

**Acharya Nagarjuna University**  
**Faculty of Engineering**  
**Academic Regulations 2020 (R20) for B. Tech (Regular)**

(Applicable for the students admitted during the  
Academic Year 2020-2021 and onwards)

**1. Eligibility for Admission:**

Admission to the above program shall be made subject to the eligibility, qualification and specialization prescribed by the University for each program from time to time.

- i. Admission shall be made either on the basis of merit/rank obtained by the qualifying candidates in EAMCET/ECET or otherwise specified, whichever is relevant.

The duration of B.Tech program is of four academic years divided into eight semesters comprising of two semesters in each academic year. A student is required to choose a branch of study at the time of admission. Students under lateral entry will be admitted straightaway into Third semester of B.Tech course in the respective branch. No change of branch shall be allowed after the admissions are closed.

**2. Award of B.Tech. Degree:**

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

- i. Regular entry students shall pursue a course of study for not less than four academic years and in not more than eight academic years.
- ii. Student's who fail to fulfill all the academic requirements for the award of the degree within eight academic years (for Regular Entry) / six academic years (for Lateral Entry) from the year of their admission, shall forfeit their seat in B.Tech course and their admission is cancelled.

*Completing the course of study shall mean not only satisfying the attendance requirements but also passing of all the subjects within the respective stipulated period*

**3. Branches of study:**

The following Branches of study are offered at present for B. Tech. degree

**S.No. Branch**

1. Civil Engineering
2. Electrical and Electronics Engineering.
3. Mechanical Engineering.
4. Electronics and Communication Engineering
5. Computer Science and Engineering.

and any other branch as approved by the authorities of the University from time to time.

#### 4. BASIC STRUCTURE FOR ENGINEERING BRANCHES

##### Semester I (First year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	Basic Science course			3	0	0	3
2	Basic Science course			3	0	0	3
3	Humanities and Social science			3	0	0	3
4	<b>*Engineering Science Courses</b>			<b>1</b>	<b>0</b>	<b>4</b>	<b>3</b>
5	Engineering Science Courses			3	0	0	3
6	Humanities and Social science LAB			0	0	3	1.5
7	Basic Science course (LAB)			0	0	3	1.5
8	Engineering Science Courses (LAB)			0	0	3	1.5
<b>Total credits</b>							<b>19.5</b>

Category	CREDITS
Basic Science course	7.5
Engineering Science Courses	7.5
Humanities and social science	4
<b>TOTAL CREDITS</b>	<b>19.5</b>

\*Breakup of credits for Engineering Graphics/Engineering Workshop shall be 1-0-4 (as per AICTE model curriculum)

##### Semester II (First year)

Sl. No.	Category	Code	Course Title	Hours per week			Credits
1	Basic Science courses			3	0	0	3
2	Basic Science courses			3	0	0	3
3	Engineering Science Courses			3	0	0	3
4	Engineering Science Courses			3	0	0	3
5	Engineering Science Courses			1	0	4	3
6	Engineering Science Courses (LAB)			0	0	3	1.5
7	Basic Science course (LAB)			0	0	3	1.5
8	Engineering Science Courses (LAB)			0	0	3	1.5
	Mandatory course (AICTE suggested)			2	0	0	0
<b>Total credits</b>							<b>19.5</b>

Universities/Institutions may swap a few courses between 1<sup>st</sup> and 2<sup>nd</sup> semesters to balance the work load of teaching and laboratory schedule.

Category	CREDITS
Basic Science course	7.5
Engineering Science Courses	12
<b>TOTAL CREDITS</b>	<b>19.5</b>

**Semester III (Second year)**

Sl.No	Category	Code	Course Title	Hours per week			Credits
1	Basic Science courses			3	0	0	3
2	Professional Core Course			3	0	0	3
3	Professional Core courses			3	0	0	3
4	Professional Core courses			3	0	0	3
5	Professional Core courses			3	0	0	3
6	Professional Core courses (LAB)			0	0	3	1.5
7	Professional Core courses (LAB)			0	0	3	1.5
8	Professional Core courses (LAB)			0	0	3	1.5
	<b>Skill oriented course*</b>			<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>
	Mandatory course (AICTE suggested)			2	0	0	0
				<b>Total credits</b>			<b>21.5</b>

Category	CREDITS
Basic Science course	3
Professional core Courses	16.5
<b>Skill oriented course*</b>	<b>2</b>
<b>TOTAL CREDITS</b>	<b>21.5</b>

