester examination will carry **60 marks**. Industrial training and seminar shall carry 100 marks and shall be evaluated through internal assessment only.

The end semester examination (theory and practical) of 3 hours duration shall ordinarily be conducted between October and December during the odd semesters and between April and June during the even semesters.

The end semester examination for project work shall consist of an evaluation of the final report submitted by the student or students of the project group (of not exceeding 4 students) by an external examiner and an internal examiner, followed by a viva- voce examination conducted separately for each student by a committee consisting of the external examiner, the supervisor of the project group and an internal examiner.

For the end semester examination in both theory and practical courses including project work, the internal and external examiners shall be appointed by the Controller of Examinations.

#### **12. PROCEDURE FOR AWARDING MARKS**

For all theory and practical courses (including project work) the end semester examination is conducted for 100 marks and the total mark shall be reduced to 60 and rounded to the nearest integer. The continuous assessment shall be

for a maximum of 40 marks. The continuous assessment shall be awarded as per the procedure given below:

### **Theory Courses**

Three tests each carrying 100 marks shall be conducted during the semester by the Department / College. The total marks obtained in all tests puttogether out of 300, shall be proportionately reduced for 20 marks and rounded to the nearest integer (This also implies equal weightage to all the three tests). The remaining 20 marks will be awarded based on the other continuous assessments like MCQs (5 Marks), Assignment (5 Marks), Mini Project / Others (5 Marks), and attendance (5 Marks).

### **Laboratory Courses**

The maximum marks for Internal Assessment shall be 40 in case of practical courses. Every practical exercise/ experiment shall be evaluated based on the conduct of the experiment / exercise and records maintained. There shall be at least one test. The criteria for arriving at the Internal Assessment marks of 40 is as follows: 20 marks shall be awarded for successful completion of all the prescribed experiments done in the Laboratory, 10 marks for the test and 10 marks for the attendance.

### **Theory Courses with Laboratory Integrated Component**

If there is a theory course with a Laboratory component, there shall be three tests: the first two tests (each 100 marks) will be from theory portions and the third test (maximum mark 100) will be for the laboratory component. The sum of marks of the first two tests shall be reduced to 60 marks and the third test mark shall be reduced to 40 marks. The sum of these 100 marks may then be arrived at for 40 marks and rounded to the nearest integer.

### **Project Work**

Project work may be allotted to a single student or a group of students not exceeding 4 per group.

The Head of the Institutions shall constitute a review committee for project work for each branch of study. There shall be three reviews during the semester by the review committee. The student shall make a presentation on the progress made by him/her before the committee. The total marks obtained in the three reviews **for 40 marks** and rounded to the nearest integer (as per the scheme given in 12.4.1).

The project report shall carry a maximum of 10 marks. The project report shall be submitted as per the approved guidelines as given by the Project Review Committee. The same mark shall be awarded to every student within the project group for the project report. Thesis Evaluation and viva-voce examination shall carry 50 marks. Marks are awarded to each student of the project group based on the individual performance in the Thesis Evaluation and viva-voce examination.

Review I	Review II	Review III	End semester Examinations				
			Thesis Submission (10)		Thesis Evaluation and Viva-Voce(50)		
10	15	15	Supervisor	Internal	Internal	External	Supervisor
			5	5	20	20	10

If a candidate fails to submit the project report on or before the specified deadline, he/she is deemed to have failed in the Project Work and shall re-register for the same in a subsequent semester.

### Other Employability Enhancement Courses

- (a) The seminar / Case study is to be considered as purely INTERNAL (with 100% internal marks only). Every student is expected to present a minimum of 2 seminars per semester before the evaluation committee and for each seminar, marks can be equally apportioned. The three-member committee appointed by the Head of the Institution will evaluate the seminar. At the end of the semester, the marks can be consolidated and taken as the final mark. The evaluation shall be based on the seminar paper (40%), the presentation (40%) and response to the questions asked during the presentation (20%).
- (b) The Industrial / Practical Training, Summer Project, Internship, shall carry 100marks and shall be evaluated through internal assessment only. At the end of Industrial/Practical training/internship/Summer Project, the candidate shall submit a certificate from the organization where he / she has undergone training and a brief report. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three - member Departmental Committee constituted by the Head of the Institution. The certificates (issued by the organization) submitted by the students and mark list shall be forwarded to the Controller of Examinations with the approval of the Head of the Institution.

### Assessment for Value Added Course

- The one / two credit course shall carry 100 marks and shall be evaluated through continuous assessments only.
- Two Assessments shall be conducted during the semester by the Department concerned.
- The total marks obtained in the tests shall be reduced to 100 marks and rounded to the nearest integer.
- A committee consisting of the Head of the Department, staff handling the course and a senior faculty member nominated by the Head of the

Institution shall monitor the evaluation process.

- The list of students along with the marks and the grades earned may be forwarded to the Controller of Examinations for appropriate action at least one month before the commencement of End Semester Examinations.

### **Assessment for Online Courses**

Students may be permitted to credit online courses (which are provided with a certificate) subject to a maximum of three credits. The approved list of online courses will be provided by the BoS Chairman with the approval of the Head of the Institution from time to time.

**These online courses of 3 credits (8 Week Courses-3 (or) 12 Week Courses-2) can be considered instead of one elective course as approved by BoS of the respective Department.** The student needs to obtain certification or credit to become eligible for writing the End Semester Examination to be conducted by Institution. **The course shall be evaluated through the End Semester Examination conducted by Controller of Examinations of the Institution.**

### **Attendance Record**

Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' which consists of attendance marked in each lecture or practical or project work class, the test marks, and the record of class work (topic covered), separately for each course. This should be submitted to the Head of the department periodically (at least three times in a semester) for checking the syllabus coverage and the records of test marks and attendance. The Head of the department will put his signature and date after due verification. At the end of the semester, the record should be verified by the Head of the Institution who will keep this document in safe custody (for five years). The Academic Audit Team may verify the records of attendance and assessment of both current and previous semesters.

### **Marks for Attendance**

Attendance marks (**rounded to the nearest integer**) for the theory and laboratory courses will be awarded as per the procedure given below:

Attendance %	Theory Course	Laboratory Course
97 to 100		10
93 to 96		8
89 to 92		6
85 to 88		4
80 to 84		2

### **13. REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATIONS**

A candidate shall normally be permitted to appear for the End Semester Examinations for all the courses registered in the current semester (vide clause 6) if he/she has satisfied the semester completion requirements (subject to Clause 7).

A candidate who has already appeared for any subject in a semester and passed the examination is not entitled to reappear for the same subject for improvement of grades.

### **14. PASSING REQUIREMENTS**

A candidate who secures not less than 50% of total marks prescribed for the course [Internal Assessment + End semester Examinations] with a minimum of 45% of the marks prescribed for the end-semester Examination, shall be declared to have passed the course and acquired the relevant number of credits. This is applicable for both theory and practical courses (including project work). If a student fails to secure a pass in courses in any semester, he/she is allowed to write arrear examinations in the supplementary / Arrear Examinations conducted within a period of one month after the publication of results, when the examination is conducted in that course; he/she should continue to register and reappear for the examinations in the failed subjects till he/she secures a pass. However, the absentees in any current semester examinations may be permitted to write the supplementary examination conducted within a period of one month after the publication of results is subject to, the valid reason provided by the student and the recommendation by the HoD with approval of the Academic Council.

The Continuous Internal Assessment (CIA) marks obtained by the candidate in the current semester (n) shall be retained and carried forward up to the next three consecutive ESEs (n+3) till the candidate secures a pass. However from the (n+4)<sup>th</sup> ESE onwards, the candidate shall be declared to have passed the examination if he/she secures a minimum of 50% marks prescribed for the end semester examinations alone. Conducting Continuous Internal Assessment test and other Assessments for improving CIA marks shall not be permitted from (n+1)<sup>th</sup> semester onwards.

The passing requirement for the courses which are assessed only through purely internal assessments (EEC courses except for project work), is 50% of the internal assessment (continuous assessment) marks only.

A student can apply for Photocopy and review of the student's semester examination answer paper in a theory course, within 1 week from the declaration of results, on payment of a prescribed fee along with prescribed application to the COE through the Head of the Institution. The COE will

arrange for the review and the results will be intimated to the student concerned through the Head of the Institution. Review is not permitted for laboratory courses and project work.

## 15. AWARD OF LETTER GRADES

All assessments of a course will be evaluated on absolute marks basis. However, to report the performance of a candidate, letter grades, each carrying a certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each subject as detailed below:

Letter Grade	GradePoints	Marks Range
O (Outstanding)	10	91 – 100
A + (Excellent)	9	81 – 90
A (Very Good)	8	71 – 80
B + (Good)	7	61 – 70
B (Average)	6	50 – 60
RA	0	<50
SA (Shortage of Attendance)	0	
W	0	

A student is deemed to have passed and acquired the corresponding credits in a particular course if he/she obtains any one of the following grades: "O", "A+", "A", "B+", "B".

"SA" denotes shortage of attendance (as per clause 7.3) and hence prevention from writing the end semester examinations. "SA" will appear only in the result sheet. "RA" denotes that the student has failed to pass that course. "W" denotes withdrawal from the exam for the particular course. The grades "RA" and "W" will figure both in Mark sheet as well as in Result Sheet. In both cases, the student has to reappear for the End Semester Examinations. If the grade "W" or "RA" is given to any course, the attendance requirement need not be satisfied.

For the Co-curricular activities such as NSS / YRC, a satisfactory / not satisfactory grading will appear in the mark sheet. Every student shall put in a minimum of 80% attendance in the training and attend the camp compulsorily. The training and camp shall be completed during the First/Second Year of the program. However, for valid reasons, the Head of the Institution may permit a student to complete this requirement in the Third /Fourth year. **A satisfactory grade in the above co-curricular activities**

**is compulsory for the award of the degree.**

The grades O, A+, A, B+, B obtained for the one-credit course shall figure in the Mark sheet under the title '**Value Added Courses**'. The Courses for which the grades RA, SA **will not figure in the mark sheet.**

For the Mandatory Course, a "**Passed / Not Cleared**" grading will appear in the MarkSheet. The Courses for which the grades U, SA will not figure in the mark sheet. A "Passed" grade in the Mandatory Course is compulsory for the award of a degree.

### **Grade sheet**

After results are declared, Grade Sheets will be issued to each student which will contain the following details:

- The college in which the candidate has studied
- The list of courses enrolled during the semester and the grade scored
- The Grade Point Average (GPA) for the semester
- The Cumulative Grade Point Average (CGPA) of all courses enrolled from the first semester onwards.

GPA for a semester is the ratio of the sum of the products of the number of credits for courses acquired and the corresponding points to the sum of the number of credits for the courses acquired in the semester.

CGPA will be calculated similarly, considering all the courses registered from the first semester. RA grades will be excluded for calculating GPA and CGPA.

$$\text{GPA / CGPA} = \frac{\sum_{i=1}^n C_i G_{P_{ii}=1}}{\sum_{i=1}^n C_i}$$



Where  $C_i$  is the number of credits assigned to the course

$GP_i$  is the point corresponding to the grade obtained for each course

$n$  is the number of all courses successfully cleared during the particular semester in the case of GPA and during all the semesters in the case of CGPA.

## 16. ELIGIBILITY FOR THE AWARD OF THE DEGREE

A student shall be declared to be eligible for the award of the B.E. / B.Tech. Degree provided the student has

- i. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's program within the stipulated time.
- ii. Completed the course requirements, appeared for the End-Semester examinations and passed all the subjects prescribed in all the 8 semesters within a maximum period of 7 years and 6 years in the case of Lateral Entry reckoned from the commencement of the first semester and third semester in the case of Lateral Entry to which the candidate was admitted.
- iii. Successfully passed any additional courses prescribed by the regulations of the Institution (vide clause 18.3)
- iv. Completed the NSS / YRC requirements.
- v. No disciplinary action pending against the student.
- vi. The award of Degree must have been approved by the Syndicate of the University.

### Classification of the Degree Awarded

#### First Class with Distinction

A student who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction:

- Should have passed the examination in all the courses of all the eight semesters (and 6 semesters in the case of Lateral Entry) in the student's First Appearance within **five** years and (Four years in the case of Lateral Entry). Withdrawal from examination (vide Clause 17) will not be considered as an appearance.
- Should have secured a CGPA of not less than **8.50**.
- One-year authorized break of study (if availed of) is included in the five years and four years in the case of lateral entry for the award of First class with Distinction.
- Should NOT have been prevented from writing end semester examination due to lack of attendance in any semester.

## **First Class**

A student who satisfies the following conditions shall be declared to have passed the examination in **First-class**:

- Should have passed the examination in all the courses of all eight semesters and 6 semesters in the case of Lateral Entry within **Six years** and Five years in the case of Lateral Entry.
- One-year authorized break of study (if availed of) or prevention from writing the End Semester examination due to lack of attendance (if applicable) is included in the duration of six years and five years in the case of lateral entry for the award of First class
- Should have secured a CGPA of not less than **7.00**.

## **Second Class**

All other students (not covered in clauses 16.2.1 and 16.2.2) who qualify for the award of the degree (vide Clause 16.1) shall be declared to have passed the examination in **Second Class**.

A candidate who is absent in end semester examination in a course / project work after having registered for the same shall be considered to have appeared in that examination for the purpose of classification. (Subject to clause 17 and 18)

## **Valuation**

Double valuation is adopted for all the theory courses to overcome any subjectivity in single valuation in the end semester examinations. So, the provision for revaluation does not arise. However, if a student wants to appeal for Photocopy and review of the result in any subjects, he / she can submit a challenge review application to the Institution CoE office. A committee consisting of the Head of the Department, concerned course instructor and a subject expert (Internal / External) nominated by the COE will review and give its recommendations.

If the difference of total marks obtained between two valuations is less than 15 marks, the highest mark among the two valuations will be considered for the award of marks.

If the difference in total marks obtained between two valuations is more than 15 marks, a third valuation is applicable. Out of the three valuations, the highest mark between two nearest marks (the mark obtained in third valuation and the marks obtained nearer to the third valuation out of the first two valuations) shall be considered for the award of marks. However, the difference between these two nearest marks must be less than 15.

## 17. **PROVISION FOR WITHDRAWAL FROM END SEMESTER EXAMINATION**

A student may, for valid reasons, (medically unfit / unexpected family situations / sports approved by HoD and Head of the Institution) be granted permission to withdraw from appearing for the end semester examination in any course or courses in **ANY ONE** of the semester examinations during the entire duration of the degree program. The application shall be sent to the Academic Council through the Head of the Institution with required documents.

Withdrawal application is valid if the student is otherwise eligible to write the examination (Clause 7) and if it is made within TEN days prior to the commencement of the examination in that course or courses and recommended by the Head of the Institution and approved by the Controller of Examinations.

17.2.1 Notwithstanding the requirement of mandatory 10 days' notice, applications for withdrawal for special cases under extraordinary conditions will be considered on the merit of the case.

In case of withdrawal from a course / courses (Clause 13), the course will figure both in Marks Sheet as well as in Result Sheet. **Withdrawal essentially requires the student to register for the course/courses.** The student has to register for the course, fulfill the attendance requirements (vide clause 7), earn continuous assessment marks and attend the end semester examination. However, the withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction.

Withdrawal is permitted for the end semester examinations in the final semester only if the period of study the student concerned does not exceed 5 years as per clause 16.2.1.

Second Time Withdrawal from a Course / Courses under Special Recommendations by the BOS and with the Approval of AC and GB, the student shall be permitted for genuine and valid reasons.

## 18. **PROVISION FOR AUTHORISED BREAK OF STUDY**

A student is permitted to go on a break of study for a maximum period of one year as a single spell.

Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree program. However, in an extraordinary situation, the candidate may apply for an additional break of study not exceeding another one year by paying the prescribed fee for the break of study. If a candidate intends to temporarily discontinue the program in the middle of the semester for valid reasons and to rejoin the program in a subsequent year, permission may be granted based

on the merits of the case provided he / she applies to the Academic Council in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Institution stating the reasons therefore and the probable date of rejoining the program.

The candidates permitted to rejoin the program after a break of study / prevention due to lack of attendance, shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new Regulations shall apply to the Academic Council in the prescribed format through the Head of the Institution at the beginning of the readmitted semester itself for prescribing additional courses, if any, from any semester of the regulations in force, to bridge the curriculum in force and the old curriculum.

The authorized break of study would not be counted towards the duration specified for passing all the courses for classification (vide Clause16.2).

The total period for completion of the Program reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 5.1 irrespective of the period of break of study so that he/she may be eligible for the award of the degree.

If any student is prevented for want of required attendance, the period of prevention shall not be considered as authorized 'Break of Study' (Clause18.1)

### **DISCIPLINE**

Every student is required to observe disciplined and decorous behavior both inside and outside the college and not to indulge in any activity which will tend to bring down the prestige of the Institution / College. The Head of Institution shall constitute a disciplinary committee consisting of Head of Institution, Two Heads of Department of which one should be from the faculty of the student, to enquire into acts of indiscipline and notify the Academic Council about the disciplinary action recommended for approval.

If a student indulges in malpractice in any of the End Semester / internal examination he / she shall be liable for punitive action as prescribed by the Institution from time to time.

### **19. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI**

The Institution may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and scheme of examinations through the Academic Council with the approval of Governing Body.



**R.M.K. COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**R.S.M NAGAR, PUDUVAYOL-601 206**



(An Autonomous Institution)

Affiliated to Anna University, Chennai / Approved by AICTE, New Delhi/

Accredited by NAAC with A Grade

An ISO 9001:2015 Certified Institution / All the Eligible UG Programs are  
accredited by NBA, New Delhi

**B.E. ELECTRONICS AND COMMUNICATION ENGINEERING**

**CURRICULUM AND SYLLABI**

**REGULATIONS 2021**

**CHOICE BASED CREDIT SYSTEM**

**PROGRAMME EDUCATIONAL OBJECTIVES:**

Graduates of Electronics and Communication Engineering programme will

**PEO1:** excel in their professional and technical career and pursue higher  
education to be globally competent

**PEO2:** evaluate the real world problems and provide with technically feasible  
and economically viable solutions

**PEO3:** continuously update technologies through lifelong learning

**PEO4:** exhibit effective communication skills and professionalism in diverse environment

**PROGRAMME OUTCOMES:**

Engineering Graduates will be able to:

**PO1: Engineering Knowledge:** Apply the knowledge of mathematics, science,  
engineering fundamentals and an engineering specialization to the solution of  
complex engineering problems.

**PO2: Problem analysis:** Identify, formulate, review research literature, and  
analyze complex engineering problems reaching substantiated conclusions using first  
principles of mathematics, natural sciences, and engineering sciences.

**PO3: Design/development of solutions:** Design solutions for complex  
engineering problems and design system components or processes that meet the  
specified needs with appropriate consideration for the public health and safety, and  
the cultural, societal, and environmental considerations.

**PO4: Conduct investigations of complex problems:** Use research-based

knowledge and research methods, including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5: Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO6: The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8: Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9: Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

**PO10: Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11: Project Management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

### **PROGRAMME SPECIFIC OUTCOMES (PSOs)**

The Electronics and Communication Engineering Graduates should be able to

- a) Develop and test electronic systems for given specifications.
- b) Design and analyze the signal processing systems as per the requirements.
- c) Apply appropriate technology for the implementation of modern communication systems.

## MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

A broad relation between the Programme Educational objectives and the Programme outcomes is given in the following table

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
<b>1</b>	✓	✓	✓	✓	✓					✓	✓	✓
<b>2</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<b>3</b>	✓	✓	✓	✓	✓		✓			✓		✓
<b>4</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		

### MAPPING OF COURSE OUTCOMES WITH PROGRAMME OUTCOMES:

A broad relation between the Course Outcomes and Programme Outcomes is given in the following table

COURSE OUTCOMES		PROGRAMME OUTCOMES												
Sem	Course Name	a	b	c	d	e	f	g	h	i	j	k	l	
I	Communicative English and Life Skills						✓	✓	✓	✓	✓		✓	
	Engineering Mathematics I	✓	✓	✓						✓				
	Physics for Electronics Engineering	✓	✓								✓			
	Engineering Chemistry	✓	✓								✓			
	Problem Solving and C Programming	✓	✓	✓	✓	✓							✓	✓
	Computer Aided Engineering Graphics	✓										✓	✓	✓
	Physics and Chemistry Laboratory	✓	✓						✓	✓	✓			
	C Programming Laboratory	✓	✓	✓	✓	✓							✓	✓
	Interpersonal Skills - Listening and Speaking Laboratory								✓	✓	✓			✓
	Technical English							✓	✓	✓	✓			✓
II	Engineering Mathematics II	✓	✓	✓						✓				
	Environmental Science and Engineering	✓	✓				✓	✓	✓		✓		✓	
	Fundamentals of Electrical Engineering and Circuits	✓	✓	✓	✓	✓	✓						✓	✓
	Electronic Devices	✓	✓	✓	✓	✓	✓						✓	✓
	Data Structures	✓	✓	✓										✓
	Engineering Practices Laboratory	✓	✓	✓	✓	✓							✓	✓
	Data Structures Laboratory	✓	✓	✓	✓	✓	✓							✓
	Advanced Reading and Writing Laboratory									✓	✓			✓





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**B.E. ELECTRONICS AND COMMUNICATION ENGINEERING**  
**REGULATIONS-2021**  
**CHOICE BASED CREDIT SYSTEM**  
**I-VIII SEMESTERS CURRICULUM AND I-II SYLLABI**

**SEMESTER I**

SI.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1		Induction Programme	MC	3 Weeks				
<b>THEORY</b>								
2	21EL101	Communicative English and Life Skills	HS	2	2	0	0	2
3	21MA101	Engineering Mathematics - I	BS	5	3	2	0	4
4	21PH102	Physics for Electronics Engineering	BS	3	3	0	0	3
5	21CH101	Engineering Chemistry	BS	3	3	0	0	3
6	21CS101	Problem Solving and C Programming	ES	3	3	0	0	3
7	21ME101	Computer Aided Engineering Graphics	ES	6	2	0	4	4
<b>PRACTICALS</b>								
8	21PC111	Physics and Chemistry Laboratory	BS	4	0	0	4	2
9	21CS111	C Programming Laboratory	ES	4	0	0	4	2
10	21EL111	Interpersonal Skills - Listening and Speaking Laboratory	HS	2	0	0	2	1
<b>TOTAL</b>				<b>32</b>	<b>16</b>	<b>2</b>	<b>14</b>	<b>24</b>

## SEMESTER II

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	21EL201	Technical English	HS	2	2	0	0	2
2	21MA201	Engineering Mathematics - II	BS	5	3	2	0	4
3	21CH102	Environmental Science and Engineering	HS	3	3	0	0	3
4	21EC201	Fundamentals of Electrical Engineering and Circuits	PC	4	4	0	0	4
5	21EC202	Electronic Devices	PC	3	3	0	0	3
6	21CS201	Data Structures	ES	3	3	0	0	3
<b>PRACTICALS</b>								
7	21EM111	Engineering Practices Laboratory	ES	4	0	0	4	2
8	21CS211	Data Structures Laboratory	ES	4	0	0	4	2
9	21EL211	Advanced Reading and Writing Laboratory	HS	2	0	0	2	1
<b>TOTAL</b>				<b>30</b>	<b>18</b>	<b>2</b>	<b>10</b>	<b>24</b>

**SEMESTER III**

<b>SI. No</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>								
1	21MA302	Linear Algebra and Partial Differential Equations	BS	5	3	2	0	4
2	21EC301	Signals and Systems	PC	5	3	2	0	4
3	21EC302	Electronic Circuits	PC	3	3	0	0	3
4	21EC303	Digital Electronics	PC	3	3	0	0	3
5	21EE401	Control Systems	PC	4	2	2	0	3
6	21CS202	Python Programming(Lab Integrated)	ES	5	3	0	2	4
<b>PRACTICALS</b>								
7	21EC311	Analog and Digital Circuits Laboratory	PC	4	0	0	4	2
8	21EC312	Foundation Lab on Internet of Things (IoT)	EEC	2	0	0	2	1
9	21CS314	Aptitude and Coding Skills - I	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>33</b>	<b>17</b>	<b>6</b>	<b>10</b>	<b>25</b>