**Semester IV (Second year)**

S.No	Category	Code	Course Title	Hours			Credits
				<b>L</b>	<b>T</b>	<b>P</b>	
1	Engineering Science Courses			3	0	0	3
2	Basic Science Course /Prof core course			3	0	0	3
3	Professional Core courses			3	0	0	3
4	Professional Core courses			3	0	0	3
5	Humanities and Social Sciences			3	0	0	3
6	Engineering Science Courses/Prof Core (Interdisciplinary) (LAB)			0	0	3	1.5
7	Professional Core courses (LAB)			0	0	3	1.5
8	Professional Core courses (LAB)			0	0	3	1.5
	<b>Skill oriented course*</b>			<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>
<b>Total credits</b>							<b>21.5</b>
<b>Internship 2 Months (Mandatory) during summer vacation</b>							
<b>Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)</b>				<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

Category	CREDITS
Basic Science Courses	3
Professional core Courses	9
Engineering Science Courses	4.5
<b>Skill oriented course*</b>	<b>2</b>
Humanities and Social Sciences	3
<b>TOTAL CREDITS</b>	<b>21.5</b>

**Semester V (Third year)**

S No	Category	Code	Course Title	Hours			Credits
				L	T	P	
1	Professional Core courses			3	0	0	3
2	Professional Core courses			3	0	0	3
3	Professional Core courses			3	0	0	3
4	Open Elective Course/Job oriented elective			2	0	2	3
5	Professional Elective courses			3	0	0	3
6	Professional Core courses Lab			0	0	3	1.5
7	Professional Core courses Lab			0	0	3	1.5
	<b>Skill advanced course/ soft skill course*</b>			<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>
	Mandatory course (AICTE suggested)			2	0	0	0
<b>Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)</b>				0	0	0	1.5
<b>Total credits</b>							<b>21.5</b>
<b>Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)</b>				<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

Category	CREDITS
Professional core Courses	12
Professional Elective courses	3
Open Elective Course/Job oriented elective	3
<b>Skill advanced course/ soft skill course*</b>	2
Summer Internship	1.5
<b>TOTAL CREDITS</b>	<b>21.5</b>

**Semester VI (Third year)**

SNo	Category	Code	Course Title	Hours			Credits
1	Professional Core courses			3	1	0	3
2	Professional Core courses			3	0	0	3
3	Professional Core courses			3	0	0	3
4	Professional Elective courses			3	0	0	3
5	Open Elective Course/Job oriented elective			2	0	2	3
6	Professional Core courses Lab			0	0	3	1.5
7	Professional Core courses Lab			0	0	3	1.5
8	Professional Core courses Lab			0	0	3	1.5
	<b>Skill advanced course/ soft skill course*</b>			<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>
	Mandatory course (AICTE)			2	0	0	0
<b>Total credits</b>							<b>21.5</b>
	<b>Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)</b>			<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**Industrial/Research Internship (Mandatory) 2 Months during summer vacation**

Category	CREDITS
Professional core courses	13.5
Professional Elective courses	3
Open Elective Course/Job oriented elective	3
<b>Skill advanced course/ soft skill course*</b>	2
Mandatory course (AICTE)	0
Industrial/Research Internship (Mandatory) 2 Months	-
<b>TOTAL CREDITS</b>	<b>21.5</b>

### Semester VII (Fourth year)

Sno	Category	Code	Course Title	Hours			Credits
1	Professional Elective courses			3	0	0	3
2	Professional Elective courses			3	0	0	3
3	Professional Elective courses			3	0	0	3
4	Open Elective Courses/ Job oriented elective			2	0	2	3
5	Open Elective Courses/ Job oriented elective			2	0	2	3
6.	<b>*Humanities and Social Science Elective</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
	<b>Skill advanced course/ soft skill course*</b>			1	0	2	2
<b>Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester)</b>				0	0	0	3
<b>Total credits</b>							<b>23</b>
<b>Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)</b>				<b>4</b>		<b>0</b>	<b>4</b>

\*There is a provision for the Universities/Institutions to implement AICTE mandatory course “Universal Human Values 2: Understanding Harmony” under Humanities and social science Elective in seventh semester for 3 credits.