### SEMESTER IV

SI.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	21MA402	Probability and Random Processes	BS	5	3	2	0	4
2	21EC401	Communication Theory	PC	3	3	0	0	3
3	21EC402	Microprocessors and Microcontrollers	PC	3	3	0	0	3
4	21EC403	Electromagnetic Fields	PC	4	4	0	0	4
5	21EC404	Linear Integrated Circuits	PC	3	3	0	0	3
6	21EL301	Universal Human Values – II: Understanding Harmony	HS	4	2	2	0	3
<b>PRACTICALS</b>								
7	21EC411	Microprocessors and Microcontrollers Laboratory	PC	4	0	0	4	2
8	21EC412	Linear Integrated Circuits Laboratory	PC	4	0	0	4	2
9	21EC413	Mini Project and Industrial Internship	EEC	2	0	0	2	1
10	21CS414	Aptitude and Coding skills - II	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>34</b>	<b>18</b>	<b>4</b>	<b>12</b>	<b>26</b>

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**SEMESTER V**

SI.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	21EC501	Digital Communication Systems	PC	3	3	0	0	3
2	21EC502	Discrete-Time Signal Processing	PC	4	2	2	0	3
3	21EC503	Data Communication Networks	PC	3	3	0	0	3
4	21EC504	Transmission Lines and Waveguides	PC	3	3	0	0	3
5		Professional Elective I	PE	3	3	0	0	3
6		Open Elective I	OE	3	3	0	0	3
<b>PRACTICALS</b>								
7	21EC511	Communication Networks and DSP Laboratory	PC	4	0	0	4	2
8	21EC512	Communication Systems Laboratory	PC	4	0	0	4	2
9	21EC513	Foundation Lab on Machine Learning	EEC	2	0	0	2	1
10	21CS512	Advanced Aptitude and Coding skills -I	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>31</b>	<b>17</b>	<b>2</b>	<b>12</b>	<b>24</b>

### SEMESTER VI

SI.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	21EC601	VLSI Design	PC	3	3	0	0	3
2	21EC602	Embedded Systems	PC	3	3	0	0	3
3	21EC603	Wireless Communications Systems	PC	3	3	0	0	3
4	21EC604	Antennas and Wave Propagation	PC	3	3	0	0	3
5		Professional Elective II	PE	3	3	0	0	3
6		Professional Elective III	PE	3/4	3/2	0	0/2	3
<b>PRACTICALS</b>								
7	21EC611	Embedded Systems and RTOS Laboratory	PC	4	0	0	4	2
8	21EC612	VLSI Design Laboratory	PC	4	0	0	4	2
9	21EC613	Innovative / Multi-Disciplinary Project	EEC	2	0	0	2	1
10	21CS614	Advanced Aptitude and Coding skills - II	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>30/31</b>	<b>18/17</b>	<b>0</b>	<b>12/14</b>	<b>24</b>

### SEMESTER VII

SI.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
<b>THEORY</b>								
1	21EC701	RF and Microwave Engineering	PC	3	3	0	0	3
2	21EC702	Optical Communication and Networks	PC	3	3	0	0	3
3	21GE901	Professional Ethics in Engineering	HS	3	3	0	0	3
4		Professional Elective IV	PE	3/4	3/2	0	0/2	3
5		Professional Elective V	PE	3	3	0	0	3
6		Open Elective II	OE	3	3	0	0	3
<b>PRACTICALS</b>								
7	21EC711	Advanced Communication Laboratory	PC	4	0	0	4	2
8	21EC712	Project Work - Phase I and Internship	EEC	6	0	0	6	3
9	21EC713	Design Thinking Laboratory	EEC	2	0	0	2	1
<b>TOTAL</b>				<b>30/31</b>	<b>18/17</b>	<b>0</b>	<b>12/14</b>	<b>24</b>

**SEMESTER VIII**

<b>S.No</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>PRACTICALS</b>								
1	21EC811	Project Work - Phase II	EEC	20	0	0	20	10
		<b>TOTAL</b>		<b>20</b>	<b>0</b>	<b>0</b>	<b>20</b>	<b>10</b>

**TOTAL NO. OF CREDITS: 181**



### HUMANITIES AND SOCIAL SCIENCES (HS)

Sl. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	21EL101	Communicative English and Life Skills	HS	2	2	0	0	2
2	21EL111	Interpersonal Skills - Listening and Speaking Laboratory	HS	2	0	0	2	1
3	21EL201	Technical English	HS	2	2	0	0	2
4	21EL211	Advanced Reading and Writing Laboratory	HS	2	0	0	2	1
5	21GE901	Professional Ethics in Engineering	HS	3	3	0	0	3
6	21CH102	Environmental Science and Engineering	HS	3	3	0	0	3
7	21EL301	Universal Human Values – II: Understanding Harmony	HS	4	2	2	0	3

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**BASIC SCIENCES (BS)**

<b>Sl. No</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	21MA101	Engineering Mathematics- I	BS	5	3	2	0	4
2	21PH102	Physics for Electronics Engineering	BS	3	3	0	0	3
3	21CH101	Engineering Chemistry	BS	3	3	0	0	3
4	21PC111	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5	21MA201	Engineering Mathematics- II	BS	5	3	2	0	4
6	21MA302	Linear Algebra and Partial Differential Equations	BS	5	3	2	0	4
7	21MA402	Probability and Random Processes	BS	5	3	2	0	4

### ENGINEERING SCIENCES (ES)

Sl.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	21CS101	Problem Solving and C Programming	ES	3	3	0	0	3
2	21ME101	Computer Aided Engineering Graphics	ES	6	2	0	4	4
3	21CS111	C Programming Laboratory	ES	4	0	0	4	2
4	21CS201	Data Structures	ES	3	3	0	0	3
5	21EM111	Engineering Practices Laboratory	ES	4	0	0	4	2
6	21CS211	Data Structures Laboratory	ES	4	0	0	4	2
7	21CS202	Python Programming(Lab Integrated)	ES	5	3	0	2	4

**PROFESSIONAL CORE (PC)**

<b>Sl.No</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	21EC201	Fundamentals of Electrical Engineering and Circuits	PC	4	4	0	0	4
2	21EC202	Electronic Devices	PC	3	3	0	0	3
3	21EC301	Signals and Systems	PC	5	3	2	0	4
4	21EC302	Electronic Circuits	PC	3	3	0	0	3
5	21EC303	Digital Electronics	PC	3	3	0	0	3
6	21EE401	Control Systems	PC	4	2	2	0	3
7	21EC311	Analog and Digital Circuits Laboratory	PC	4	0	0	4	2
8	21EC401	Communication Theory	PC	3	3	0	0	3
9	21EC402	Microprocessors and Microcontrollers	PC	3	3	0	0	3
10	21EC403	Electromagnetic Fields	PC	4	4	0	0	4
11	21EC404	Linear Integrated Circuits	PC	3	3	0	0	3
12	21EC411	Microprocessors and Microcontrollers Laboratory	PC	4	0	0	4	2
13	21EC412	Linear Integrated Circuits Laboratory	PC	4	0	0	4	2
14	21EC501	Digital Communication systems	PC	3	3	0	0	3
15	21EC502	Discrete-Time Signal Processing	PC	4	2	2	0	3
16	21EC503	Data Communication Networks	PC	3	3	0	0	3
17	21EC504	Transmission Lines and waveguides	PC	3	3	0	0	3
18	21EC511	Communication Networks and DSP Laboratory	PC	4	0	0	4	2
19	21EC512	Communication Systems Laboratory	PC	4	0	0	4	2
21	21EC601	VLSI Design	PC	3	3	0	0	3
21	21EC602	Embedded Systems	PC	3	3	0	0	3
22	21EC603	Wireless Communications Systems	PC	3	3	0	0	3
23	21EC604	Antennas and Wave Propagation	PC	3	3	0	0	3
24	21EC611	Embedded System and RTOS Laboratory	PC	4	0	0	4	2
25	21EC612	VLSI Design Laboratory	PC	4	0	0	4	2

26	21EC701	RF and Microwave Engineering	PC	3	3	0	0	3
27	21EC702	Optical Communication and Networks	PC	3	3	0	0	3
28	21EC711	Advanced Communication Laboratory	PC	4	0	0	4	2

**PROFESSIONAL ELECTIVES (PE)**  
**SEMESTER V**  
**ELECTIVE – I**

<b>Sl.No.</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	21EC901	Sensors, Actuators and Interfaces	PE	3	3	0	0	3
2	21ME927	Total Quality Management	PE	3	3	0	0	3
3	21CS401	Computer Architecture	PE	3	3	0	0	3
4	21EC902	Advanced Microprocessors and Microcontrollers	PE	3	3	0	0	3
5	21EC903	Introduction to NanoScience and Nano Technology	PE	3	3	0	0	3

**SEMESTER VI  
ELECTIVE – II**

<b>Sl.No</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	21EC904	Introduction to MEMS and NEMS	PE	3	3	0	0	3
2	21CS602	Cryptography and Network Security	PE	3	3	0	0	3
3	21EC905	Digital Image Processing	PE	3	3	0	0	3
4	21EC906	Medical Electronics	PE	3	3	0	0	3
5	21AI401	Artificial Intelligence	PE	3	3	0	0	3
6	21ME918	Essence of Indian Traditional Knowledge	PE	3	3	0	0	3

**SEMESTER VI  
ELECTIVE – III**

<b>Sl.No</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGOR Y</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	21EC907	IoT System design and Applications (Lab Integrated)	PE	4	2	0	2	3
2	21CS918	Data Science Fundamentals	PE	3	3	0	0	3
3	21EC908	Advanced Digital Signal Processing	PE	3	3	0	0	3
4	21EC909	Multimedia Compression and Communication	PE	3	3	0	0	3
5	21EC910	Robotics and Automation	PE	3	3	0	0	3
6	21EC911	Systems Programming	PE	3	3	0	0	3



**SEMESTER VII  
ELECTIVE – IV**

<b>Sl.No</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	21EC912	Principles of Speech Processing(Lab Integrated)	PE	4	2	0	2	3
2	21EC913	Cognitive Radio	PE	3	3	0	0	3
3	21EC914	Wireless Adhoc and Sensor Networks	PE	3	3	0	0	3
4	21EC915	ARM System Architecture	PE	3	3	0	0	3
5	21EC916	FPGA and ASIC Design	PE	3	3	0	0	3

**SEMESTER VII  
ELECTIVE – V**

SI.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	21EC917	Applications of 4G /5G Communications	PE	3	3	0	0	3
2.	21CS928	UAV and Drone Technology	PE	3	3	0	0	3
3.	21EC918	Satellite Communication	PE	3	3	0	0	3
4.	21ME925	Introduction to Innovation, IP Management and Entrepreneurship	PE	3	3	0	0	3
5.	21ME909	Indian Constitution	PE	3	3	0	0	3
6.	21EC919	Linux Kernel and DeviceDrivers	PE	3	3	0	0	3
7.	21EC920	Automotive Software Engineering	PE	3	3	0	0	3

**\*Professional Electives are grouped according to elective number as was done previously.**

### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

SL.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	21EC312	Foundation Lab on Internet of Things (IoT)	EEC	2	0	0	2	1
2	21CS314	Aptitude and Coding skills- I	EEC	2	0	0	2	1
3	21EC413	Mini Project and Industrial Internship	EEC	2	0	0	2	1
4	21CS414	Aptitude and coding skills- II	EEC	2	0	0	2	1
5	21EC513	Foundation Lab on Machine Learning	EEC	2	0	0	2	1
6	21CS512	Advanced Aptitude and codingskills -I	EEC	2	0	0	2	1
7	21EC613	Innovative / Multi-Disciplinary Project	EEC	2	0	0	2	1
8	21CS614	Advanced Aptitude and codingskills- II	EEC	2	0	0	2	1
9	21EC712	Project Work - Phase I and Internship	EEC	6	0	0	6	3
10	21EC713	Design Thinking Laboratory	EEC	2	0	0	2	1
11	21EC811	Project Work - Phase II	EEC	20	0	0	20	10

**LIST OF OPEN ELECTIVES  
(ADS)**

<b>SL.NO.</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1.	21AI402	Data Analytics	OE	3	3	0	0	3
2.	21AI701	Deep Learning Techniques	OE	3	3	0	0	3
3.	21AI001	Introduction to Data Science	OE	3	3	0	0	3
4.	21AI401	Artificial Intelligence	OE	3	3	0	0	3
5.	21AI502	Machine Learning	OE	3	3	0	0	3
6.	21AI911	Soft Computing	OE	3	3	0	0	3

**(CSE)**

<b>SL.NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1.	21CS001	Python Programming	OE	3	3	0	0	3
2.	21CS303	Software Engineering	OE	3	3	0	0	3
3.	21CS002	Mobile Application Development	OE	3	3	0	0	3
4.	21CS304	Database Management System	OE	3	3	0	0	3
5.	21CS914	Internet of Things	OE	3	3	0	0	3
6.	21CS701	Cloud Computing	OE	3	3	0	0	3
7.	21CS003	Block Chain Technologies	OE	3	3	0	0	3
8.	21CS901	Cyber Physical Systems	OE	3	3	0	0	3
9.	21CS902	Web Security	OE	3	3	0	0	3
10.	21CS904	Image Processing	OE	3	3	0	0	3
11.	21CS905	Computer Vision	OE	3	3	0	0	3
12.	21CS907	Human Computer Interaction	OE	3	3	0	0	3

**ME**

<b>SL.NO</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CATEGORY</b>	<b>CONTACT PERIODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1.	21ME001	Introduction to Nanotechnology	OE	3	3	0	0	3
2.	21ME002	Design Thinking	OE	3	3	0	0	3
3.	21ME003	Industrial Engineering and Operation Management	OE	3	3	0	0	3
4.	21ME004	Composite Materials	OE	3	3	0	0	3
5.	21ME005	Vehicle Styling and Design	OE	3	3	0	0	3
6.	21ME006	Testing of Materials	OE	3	3	0	0	3
7.	21ME007	Lean six sigma and Supply chain Management	OE	3	3	0	0	3
8.	21ME008	Product Design and Development	OE	3	3	0	0	3

### SUMMARY

S.No.	SUBJECT AREA	CREDITS PER SEMESTER								CREDITS TOTAL	Percentage
		I	II	III	IV	V	VI	VII	VIII		
1	HS	3	6		3			3		15	8.29
2	BS	12	4	4	4					24	13.26
3	ES	9	7	4						20	11.05
4	PC		7	15	17	16	16	8		79	43.65
5	PE					3	6	6		15	8.29
6	OE					3		3		6	3.31
7	EEC			2	2	2	2	4	10	22	12.15
8	MC	NON-CREDIT COURSE								-	-
	<b>Total</b>	<b>24</b>	<b>24</b>	<b>25</b>	<b>26</b>	<b>24</b>	<b>24</b>	<b>24</b>	<b>10</b>	<b>181</b>	

## SEMESTER I

COURSE CODE	COURSE TITLE	L	T	P	C
21EL101	COMMUNICATIVE ENGLISH and LIFE SKILLS	2	0	0	2

(Common to all branches)

### OBJECTIVES:

The Course will enable learners to:

- Strengthen their basic reading and writing skills.
- Comprehend listening contexts competently.
- Improve their speaking skills to speak fluently in real contexts.
- Develop vocabulary of a general kind and enhance their grammatical accuracy.

### UNIT I COMMUNICATION BASICS

06

**Listening** - short texts- short formal and informal conversations. **Speaking**- introducing oneself - exchanging personal information. **Reading** - practice in skimming - scanning and predicting. **Writing**-completing sentences - developing hints- free writing – Everyday expressions- collocations. Life Skills - Overview of Life Skills: significance of life skills.

### UNIT II COMMUNICATION INTERMEDIATE

06

**Listening**- telephonic conversations. **Speaking** – sharing information of a personal kind — greeting – taking leave. **Reading** – short comprehension passages - pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions / open-ended questions) - **Writing** – paragraph writing- topic sentence - main ideas, short narrative descriptions using some suggested vocabulary and structures. Life skills – Self-awareness: definition, need for self-awareness; Coping with Stress and Emotions.

### UNIT III COMMUNICATION VANTAGE

06

**Listening** – listening to longer texts and filling up the table - **Speaking**- asking about routine actions and expressing opinions. **Reading**- Long texts (cloze reading) - **Writing**- jumbled sentences - product description - use of reference words and discourse markers. Grammar – Tenses - phrasal verbs - Wh – Questions, yes or no questions and direct / indirect questions – countable & uncountable nouns – modal verbs. Life skills – Assertiveness vs Aggressiveness



## **UNIT IV SYNERGISTIC COMMUNICATION**

**06**

**Listening** - listening to dialogues or conversations and completing exercises based on them - **Speaking**- speaking about one-self- speaking about one's friend – **Reading** - different types of texts- magazines - **Writing** - letter writing, informal or personal letters - e-mails-conventions of personal email - Language development - synonyms – antonyms. Life Skills –Problem Solving Techniques.

## **UNIT V COMMUNICATION HIGHER**

**06**

**Listening** – listening to TED talks - **Speaking** – role play – **Reading** - Biographies – **Writing**- writing short essays (analytical & issue-based essays) – dialogue writing. Life Skills – Leadership & Decision making.

**TOTAL PERIODS: 30**

### **OUTCOMES:**

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

- Read articles in magazines and newspapers efficiently and acquire different life skills.
- Comprehend conversations and short talks delivered in English and develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.
- Participate actively in informal conversations and develop negotiation skills.
- Write effective personal letters and emails and deal with personal and societal issues.
- Exhibit proficiency in writing analytical essays and develop leadership skills.

### **TEXT BOOKS:**

1. Kumar, Suresh E., and Sreehari, P. Communicative English. Hyderabad: OrientBlackswan, 2019.
2. Richards, C. Jack. Interchange. Students' Book-2. New Delhi: CUP, 2017.

### **REFERENCES:**

1. Bailey, Stephen. Academic Writing: A Practical Guide for Students. New York: Rutledge, 2017.
2. Dhanavel, S P. English and Soft Skills, Volume Two, Hyderabad: Orient Blackswan,2019.
3. Elbow, Peter. Writing Without Teachers. London: Oxford University Press, 1998.
4. James, Larry. The First Book of Life Skills; First Edition, Embassy Books, 2016.

5. Larsen, Kristine, Stephen Hawking: A Biography. Westport: Greenwood PublishingGroup, 2012.
6. Redston, Chris., and Cunningham, Gillie. Face2Face (Pre-intermediate Student's Book & Workbook). New Delhi: Cambridge University Press, 2020.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21MA101</b>	<b>ENGINEERING MATHEMATICS – I</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>

**(Common to all branches)**

**OBJECTIVES:**

The syllabus is designed to:

- Explain the concepts of matrix algebra.
- Make the students understand the idea of curvature, evolutes and envelopes.
- Impart the knowledge of functions of several variables.
- Introduce the concepts of Gamma and Beta integral.
- Develop an understanding on the basics of multiple integrals.

**UNIT I MATRICES**

**9+6**

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of eigen values and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices by orthogonal transformation – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

**UNIT II APPLICATIONS OF DIFFERENTIAL CALCULUS**

**9+6**

Curvature in Cartesian and Polar Co-ordinates – Centre and radius of curvature – Circle of curvature– Evolutes – Envelopes (excluding Evolute as envelope of normal).

**UNIT III FUNCTIONS OF SEVERAL VARIABLES**

**9+6**

Limits – Continuity – Partial derivatives (excluding Euler’s theorem) – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor’s series for functions of two variables – Maxima and minima of functions of two variables – Lagrange’s method of undetermined multipliers.

**UNIT IV GAMMA, BETA INTEGRALS AND APPLICATIONS**

**9+6**

Gamma and Beta Integrals – Properties – Relation between Gamma and Beta functions, Evaluation of integrals using Gamma and Beta functions.

## **UNIT V      MULTIPLE INTEGRALS**

**9+6**

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids.

**TOTAL PERIODS: 75**

### **OUTCOMES:**

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

- Diagonalize a matrix by orthogonal transformation.
- Determine the Evolute and Envelope of curves.
- Examine the maxima and minima of function of several variables.
- Apply Gamma and Beta integrals to evaluate improper integrals.
- Evaluate the area and volume by using multiple integrals.

### **TEXT BOOKS:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, .2016
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. T. Veerarajan, "Engineering Mathematics", Tata McGraw Hill, 2nd Edition, New Delhi, 2011.

### **REFERENCES:**

1. M. K. Venkataraman, "Engineering Mathematics", Volume I, Fourth Edition, The National Publication Company, Chennai, 2003.
1. 2. Sivaramakrishna Dass, C. Vijayakumari, "Engineering Mathematics", Pearson Education India, 4th Edition 2019.
2. H. K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
3. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
4. S.S. Sastry, "Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21PH102</b>	<b>PHYSICS FOR ELECTRONICS ENGINEERING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **OBJECTIVES:**

- To educate the fundamental important concepts in physics and to apply the knowledge in solving scientific and engineering problems
- To impart the basic concepts of conducting materials, semiconducting materials, opto and nanoelectronic devices, light propagation in waveguides and electro- magnetostatics and electrodynamics

### **UNIT I CONDUCTING MATERIALS 9**

Classical free electron theory - Expression for electrical conductivity -Four probe method- determination of resistivity -Expression for Thermal conductivity- Wiedemann-Franz law - Success and failures of CFT -Effect of temperature on Fermi function - Density of energy states- Carrier concentration in metals and average energy of an electron at 0 K – Energy bands in solids.

### **UNIT II SEMICONDUCTING MATERIALS 8**

Intrinsic semiconductors – Energy band diagram – Direct and indirect band gap semiconductors -Carrier concentration in intrinsic semiconductors – determination of band gap - Extrinsic semiconductors - n-type and p-type semiconductors (qualitative) – Variation of Fermi level with temperature and impurity concentration – Hall effect and its applications.

### **UNIT III OPTO AND NANO ELECTRONIC DEVICES 9**

Carrier generation and recombination processes in semiconductors (concepts only) –LED- Organic LED- Photo detectors- Photodiodes -Solar cell – Electron density in bulk material (qualitative) -Size dependence of Fermi energy- Band gap of nano material -Quantum confinement- Quantum structures-Density of states in quantum well, quantum wire and quantum dot structures - Quantum dot lasers

### **UNIT IV LASER AND FIBRE OPTICS 8**

Population of energy levels, Einstein's A and B coefficients- derivation – Resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homo junction and hetero junction – Engineering applications in communication.

Fibre optics -principle, numerical aperture and acceptance angle, V- number – Types of optical fibre (Material, Refractive index and Mode) – Losses in optical

fibre - Fibre optic communication - Fibre optic sensors (pressure and displacement).

## **UNIT V ELECTRO-MAGNETOSTATICS AND ELECTRODYNAMICS 11**

Electrostatics: Coulomb's law - Gauss's law, Applications of Gauss's law (qualitative) - Maxwell's equation-I (equation only) - Electric field in matter: dielectrics, electric polarization, electric permittivity and susceptibility, relative permittivity, Types of polarization (electronic, ionic, orientation and space charge) - Internal field – Derivation - Clausius- Mossotti equation

Magnetostatics: Biot-Savart law and its applications (qualitative) – Ampere's law and its applications (qualitative)-Lorentz force-Maxwell's equation-II (equations only).

Electrodynamics: Faraday's law of induction, Lenz law - Maxwell's equations-III and IV (equations only) – Electromagnetic waves in dielectric medium - Electromagnetic waves in vacuum

### **TOTAL PERIODS : 45**

### **COURSE OUTCOMES:**

On successful completion of this course, the student will be able to

- Comprehend the classical and quantum electron theories and energy band structures
- Explain the conducting properties of semiconductors and its applications in various devices.
- Discuss the Quantum Confinement effects and the working of various Opto and Nanoelectronic devices.
- Describe the principle, construction and working of lasers and their applications in fibre optic communication.
- Elucidate electrostatics and electrodynamics in dielectric materials.