Category	CREDITS
Professional Elective courses	9
Open Elective Course/Job oriented elective	6
Humanities and Social Science Elective	3
Skill advanced course/ soft skill course*	2
Industrial/Research Internship	3
<b>TOTAL CREDITS</b>	<b>23</b>

### Semester VIII (Fourth year)

Semester VIII (Fourth Year)							
Sl. No.	Category	Code	Course Title	Hours per week			Credits
1	Major Project	PROJ	Project Project work, seminar and internship in industry	0	0	0	12
	<b>INTERNSHIP (6 MONTHS)</b>						
<b>Total credits</b>							<b>12</b>

## 5. Curricular Framework for Regular and Honors B.Tech Programmes of all Branches

1. Award of the Degree: A student will be declared eligible for the award of B. Tech. degree if he/she fulfills the following:
  - i. Pursues a course of study in not less than four and not more than eight academic years.
  - ii. After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.
  - iii. Registers for 160 credits and must secure all the 160 credits.
  - iv. A student shall be eligible for the award of B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.
2. Structure of the Undergraduate Engineering program:

Every course of B. Tech. Program shall be placed in one of the nine categories as listed in table below:

S.No.	Category	Code	Suggested breakup of Credits (APSCHE)	Suggested breakup of Credits (AICTE)
1	Humanities and social science including Management courses	HSMC	10.5	12
2	Basic Science courses	BSC	21	25
3	Engineering science courses	ESC	24	24
4	Professional core Courses	PCC	51	48
5	Open Elective Courses	OEC	12	18
6	Professional Elective Courses	PEC	15	18
7	Internship, seminar, project work	PROJ	16.5	15
8	Mandatory courses	MC	Non-credit	Non-credit
9	Skill Oriented Courses	SC	10	-
<b>Total Credits</b>			<b>160</b>	<b>160</b>

3. Assigning of Credits:
  - 1 Hr. Lecture (L) per week - 1 credit
  - 1 Hr. Tutorial (T) per week - 1 credit
  - 1 Hr. Practical (P) per week - 0.5 credits
  - 2 Hours Practical (Lab)/week - 1 credit

4. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., shall be included in the guidelines issued by AICTE
5. All undergraduate students shall register for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.
6. Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.
7. Universities/Institutions may swap some of the courses between first and second semester to balance the work load.
8. The concerned Board of studies can assign tutorial hours to such courses wherever it is necessary, but without change in the total number of credits already assigned for semester.
9. There shall be 05 Professional Elective courses and 04 Open Elective courses. All the Professional & Open Elective courses shall be offered for 03 credits, wherever lab component is involved it shall be (2-0-2) and without lab component it shall be (3-0-0). If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.
10. All Open Electives are offered to students of all branches in general. However, a student shall choose an open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.

11. A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the Programme. Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.
12. The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.
13. Students shall undergo mandatory summer internships for a minimum of six weeks duration at the end of second and third year of the Programme. There shall also be mandatory full internship in the final semester of the Programme along with the project work.
14. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course.
15. Under graduate Degree with Honors/Minor shall be issued by the University to the students who fulfill all the academic eligibility requirements for the B. Tech program and Honors/Minor program. The objective is to provide additional learning opportunities to academically motivated students.

#### **6.Credits:**

- i. *Academic Year*: Two consecutive (one odd + one even) semesters constitute one academic year.
- ii. *Choice Based Credit System (CBCS)*: The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses).
- iii. *Credit*: A unit by which the course work is measured.

#### **7. Distribution and Weightage of Marks (Internal & External):**

- i. The performance of a student in each semester shall be evaluated subject-wise with a maximum of 100 marks for theory and 100 marks for practical subject.
- ii. For both theory and lab subjects the distribution shall be 30marks for Internal Evaluation and 70 marks for the External Evaluation.
- iii. There shall be five units in each of the theory subjects.



iv. For theory subjects, there shall be two midterm examinations during the semester. Each midterm examination shall consist of assignment for 10 marks and sessional test for 20 marks with duration of 150 minutes respectively.

First midterm examination shall be conducted for 50% coverage of syllabus and second midterm examination shall be conducted for remaining 50% of syllabus. Both the midterm exams are compulsory. Final midterm examination marks for a total of 30 marks shall be arrived at, by considering the 80% weightage (24 marks) to that midterm examination in which the student scores more marks and the remaining 20% (6 marks) for other midterm exam.

\*Note 1: The assignment test paper shall contain 6 questions of equal weightage and student is asked to answer any 2 questions randomly and shall be condensed for 10 marks, any fraction rounded off to the next higher mark.

\*Note 2: The sessional examination shall contain 3 questions out of which first question is objective(6marks) and compulsory and remaining two questions(7 marks each) having internal choice and shall be considered for 20 marks, any fraction rounded off to the next higher mark.

- v. For theory subjects, there will be 5 questions with following pattern in the End-Examination.
- a. All Questions have to be answered compulsorily.
  - b. All five questions, EITHER/OR type shall be followed with 14 marks for each.
  - c. In each question as mentioned in (c), one, two or more bits can be set.

vi. Further, whenever any theory subject with two parts is offered (combined subject), for ex: Electrical & Mechanical Technology, then there shall be only two parts Part A, Part B in the question paper.

First question objective can be equally divided into two parts.