### **TEXT BOOKS:**

1. M.N. Avadhanulu and P.G. Kshirsagar, "A text book of Engineering Physics", S. Chand and Company, New Delhi, 2014.
2. Kasap, S.O. —Principles of Electronic Materials and Device, McGraw-Hill Education, 2007.
3. Wahab, M.A. —Solid State Physics: Structure and Properties of Materials. Narosa Publishing House, 2009.

4. David J Griffiths, "Introduction to Electrodynamics", Pearson Education India Learning Private Limited; 4th Edition, 2015.
5. J. D Kraus", "Electromagnetics", McGraw-Hill Inc. 4th Edition, 1992.

#### **REFERENCES:**

1. R.K. Gaur and S.L. Gupta, "Engineering Physics", Dhanpat Rai Publications (P) Ltd., Eighth Edition., New Delhi, 2001.
2. Hanson, G.W. Fundamentals of Nanoelectronics, Pearson Education, 2009R.  
A. Serway and J.W. Jewett, "Physics for Scientists and Engineers", Ninth Edition. Cengag Learning, 2014.
4. Rogers, B., Adams, J. & Pennathur, S. —Nanotechnology: Understanding Small Systems. CRC Press, 2014
5. A. Marikani, "Materials Science", PHI Learning Private Limited, Eastern Economy Edition, 2017.
6. R. Wolfson, "Essential University Physics", Volume 1 and 2 with Mastering Physics, Global Edition, 3rd Edition, Pearson 2017.
7. B.K. Pandey and S. Chaturvedi, "Engineering Physics", Cengage Learning India, 2012.
8. J. Singh, "Semiconductor Optoelectronics: Physics and Technology", McGraw-Hill Inc., 1995.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21CH101</b>	<b>ENGINEERING CHEMISTRY</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**(Common to CSE, ECE and AI&DS)**

**OBJECTIVES:**

The syllabus is designed to:

- Understand the role of chemistry in everyday life.
- Develop an understanding of the basic concepts of electro chemistry and its applications.
- Learn the principles and generation of energy in different types of batteries, fuel cells, nuclear reactors, solar cells and wind mills.
- Make them acquire basic knowledge on polymers, their classification and the applications of specialty polymers in engineering and technology.
- Understand the preparation, properties and applications of nano materials in various fields.

**UNIT I CHEMISTRY IN EVERYDAY LIFE 8**

Importance of chemistry in everyday life - food additives - types (colours, preservatives, flavours and sweeteners), effects - food adulteration – types of adulteration (intentional, incidental) - effects of food adulterants - cosmetics and personal care products (fairness creams, perfumes, deodorants, shampoos)- effects – beverages-classification – carbonated beverages – nutritive values and effects. Water – impurities – industrial uses of water – hardness, external treatment (demineralization) – desalination (reverse osmosis).

**UNIT II ELECTROCHEMISTRY 10**

Introduction – terminology - conductance of electrolytes- specific conductance, equivalent conductance, molar conductance- factors affecting conductance- origin of electrode potential- single electrode potential, standard electrode potential- measurement of single electrode potential-reference electrodes (standard hydrogen electrode, calomel electrode) electrochemical series, applications – measurement of EMF of the cell – Nernst equation - (derivation), numerical problems. Chemical sensors – principle of chemical sensors- breath analyzer and Clark oxygen analyzer.

**UNIT III ENERGY STORAGE DEVICES AND ENERGY SOURCES 9**

Batteries – primary battery (alkaline battery) - secondary battery (Pb-acid battery, Ni-metal hydride battery, Li-ion battery) - fuel cells (H<sub>2</sub>-O<sub>2</sub> fuel cell). Nuclear Energy – nuclear reactions – fission, fusion, differences, characteristics– nuclear chain



reactions –light water nuclear reactor – breeder reactor. Renewable energy sources- solar energy – thermal conversion (solar water heater and heat collector) - photovoltaic cell– wind energy.

#### **UNIT IV POLYMERS**

**9**

Introduction – monomer, functionality, degree of polymerization – classification based on sources and applications – effect of polymer structure on properties - types of polymerization (addition, condensation) - thermoplastic and thermosetting resins – preparation, properties and applications of Teflon, polyvinyl chloride, polycarbonate, Bakelite.

Special polymers - biodegradable polymers - properties and applications of polycaprolactone, polyhydroxyalkanoate – properties and applications of electrically conducting polymers (poly aniline, polyvinylidene fluoride).

#### **UNIT V NANOCHEMISTRY**

**9**

Introduction – synthesis – top-down process (laser ablation, chemical vapour deposition), bottom- up process (precipitation, electrochemical deposition) – properties of nanomaterials – types (nanorods, nanowires, nanotubes-carbon nanotubes, nanocomposites).

Applications of carbon nanotubes – applications of nanomaterials in electronics, information technology, medical and healthcare, energy, environmental remediation, construction and transportation industries.

**TOTAL PERIODS: 45**

#### **OUTCOMES:**

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

- Illustrate the role of chemistry in everyday life and the industrial uses of water.
- Discuss the measurement of electrode potential by using various electrodes and the applications of electrochemical series by employing Nernst equation.
- Interpret the principles and generation of energy in batteries, fuel cells, nuclear reactors, solar cells and wind mills.
- Differentiate the types, properties and applications of polymeric materials employed in our day today life.
- Explain the basic concepts, synthesis and the applications of nano materials in various fields.

**TEXT BOOKS:**

1. P. C. Jain and Monika Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2019.
2. Prasanta Rath, "Engineering Chemistry", 1st Edition, Cengage Learning India Pvt.Ltd., Delhi, 2015.
3. V. R. Gowariker, N. V. Viswanathan, and Jayadev Sreedhar, "Polymer Science", 4th Edition, New Age International Publishers, New Delhi, 2021.
4. Fred W. Billmeyer, "Textbook of Polymer Science", 3rd Edition, Wiley India Pvt. Ltd., New Delhi, 2007.

**REFERENCES:**

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", 12th Edition, S. Chand & Company, New Delhi, 2010.
2. Kirpal Singh, "Chemistry in daily life", 3rd Edition, PHI Learning Pvt. Ltd., 2012.
3. J. C. Kuriacose and J. Rajaram, "Chemistry in Engineering and Technology", Volume-1 & Volume -2, Tata McGraw-Hill Education Pvt. Ltd., 2010.
4. Geoffrey A. Ozin, Andre C. Arsenault, Ludovico Cademartiri, "Nanochemistry: A Chemical Approach to Nanomaterials", 2nd Edition, RSC publishers, 2015.
5. Prasanna Chandrasekhar, "Conducting polymers, fundamentals and applications – A Practical Approach", 1st Edition, Springer Science & Business Media, New York, 1999.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21CS101</b>	<b>PROBLEM SOLVING AND C PROGRAMMING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**(Common to all branches)**

## **OBJECTIVES**

- To make the students understand the fundamentals of problem solving using Algorithm and Flowchart
- To teach the basic programming constructs for solving simple problems
- To introduce the basic concepts of arrays and strings
- To acquaint the students about functions, pointers, structures and their relationship
- To impart knowledge on the concepts of file handling

## **UNIT I INTRODUCTION TO ALGORITHM AND C 9**

Introduction to Computer System – Block diagram, Program Development Life Cycle.

**General problem Solving concepts:** Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops.

**Imperative languages:** Introduction to imperative language, syntax and constructs of a specific language (ANSI C), Applications

**Types, Operators:** Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Basic I/O using scanf, printf, Operators – Types, Precedence, Associativity, Proper variable naming and Hungarian Notation.

## **UNIT II CONTROL FLOW STATEMENTS 7**

Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, goto labels, structured and unstructured programming.

## **UNIT III ARRAYS AND FUNCTIONS 10**

Arrays and Strings – Initialization, Declaration – One Dimensional and Two Dimensional arrays – Linear search, Binary Search, Matrix Operations (Addition and Subtraction) Basics of functions, parameter passing and returning type, C main

return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Pre-processor, Standard Library Functions and return types.

#### **UNIT IV STRUCTURES AND POINTERS**

**10**

Basic Structures, Structures and Functions, Array of structures. Pointers and address, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated. Pointer of structures, Self-referential structures, Table look up, typedef, unions, Bit-fields

#### **UNIT V FORMATTED I/O AND FILE PROCESSING**

**9**

Formatted Output – fprintf, Formated Input – fscanf, Variable length argument list. Files - file access including FILE structure, fopen, fread, fwrite, stdin, sdtout and stderr, File Types – Text, Binary - Error Handling including exit, perror and error.h, Line I/O, related miscellaneous functions.

**TOTAL PERIODS: 45**

#### **OUTCOMES:**

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

- Develop algorithmic solutions to simple computational problems
- Develop simple applications using basic constructs
- Write programs using arrays and strings
- Design and implement applications using functions, pointers and structures.
- Design applications using sequential and random access file processing.

#### **TEXT BOOKS:**

1. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, Pearson Education India, 2nd Edition, 2015.
2. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

#### **REFERENCE BOOKS:**

1. B. Gottfried, Programming with C, Schaum Outline Series, Fourth Edition, 2018

2. Herbert Schildt, C: The Complete Reference, McGraw Hill, Fourth Edition, 2017
3. Yashavant Kanetkar, Let Us C, BPB Publications, 16<sup>th</sup> Edition, 2018.
4. Reema Thareja, "Programming in C", 2<sup>nd</sup> Edition, Oxford University Press, 2018.
5. Zed A. Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (like C)", (Zed Shaw's Hard Way Series), 1<sup>st</sup> Edition, Addison- Wesley Professional, 2015.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21ME101</b>	<b>COMPUTER AIDED ENGINEERING GRAPHICS</b>	<b>2</b>	<b>0</b>	<b>4</b>	<b>4</b>

**(Common to I semester ECE, ME & II semester CSE, AI&DS)**

**OBJECTIVES:**

Students completing this course are expected to:

- Explain the graphic skills for communication of concepts, ideas and design of engineering products.
- Summarize the procedure to draw the various types of curves
- Reproduce the concept to project orthographic projections of points, lines and plane surfaces.
- Apply the concept of projections in projection of solids and section of solids.
- Use the visualization skills in development of surfaces of solids and isometric projections.

**UNIT I INTRODUCTION TO CONVENTIONS IN ENGINEERING DRAWING AND CAD COMMANDS** **18**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning. Introduction to CAD commands- CAD user interface- coordinate systems, object selection methods, selection of units and precession. Sketching – line, circle, arc, polygon, rectangle and ellipse. Working with object snaps, layers and object properties. Editing the objects – copy, move, trim, extend, working with arrays, mirror, scale, hatch, fillet and chamfer. Conversion of simple pictorial diagrams to orthographic view using CAD software

**UNIT II PLANE CURVES** **16**

Basic Geometrical constructions, Curves used in engineering practices:

Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves.

**UNIT III PROJECTION OF POINTS, LINES AND PLANE SURFACE** **18**

Orthographic projection- principles-Principal Planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

**UNIT IV PROJECTION OF SOLIDS AND PROJECTION OF SECTIONED SOLIDS 20**

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method. Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section.

**UNIT V DEVELOPMENT OF SURFACES AND ISOMETRIC PROJECTION 18**

Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Principles of isometric projection – isometric scale – Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions.

**TOTAL PERIODS: 90**

**OUTCOMES:**

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

- Discuss the procedure to draw the orthographic views using CAD software.
- Explain the methods to construct the various types of plane curves.
- Draw the projection of points, lines and planes.
- Use the concepts in drawing of projection and section of solids.
- Demonstrate the isometric projection and development of surfaces of a solid.
- Apply the concepts of engineering drawing in practical applications.

**TEXT BOOKS:**

1. Natarajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 33rd Edition, 2020.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P)Limited, 15th Edition, 2019

**REFERENCES:**

1. Bhatt N.D. "Engineering Drawing", Charotar Publishing House, 53rd edition 2019.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 3rd Edition, 2019.
3. Engineering Drawing Practice for Schools and Colleges BIS SP46:2003 (R2008), Published by Bureau of Indian Standards (BIS), 2008.

4. Parthasarathy. N.S and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2019.
5. Gopalakrishna. K.R., Engineering Drawing Vol 1 & 2, Subhas Publications, 27th Edition, 2017.



<b>COURS ECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21PC111</b>	<b>PHYSICS AND CHEMISTRY LABORATORY</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(Common to I semester CSE, AI&DS, ECE and II semester ME)**

**PHYSICS LABORATORY OBJECTIVES:**

The syllabus is designed to:

- Introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter, semiconductors and liquids.

**LIST OF EXPERIMENTS** (Any five experiments to be conducted)

1. Determination of wavelength and velocity of ultrasonic waves by Ultrasonic Interferometer.
2. Determination of thermal conductivity of a poor conductor by LEE'S Disc method.
3. (i) Determination of wavelength and divergence angle of semiconductor laser source using diffraction grating.  
(ii) Determination of particle size by using diffraction of semiconductor laser beam.  
(iii) Analysis of Numerical aperture and acceptance angle of an optical fiber.
4. Determination of Young's Modulus of a beam by non-uniform bending method.
5. Determination of the moment of inertia of the disc and rigidity modulus of wire by Torsional pendulum.
6. Spectrometer - Determination of wavelength of Mercury Spectrum using diffraction grating.
7. Determination of thickness of wire by air wedge method.
8. Determination of Young's Modulus of a beam by Uniform bending method.
9. Determination of band gap of a semiconductor.

**TOTAL PERIODS: 30**

## **COURSE OUTCOMES:**

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

- Determine the Modulus of elasticity of materials
- Determine the Thermal Conductivity of bad conductor using Lee's disc method.
- Calculate the Compressibility of liquids and velocity of ultrasonic waves in liquids
- Measure the wavelength of prominent spectral lines of Mercury Spectrum and particle size of powder using diffraction phenomenon and thickness of thin materials using interference phenomenon,
- Determine the band gap energy of a semiconductor.

## **REFERENCES:**

1. Wilson J.D. and Hernandez C.A., - Physics Laboratory Experiments, Houghton Mifflin Company, New York, 2005.
2. Physics Laboratory Manual, Department of Physics, R.M.K. College of Engineering and Technology, 2019.

## **CHEMISTRY LABORATORY OBJECTIVES:**

The syllabus is designed to:

- To make the students acquire practical skills through volumetric and instrumental analysis.

## **LIST OF EXPERIMENTS (Any five experiments to be conducted)**

1. Determination of total, temporary and permanent hardness of water by EDTA method.
2. Conductometric titration of strong acid vs. strong base.
3. Determination of strength of acids in a mixture using a conductivity meter.
4. Determination of strength of given hydrochloric acid using a pH meter.
5. Estimation of the iron content of the given solution using a potentiometer.
6. Estimation of the iron content of the water sample using a spectrophotometer (thiocyanate method).
7. Estimation of sodium present in water using a flame photometer.

8. Determination of the molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Determination of corrosion rate by weight loss method.
10. Determination of flash and fire point of a lubricating oil (Pensky Martens apparatus).
11. Determination of concentration of a given solution by constructing a galvanic cell.

### **TOTAL PERIODS: 30 OUTCOMES:**

Based on hands-on experience, students will be able to:

- Estimate the amount of different types of hardness in the given water sample and also determine the iron and sodium content present in it.
- Determine the change in conductivity of acids on the addition of base through conductometric titration.
- Examine the change in pH when an acid is added with a base using pH meter and to determine the corrosion rate of a given metal.
- Examine the redox reaction using a galvanic cell, its impact on emf values through potentiometer and to determine the flash and fire point of Oil by Pensky Martens apparatus.
- Estimate the amount of a strong acid using a strong base and to determine the molecular weight of the polymer through Ostwald viscometric method.

### **REFERENCES:**

1. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, "Vogel's Quantitative Chemical Analysis", 6th Edition, Pearson Education Pvt. Ltd., 2009.
2. Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch, Fundamentals of analytical chemistry Tenth Edition, Cengage Learning 2021.
3. Chemistry Laboratory Manual, Department of Chemistry, RMK College of Engineering and Technology, 2019.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21CS111</b>	<b>C PROGRAMMING LABORATORY</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(Common to all branches)**

### **OBJECTIVES:**

- To make the students write simple programs using basic constructs
- To familiarize the concepts of strings, pointers, functions and structures
- To equip the students on the knowledge of file processing concepts

### **LIST OF EXPERIMENTS**

- Algorithm and Flowchart
- Control Flow Structures
- Arrays
- Functions
- Searching
- Sorting
- Structures
- Pointers
- Files and File Operations

### **INDICATIVE LIST OF EXERCISES:**

1. Constructing Flow charts using RAPTOR tools.
2. Programs using I/O statements and expression
3. Write a program to find whether the given line is horizontal or vertical.
4. Write a program to calculate the distance between two points  $p_1(x_1,y_1)$ ,  $p_2(x_2,y_2)$ .
5. Write a program to calculate the force for the given mass and acceleration.
6. Write a program to calculate the Young's modulus.
7. Write a program to calculate the type of solution based on its pH value.
8. Write a program to temperature conversion (Fahrenheit to Celsius and vice versa)
9. Programs using decision-making constructs.
10. Write a program to find whether the given year is leap year or Not? (Hint: not every centurion year is a leap. For example 1700, 1800 and 1900 is not a leap year)

11. Design a calculator to perform the operations, namely, addition, subtraction, multiplication, division and square of a number.
12. Check whether a given number is Armstrong number or not?
13. Given a set of numbers like, find sum of weights based on the following conditions.
  - 5 if it is a perfect cube.
  - 4 if it is a multiple of 4 and divisible by 6.
  - 3 if it is a prime number.

Sort the numbers based on the weight in the increasing order as shown below:

<10, its weight >, <3 6, its weight >, < 89,its weight >

14. Populate an array with height of persons and find how many persons are above the average height.
15. Populate a two dimensional array with height and weight of persons and compute the Body Mass Index of the individuals.
16. Given a string —a\$bcd./fg|| find its reverse without changing the position of special characters.(Example input:a@gh%;j and output:j@hg%;a)
17. Convert the given decimal number into binary, octal and hexadecimal numbers using user defined functions.
18. From a given paragraph perform the following using built-in functions:
  - a. Find the total number of words.
  - b. Capitalize the first word of each sentence.
  - c. Replace a given word with another word.
19. Solve towers of Hanoi using recursion.
20. Sort the list of numbers using pass by reference.
21. Generate salary slip of employees using structures and pointers. Create a structure Employee with the following members: EID, Ename, Designation, DOB, DOJ, Basic pay. Note that DOB and DOJ should be implemented using structure within structure.
22. Compute internal marks of students for five different subjects using structures and functions.
23. Insert, update, delete and append telephone details of an individual or a company into a telephone directory using random access file.
24. Count the number of account holders whose balance is less than the minimum balance using sequential access file.

25. Mini project: Create a —Railway reservation system with the following modules
- Booking
  - Availability checking
  - Cancellation
  - Prepare Chart

**TOTAL PERIODS : 60**

**OUT COMES:**

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

- Write programs for simple applications making use of basic constructs, arrays and strings.
- Develop programs involving functions, recursion, pointers, and structures.
- Create applications using sequential and random access file processing.

**TEXT BOOKS:**

1. Brian W Kernighan and Dennis M Ritchie, The C Programming Language, Pearson Education India, 2nd Edition, 2015.
2. Anita Goel and Ajay Mittal, " Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

**REFERENCE BOOKS:**

1. B. Gottfried, Programming with C, Schaum Outline Series, Fourth Edition, 2018
2. Herbert Schildt, C: The Complete Reference, McGraw Hill, Fourth Edition, 2017
3. Yashavant Kanetkar, Let Us C, BPB Publications, 16<sup>th</sup> Edition, 2018.
4. Reema Thareja, "Programming in C", 2<sup>nd</sup> Edition, Oxford University Press, 2018.
5. Zed A. Shaw, "Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (like C)", (Zed Shaw's Hard Way Series), 1<sup>st</sup> Edition, Addison- Wesley Professional, 2015.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21EL111</b>	<b>INTERPERSONAL SKILLS - LISTENING AND SPEAKING LABORATORY</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**(Common to all branches)**

**OBJECTIVES:**

The Course will enable learners to:

- Equip and strengthen the English language skills.
- Provide guidance and practice to engage in specific academic speaking activities.
- Demonstrate presentation skills competently.
- Improve general and academic listening skills.
- Develop intent listening and negotiating skills pertaining to placement

**UNIT I**

**06**

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification  
Improving pronunciation - pronunciation basics - taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

**UNIT II**

**06**

Listen to a process information- give information, as part of a simple explanation – conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

**UNIT III**

**06**

Deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail.

**UNIT IV**

**06**

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and participating in conversations.

**UNIT V**

**06**

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication group/pair presentations - negotiate disagreement in

group work.

**TOTAL PERIODS : 30**

**OUTCOMES:**

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

- Listen and respond appropriately.
- Exhibit linguistic competency.
- Greet and respond effectively.
- Participate in group discussions.
- Make effective presentations.

**TEXT BOOKS:**

1. Brooks, Margaret. Skills for Success. Listening and Speaking. Level 4. Oxford: Oxford University Press, 2015.
2. Dhanavel, S. P. English and Soft Skills, Volume One, Hyderabad: Orient Blackswan, 2016.

**REFERENCES:**

1. Bhatnagar, Nitin., and Bhatnagar, Mamta. Communicative English for Engineers and Professionals. New Delhi: Pearson, 2010.
2. Hughes, Glyn., and Moate, Josephine. Practical English Classroom. Oxford: Oxford University Press, 2014.
3. Ladousse, Gillian Porter. Role Play. Oxford: Oxford University Press, 2014.
4. Richards, Jack C., and Bholke, David. Speak Now. Level 3. Oxford: Oxford University Press, 2010
5. Vargo, Mari. Speak Now. Level 4. Oxford, Oxford University Press, 2013.



## SEMESTER II

COURSE CODE	COURSE TITLE	L	T	P	C
21EL201	TECHNICAL ENGLISH	2	0	0	2

(Common to all branches)

### OBJECTIVES:

The Course prepares second semester Engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Demonstrate their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

### UNIT I INTRODUCTION - TECHNICAL ENGLISH 06

**Listening**- Listening to talks mostly of a scientific/technical nature and completing information- gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newspapers- **Writing**- purpose statements – extended definitions - writing instructions – checklists – recommendations - Vocabulary Development- technical vocabulary. Language Development –subject verb agreement - compound words.

### UNIT II READING AND STUDY SKILLS 06

**Listening** - Listening to longer technical talks and completing exercises based on them -**Speaking** - describing a process - **Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing- **Writing**- interpreting charts, graphs - Vocabulary Development- vocabulary used in formal letters/emails and reports Language Development- impersonal passive voice, numerical adjectives.

### UNIT III TECHNICAL WRITING AND GRAMMAR 06

**Listening**- Listening to classroom lectures/ talks on engineering/technology - **Speaking** – introduction to technical presentations- **Reading** – longer texts both general and technical, practice in speed reading; **Writing**-Describing a process, use of sequence words- Vocabulary Development- sequence words- Misspelled words. Language Development- embedded sentences

## **UNIT IV REPORT WRITING**

**06**

**Listening-** Listening to documentaries and making notes. **Speaking** – mechanics of presentations-**Reading** – reading for detailed comprehension- **Writing-** Report Writing (accident and survey) - minutes of a meeting - Vocabulary Development- finding suitable synonyms- paraphrasing-. Language Development- reported speech.

## **UNIT V GROUP DISCUSSION AND JOB APPLICATIONS**

**06**

**Listening-** TED talks; **Speaking** –participating in a group discussion **-Reading–** reading and understanding technical articles **Writing–** email etiquette- job application

– cover letter –Resume preparation (via email and hard copy)- Vocabulary Development- verbal analogies - Language Development- clauses- if conditionals.

### **TOTAL PERIODS: 30 OUTCOMES:**

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

- Listen to short talks effectively and read technical texts effortlessly.
- Manage to interpret the given phrase or the graphical rendering and review the contents.
- Develop flair for writing technical documents with grammatical accuracy.
- Write context specific reports and record minutes of meeting.
- Speak effectively in varied formal and informal contexts and prepare winning job application.

### **TEXT BOOKS:**

1. Fried-Booth, Diana L. Project Work. Oxford: Oxford University Press, 2014.
2. Sudharshana. N. P., and Saveetha C. English for Technical Communication. New Delhi: Cambridge University Press, 2018.

### **REFERENCES:**

1. Grussendorf, Marion. English for Presentations. Oxford: Oxford University Press, 2010.
2. Herbert, A. J. The Structure of Technical English. London: Longman. 1976.
3. Kumar, Suresh. E. Engineering English. Orient BlackSwan: Hyderabad, 2015.
4. Means, Thomas L., and Langlois, Elaine. English & Communication for

Colleges.Cengage Learning, USA: 2017.

5. Raman, Meenakshi., and Sharma, Sangeetha, Technical Communication Principles and Practice. New Delhi: Oxford University Press, 2017.



#### **UNIT IV      COMPLEX DIFFERENTIATION AND CONFORMAL MAPPING      9+6**

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (Statement only) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping:  $w = z + k$ ,  $kz$ ,  $1/z$ ,  $z^2$  and bilinear transformation.

#### **UNIT V      COMPLEX INTEGRATION      9+6**

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Statement and applications of Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle(excluding poles on the real axis).

#### **TOTAL PERIODS : 75**

#### **OUTCOMES:**

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

- Solve the higher order linear differential equations.
- Determine the gradient of a scalar field, divergence and curl of a vector fields and interpret their physical meaning and evaluate line, surface and volume integrals by vector integration.
- Apply Laplace Transforms method for solving linear ordinary differential equation.
- Construct an analytic function and analyze conformal mapping.
- Evaluate the real integrals using complex integration.

#### **TEXT BOOKS:**

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2018.
3. T. Veerarajan, "Engineering Mathematics", Tata McGraw Hill, 2nd Edition, New Delhi, 2011.

#### **REFERENCES:**

1. M. K. Venkataraman, "Engineering Mathematics, Volume I", 4th Edition, The National Publication Company, Chennai, 2003.
2. Sivaramakrishna Dass, C. Vijayakumari, "Engineering Mathematics", Pearson

Education India, 4th Edition 2019.

3. H. K. Dass, and Er. Rajnish Verma, "Higher Engineering Mathematics", S. Chand Private Limited, 3rd Edition 2014.
4. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, 6th Edition, New Delhi, 2008.
5. S.S. Sastry, "Engineering Mathematics", Vol. I & II, PHI Learning Private Limited, 4th Edition, New Delhi, 2014.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21CH102</b>	<b>ENVIRONMENTAL SCIENCE AND ENGINEERING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**(Common to I semester ME & II semester CSE, AI&DS and ECE)**

### **OBJECTIVES:**

The course is designed to:

- Appreciate the natural resources of environment which are inherently created for supporting life.
- Learn scientific and technological solutions to current day pollution issues.
- Study the interrelationship between living organisms and environment.
- Understand the integrated themes of biodiversity.
- Appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

### **UNIT I NATURAL RESOURCES 11**

Introduction - scope and importance of environment – need for public awareness. Forest resources- Use and over-exploitation, deforestation - timber extraction, mining, dams and their effects on forests and tribal people. Water resources - Use and over-utilization of surface and ground water, conflicts over water, dams-benefits and problems. Mineral resources- Use and exploitation, environmental effects of extracting and using mineral resources. Food resources- World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources - Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources- Land as a resource, land degradation, soil erosion and desertification – role of an individual in conservation of natural resources - case studies.

### **UNIT II POLLUTION AND ITS MANAGEMENT 11**

Pollution – causes, effects and control measures - Air pollution- Water pollution - Soil pollution - Marine pollution - Noise pollution - Thermal pollution - Nuclear hazards - nuclear accidents and holocaust - role of an individual in prevention of pollution – case studies. Waste management - causes, effects and control measures of municipal solid wastes, e-waste, plastic waste.

### **UNIT III ECOSYSTEMS AND BIODIVERSITY 9**

Introduction to ecosystems – structure and function of an ecosystem – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids - types, characteristic features, structure and functions of - Forest

ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (lakes, oceans).

Introduction to biodiversity – types (genetic, species and ecosystem diversity) – values of biodiversity – threats to biodiversity - endangered and endemic species – conservation of biodiversity (in-situ and ex-situ conservation) - India as a mega-diversity nation – hot-spots of biodiversity in India.

#### **UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 8**

Sustainable development – sustainable development goals - water conservation, rain water harvesting, watershed management – resettlement and rehabilitation - consumerism and waste products, value education.

Disaster management- floods, drought, earthquake, tsunami, cyclone and landslides - case studies. Environmental ethics- issues and possible solutions – environment protection act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act.

#### **UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6**

Introduction - population growth, variation among nations, population explosion, family welfare programme – women and child welfare - environment and human health – endemic/epidemic/pandemic, COVID – 19, HIV / AIDS– role of information technology in environment and human health –environmental impact assessment- case studies.

**TOTAL PERIODS: 45**

#### **OUTCOMES:**

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

- Associate the effects of exploitation of Natural resources on environment
- Discuss the sources, effects, control measures of different types of pollution and solidwaste management
- Summarize the values, threats, conservation of biodiversity and ecosystems
- Summarize the water conservation methods and various environmental acts for environmental sustainability
- Explain the effect of Human population and role of IT in environment and human health.

#### **TEXT BOOKS:**

1. Anubha Kaushik and C. P. Kaushik, "Perspectives in environmental studies", New AgeInternational, 6th edition, 2018.



2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2017.
3. Gilbert M. Masters, Wendell P. Ela "Introduction to Environmental Engineering and Science", 3rd edition, Pearson Education, 2015.

## **REFERENCES:**

1. William P. Cunningham and Mary Ann Cunningham, "Environmental Science: A Global Concern", McGraw Hill, 14th edition, 2017.
2. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India Pvt. Ltd., Delhi, 14th edition, 2014.
3. Erach Bharucha, "Textbook of Environmental Studies", Universities Press Pvt. Ltd., Hyderabad, 2nd edition, 2015.
4. Muhammad Adnan Shereen, Suliman Khan, Abeer Kazmi, Nadia Bashir, Rabeea Siddique, COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses, Journal of Advanced Research 24, 91–98, 2020.
5. Siam, M. H. B., Nishat, N. H., Ahmed, A., & Hossain, M. S., Stopping the COVID-19 Pandemic: A Review on the Advances of Diagnosis, Treatment, and Control Measures. Journal of Pathogens, 1–12, 2020.
6. Ben Hu, Hua Guo, Peng Zhou & Zheng-Li Shi, Characteristics of SARS-CoV-2 and COVID-19, Nature Reviews, Microbiology volume 19, 141–154, 2021.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21EC201</b>	<b>FUNDAMENTALS OF ELECTRICAL ENGINEERING AND CIRCUITS</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- To develop an understanding of the fundamental laws, theorems, elements of electric circuits and to analyze dc and ac circuits
- To understand transient response behaviour of electric circuits.
- To introduce different methods of circuit analysis using network theorems, duality and topology

**UNIT I FUNDAMENTALS OF ELECTRICAL ENGINEERING 12**

Fundamental concepts of dc and ac circuits, Steady state solution of DC circuits, Circuit laws and their applications in solving problems

Introduction to AC Circuits, Sinusoidal steady state analysis, Power and Power factor, Single phase and three phase balanced circuits.

**UNIT II NETWORK THEOREMS FOR DC AND AC CIRCUITS 12**

Source transformation, Superposition theorem, Thevenin's & Norton's theorems, Reciprocity and Maximum power transfer theorem

**UNIT III RESONANCE AND COUPLED CIRCUITS 12**

Resonance - Series resonance - Parallel resonance, Variation of impedance with frequency - Variation in current through and voltage across L and C with frequency, Bandwidth - Q factor - Selectivity, Self-inductance - Mutual inductance - Dot rule - Coefficient of coupling - Analysis of multi winding coupled circuits, Series, parallel connection of coupled inductors - Single tuned and double tuned coupled circuits

**UNIT IV TRANSIENT ANALYSIS 12**

Natural response - Forced response Transient response of RC, RL and RLC circuits to excitation by step signal, impulse signal and exponential sources Complete response of RC, RL and RLC circuits to sinusoidal excitation

**UNIT V TWO PORT NETWORKS 12**

Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid(H) parameters Interconnection of two port networks

**TOTAL PERIODS: 60**

## **OUTCOMES:**

On successful completion of this course, the student will be able to

- Develop the capacity to analyze electrical circuits using mesh and nodal analysis
- Apply the circuit theorems in real time
- Analyse resonance and coupled circuits
- Analyse the transient response for DC circuits
- Explain the two port networks and parameters
- Design, understand and evaluate the AC and DC circuits.

## **TEXT BOOKS:**

1. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, 2017, Sixth Edition, Tata McGraw Hill Education Private Limited, India.
2. Abhijit Chakrabarti, Circuit Theory Analysis and Synthesis, 2018, Seventh Edition, Dhanpat Rai and Co

## **REFERENCES:**

1. S.K.Bhattacharya " Basic Electrical and Electronics Engineering", Pearson India, 2011.
2. Joseph Edminister and Mahmood Nahvi, —Electric Circuits||, Schaum's Outline Series, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint 2016.
3. W.H.Hayt, J.E.Kemmerly & S.M.Durbin, Engineering Circuit Analysis, 2019, Ninth Edition, McGraw Hill Education, New Delhi, India.
4. Allan R. Hambley, Electrical Engineering – Principles & Applications, 2017, Seventh Edition, Pearson Education, Noida, India
5. A.Bruce Carlson, —Circuits: Engineering Concepts and Analysis of Linear Electric Circuits||, Cengage Learning, India Edition 2nd Indian Reprint 2009.
6. Allan H. Robbins, Wilhelm C. Miller, —Circuit Analysis Theory and Practice, Cengage Learning, Fifth Edition, 1st Indian Reprint 2013.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21EC202</b>	<b>ELECTRONIC DEVICES</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **OBJECTIVES:**

- To make the students understand the fundamentals of electronic devices.
- To acquaint the semiconductor properties and formation of PN Junction diode and its characteristics
- To explain the operation and applications of BJT and FET
- To study the operation of special diodes and examine their characteristics
- To describe the functionality of power semiconductor devices and classify various types of optoelectronic devices

### **UNIT I PN JUNCTION DIODE 9**

Theory of PN junction diode – Energy band structure of open-circuited PN junction – Quantitative theory of PN diode currents – Diode current equation– Static and dynamic resistance levels – Transition and diffusion capacitances, Temperature dependence of V-I characteristics of diode – Switching characteristics, Breakdown in PN junction diodes – Diode as a circuit element – Piecewise Linear diode model – PN diode applications

### **UNIT II BIPOLAR JUNCTION TRANSISTOR 9**

BJT: Construction of BJT – Transistor biasing – Operation of NPN and PNP transistors– Types of configurations– Transistor as an amplifier - Large signal, dc and small signal CE values of current gain – Breakdown in transistors – Ebers-Moll Model.

### **UNIT III FIELD EFFECT TRANSISTOR 9**

Construction and operation of N-channel JFET – Characteristic parameters of JFET– Expression for saturation drain current – Slope of V-I characteristics – Biasing for zero current drift - Comparison of BJT and JFET – Applications of JFET, Construction and operation of N-Channel and P-Channel MOSFET – Enhancement and depletion type MOSFET – Characteristics – Threshold voltage – Channel length modulation – Comparison of N-channel and P- channel MOSFETs– Comparison of MOSFET with JFET – Applications of MOSFETs in CMOS circuits.

## **UNIT IV SPECIAL SEMICONDUCTOR DEVICES**

**9**

Construction, Principle of operation, characteristics and applications of Zener diode, Backward diode, Varactor diode, Step Recovery Diode, Point contact diode – Metal-Semiconductor junction – Schottky diode – Tunnel diode – Gunn Diode – Impatt Diode – PIN Diode – PIN Photodiode - Avalanche Photodiode - DUAL GATE MOSFET – FINFET– MESFET.

## **UNIT V POWER SEMICONDUCTOR & OPTOELECTRONIC DEVICES 9**

Power Semiconductor Devices: Construction, Principle of operation, characteristics and applications of UJT, PNP Diode, SCR, LASCR, DIAC, TRIAC, GTO Thyristors – Power BJT – Power MOSFET – DMOS – VMOS. Optoelectronic Devices: Photoconductive sensors – Photoconductive cell – Photovoltaic sensors Photo emissive sensors –Light emitters - LCD, Alpha numeric displays, LCD Panels, Plasma display Panels - Optocoupler, CCD, BBD.

**TOTAL PERIODS: 45**

### **OUTCOMES:**

On successful completion of this course, the student will be able to

- Understand the basics of electron devices
- Explain the basics of device physics and working principle of PN Junction diode
- Describe the construction, operation and applications of BJT, JFET and MOSFET
- Understand the device physics of metal-semiconductor junctions and working principle of special semiconductor devices
- Explain the construction and working principle of power semiconductor devices and optoelectronic and display devices

### **TEXT BOOKS:**

1. Donald A Neaman, Semiconductor Physics and Devices, McGraw Hill, Fourth Edition, 2017.
2. Salivahanan S and Sureshkumar N, Electronic Devices and Circuits, McGraw Hill Education, Fourth Edition, 2017.

### **REFERENCES:**

1. Ben G Streetman and Sanjay Kumar Banerjee, Solid State Electronic Devices, Pearson, Seventh Edition, 2015
2. Jacob Millman, Christos C. Halkias and Satyabrata Jit, Electronic Devices and Circuits, McGraw Hill, Fourth Edition, 2015.

3. Robert Boylestad and Louis Nashelsky, *Electron Devices and Circuit Theory*, Pearson, Eleventh Edition, 2013.
4. Thomas L. Floyd, *Electronic Devices*, Pearson, Ninth Edition, 2016.
5. Tyagi M.S, *Introduction to Semiconductor Materials and Devices*, Wiley, 2008.
6. David A Bell, *Electric Circuits and Electronic Devices*, Oxford University Press, 2010.
7. Robert F Pierret, *Semiconductor Device Fundamentals*, Pearson, 1996.



**OUTCOMES:**

At the end of the course, the student should be able to:

- Implement abstract data types for linear data structures.
- Apply the appropriate linear data structures to solve problems.
- Identify and use appropriate tree data structures in problem solving.
- Choose appropriate Graph representations and solve real-world applications.
- Critically analyze the various sorting and searching algorithms.

**TEXT BOOKS:**

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2016.
2. Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2014.

**REFERENCES:**

1. Narasimha Karumanchi, "Data Structure and Algorithmic Thinking with Python: DataStructure and Algorithmic Puzzles", Career Monk Publications, 2020.
2. Jean-Paul Tremblay and Paul Sorenson, "An Introduction to Data Structures with Application", McGraw-Hill, 2017.
3. Mark Allen Weiss, "Data Structures and Algorithm Analysis in Java", Third Edition, Pearson Education, 2012.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second Edition, University Press, 2008.
5. Ellis Horowitz, Sartaj Sahni, Dinesh P Mehta, "Fundamentals of Data Structures in C++", Second Edition, Silicon Press, 2007.



<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21EM111</b>	<b>ENGINEERING PRACTICES LABORATORY</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(Common to I semester ME & II semester CSE, ECE, AI&DS)**

### **OBJECTIVES:**

Students completing this course are expected to:

- Use suitable tools for making carpentry components and pipe connections for plumbing works.
- Apply the welding techniques to join the structures
- Demonstrate the basic machining operations, working of centrifugal pump, Air conditioner, and operations of smithy, foundry
- Measure various electrical quantities
- Explain the working of electronic components and its utilization.

### **GROUP A (CIVIL & MECHANICAL)**

#### **I CIVIL ENGINEERING PRACTICE**

**15**

#### **Buildings:**

- a. Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

#### **Plumbing Works:**

- a. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
- b. Study of pipe connections requirements for pumps and turbines.
- c. Preparation of plumbing line sketches for water supply and sewage works.
- d. Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
- e. Demonstration of plumbing requirements of high-rise buildings.

#### **Carpentry using Power Tools only:**

- a. Study of the joints in roofs, doors, windows and furniture.

- b. Hands-on-exercise: Woodwork, joints by sawing, planning and cutting.

## **II MECHANICAL ENGINEERING PRACTICE**

**15**

### **Welding:**

- (a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
- (b) Gas welding practice

### **Basic Machining:**

- (a) Simple Turning and Taper turning
- (b) Drilling Practice

### **Sheet Metal Work:**

- (a) Forming & Bending:
- (b) Model making – Trays and funnels.
- (c) Different type of joints

### **Machine assembly practice:**

- (a) Study of centrifugal pump
- (b) Study of air conditioner

### **Demonstration on:**

- (a) Smithy operations, upsetting, swaging, setting down and bending. Example Exercise – Production of hexagonal headed bolt.
- (b) Foundry operations like mould preparation for gear and step cone pulley.
- (c) Fitting: Exercises – Preparation of square fitting and V – fitting models.

## **GROUP B (ELECTRICAL & ELECTRONICS)**

### **III ELECTRICAL ENGINEERING PRACTICE**

**15**

1. Study of various safety measures in Electrical System
2. Draw and demonstrate the layout for a residential house wiring using energy meter, switches, fuse, indicator, LED lamp, fluorescent lamp with one of the lamps to be controlled by 2 different switches
3. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit (series and parallel circuit).
4. Measurement of energy using single-phase energy meter for incandescent lamp and LED lamp.
5. Measurement of resistance to earth of an electrical equipment

#### **IV ELECTRONICS ENGINEERING PRACTICE**

**15**

1. Study of Electronic components (fixed and Variable):
  - i. Resistor – Measurement of resistance using colour coding and digital multimeter.
  - ii. Capacitor – Measurement of capacitance using identification code, LCR meter
  - iii. Inductor – Measurement of inductance using colour coding and LCR meter
2. Study of Electronic equipment:
  - i. Signal generation using AFO (sine, square, triangle for various frequency and amplitude ranges)
  - ii. Measurement of amplitude, frequency, peak-peak, RMS, period, DC level of sine, square and triangle waveform using CRO and DSO.
  - iii. Measurement of DC voltage and current using analog and digital meters
3. Study of Electronic accessories:
  - i. Circuit connection using Breadboard and wires.
  - ii. Circuit connection using general purpose PCB by Soldering practice techniques.
4. Study of logic gates AND, OR, EX-OR and NOT by demonstration.
5. Generation of Clock Signal.
6. Measurement of ripple factor of HWR and FWR.
7. Study of Iron box, fan and regulator (resistive and electronics type), emergency lamp, Power Tools: (a) Range Finder (b) Digital Live-wire detector

**TOTAL PERIODS : 60**

#### **OUTCOMES:**

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

- Classify the Tools and Techniques used for Carpentry work and Sheet Metal Fabrication.
- Use welding equipments to join the structures.
- Demonstrate the pipe fittings for plumbing works.
  - Carry out simple wiring as per the layout given
  - Measures various electrical parameters like Voltage,

Current, Power factor, Energy, Earth resistance etc.

- Calculate ripple factor of a given waveform, use logic gates for simple applications.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21CS211</b>	<b>DATA STRUCTURES LABORATORY</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(Common to CSE, ECE & AI&DS)**

**OBJECTIVES:**

- To implement the basic data structures for solving simple problems.
- To implement linear and non-linear data structures
- To understand the different operations of search trees
- To implement graph traversal algorithms
- To get familiarized to sorting and searching algorithms

**LIST OF EXPERIMENTS:**

1. Array Manipulation
  - a. Find kth smallest element in an unsorted array
  - b. Find the sub array with given sum
  - c. Matrix manipulations – Addition, Subtraction, Multiplication
  - d. Job Sequencing: Given an array of jobs where every job has a deadline and a profit. Profit can be earned only if the job is finished before the deadline. It is also given that every job takes a single unit of time, so the minimum possible deadline for any job is 1. How to maximize total profit if only one job can be scheduled at a time. Print the sequence of job ID order to maximize total profit.
2. String manipulations:
  - a. Reversing a set of words and count the frequency of each letter in the string.
  - b. Pattern Recognition - Find the number of patterns of form 1[0]1 where [0] represents any number of zeroes (minimum requirement is one 0) there should not be any other character except 0 in the [0] sequence in a given binary string.
  - c. Remove all the occurrences of string S2 in string S1 and print the remaining.
3. Pointers
  - a. Manipulating two dimensional arrays using pointers.
  - b. Print all permutations of a given string using pointers.
4. Dynamic Memory Allocation

- a. Find Largest Number.
- b. Print the list in reverse order.
5. Array implementation of List, Stack and Queue ADTs.
6. Linked list implementation of List, Stack and Queue ADTs.
7. Applications of List, Stack and Queue ADTs.
8. Implementation of Binary Trees and operations of Binary Trees.
9. Implementation of Binary Search Trees.
10. Implementation of AVL Trees.
11. Implementation of Heaps using Priority Queues.
12. Graph representation and Traversal algorithms.
13. Implement searching and sorting algorithms. Analyze and compare the time taken for various algorithms with best, average and worst case inputs.

**TOTAL PERIODS: 60**

**OUTCOMES:**

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

- Write functions to implement linear and non-linear data structure operations.
- Suggest and use appropriate linear / non-linear data structure operations for solving a given problem.
- Implement different operations of search trees.
- Implement appropriate Graph representations and traversals to solve real-world applications.
- Implement and analyze the various searching and sorting algorithms.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>21EL211</b>	<b>ADVANCED READING AND WRITING LABORATORY</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**(Common to all branches)**

**OBJECTIVES:**

The Course will enable learners to:

- Acquire a wide range of reading and writing techniques.
- Strengthen the reading skills.
- Enhance technical writing skills.
- Develop critical thinking skills.

**UNIT I**

**06**

**Reading** - Strategies for effective reading - **Writing** -Write a descriptive paragraph - Predicting content using photos and titles.

**UNIT II**

**06**

**Reading** - Use of graphic organizers to review and aid comprehension. **Writing** - Write an opinion paragraph

**UNIT III**

**06**

**Reading** - speed reading techniques - **Writing** - Elements of a good essay- Analytical Essay.

**UNIT IV**

**06**

**Reading** - Genre and Organization of Ideas – **Writing** - Email writing - Job application

**UNIT V**

**06**

**Reading** - Critical reading and thinking -**Writing** - letter of recommendation - Vision statement

**TOTAL PERIODS: 30**

**OUTCOMES:**

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

- Comprehend and interpret pictures and titles.

- Review texts using transcoding.
- Read various texts using speed reading techniques.
- Write effective emails, job applications, and persuasive recommendations.
- Display critical thinking in various professional contexts.

### **TEXT BOOKS:**

1. Daise, Debra., Norloff, Charl., and Carne, Paul. Reading and Writing (Level 4)Oxford: Oxford University Press, 2011.
2. Ward, Colin S., and Margot, Gramer F. Reading and Writing (Level 3) Oxford: OxfordUniversity Press, 2011.

### **REFERENCES:**

1. Liss, Rhonda., and Davis, Jason. Effective Academic Writing (Level 3). Oxford: Oxford University Press, 2014.
2. Elbow, Peter. Writing Without Teachers. London: Oxford University Press, 1998. Print.
3. Suresh Kumar, E., Sandhya, B. Savithri, J., and Sreehari, P. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2014.
4. Goatly, Andrew. Critical Reading and Writing. New York: Routledge, 2000.
5. Petelin, Roslyn., and Durham, Marsha. The Professional Writing Guide: Knowing Well and Knowing Why. Warriewood, NSW: Business & Professional Publishing, 2004.
6. Withrow, Jeans., Brookes, Gay., and Cummings, Martha Clark. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge: Cambridge University Press, 2004.