Part – A: shall contain two questions, EITHER/OR type shall be followed with 14 marks for each.

Part – B: shall also contain two questions, EITHER/OR type shall be followed with 14 marks for each.

vii. Model Question paper for each theory course shall be prepared by the teacher within 15 days from the commencement of the semester and the same shall be forwarded to the Controller of Examinations through the Chairman, BOS concerned.

viii. For practical subjects there shall be a continuous evaluation during the semester for 30 internal marks and 70 end examination marks. Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the report of experiments/jobs( 10 marks for the record submitted and 5 marks for day to day work). The end examination for 15 marks (10 marks for experiment and 5 marks for viva-voce) shall be conducted by the laboratory teacher and another examiner from the same department.

\*Note: Day to day performance shall be recorded in student record(each experiment carries 10 marks, at least ten experiments should be done and average marks must be taken at the end of semester).

ix. For the subject having design and / or drawing, such as Engineering Drawing, Machine Drawing and Estimation, the distribution shall be 30 marks for internal evaluation and 70 marks for end examination. The Internal evaluation will be 10 marks for day-to-day work in the class that shall be evaluated by the concerned subject teacher based on the reports/submissions prepared in the class. Further, there shall be two midterm exams in a Semester for a duration of 2 hrs each, evenly distributed over the syllabi for 20 marks and the average marks of both the mid examinations shall be considered as internal test marks. The sum of day to day evaluation and the internal test marks will be the final internal marks for the subject.

x. Out of a total of 200 marks for the project work, 60 marks shall be for Internal Evaluation and 140 marks for the End Semester Examination (Viva-voce). The viva-voce shall be conducted by a committee consisting of Head of the Department, Project Supervisor and an External Examiner nominated by the Principal from the panel of 3 members proposed by Head of the Department. The project work shall start in IV year I semester and shall continue in the semester break. The evaluation of project work shall be conducted at the end of the IV year II semester. The Internal Evaluation shall be made on the basis of weekly progress (a minimum of 12 weeks and 2 marks for

each week progress) and at least two seminars (one at the beginning of IV B.Tech II semester (20 marks) and the other before submission of project work(12 marks) given by each student on the topic of his project.

xi. The laboratory records and internal test papers shall be preserved for minimum of 2 years in the respective departments and shall be produced to the Committees of the college as and when the same are asked for.

### **8.Attendance Requirements:**

- i. A student shall be eligible to appear for end semester examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- iii. Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.
- v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.
- vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the college. (a) A student is eligible to write the University examinations if he acquires a minimum of 50% in each subject and 75% of attendance in aggregate of all the subjects

### **9.Minimum Academic Requirements (For Regular Entry Students):**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.8

- i. A student who could not secure a minimum of 50% aggregate from midterm examination marks is not eligible to appear for the semester end examination and shall have to repeat that semester.
- ii. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, design, drawing subject or project if he secures not less than 40% of marks in the end examination and a minimum of 50% of marks in the sum total of the internal evaluation and end examination taken together. In the internship & project he/she should secure 40%. For practical examination if he secures not less than 50% of marks in the semester end examination.

- iii. A student shall be promoted from I to II year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 irrespective of back log subjects in I/IV B.Tech.
- iv. A student shall be promoted from II to III year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 and also must secure 70% of the credits of the subjects that have been studied up to I year II semester from irrespective of whether the candidate takes the end examination or not as per the normal course of study. At the time of commencement of class work, he must attain the required credits
- v. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 and also must secure 70% of the credits of the subjects that have been studied upto II year II semester. At the time of commencement of class work, he must attain the required credits and in case of getting detained for want of credits by sections ii and iii above, the student may make up the credits through supplementary exams of the above exams before the date of class work commencement of Third or Fourth year I semester respectively.

#### **10. Minimum Academic Requirements (For Lateral Entry Students):**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.9

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 40% of marks in the end examination and a minimum of 50% of marks in the sum total of the internal evaluation and end examination taken together. In the Seminar & Comprehensive viva-voce he/she should secure 40%.
- ii. A student who could not secure a minimum of 50% aggregate from midterm examination marks is not eligible to appear for the semester end examination and shall have to repeat that semester.
- iii. A student shall be promoted from II to III year only if he/she fulfils the academic requirements of attendance and internal marks as stipulated in clause 6 and 7 irrespective of back log subjects in II/IV B.Tech
- iv. A student shall be promoted from III to IV year only if he/she fulfils the academic requirement of attendance and internal marks as stipulated in clause 6 and 7 and also must secure **70%** of the subjects that have been studied up to III year I semester from

### 11.Promotion Rules:

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

### 12.Grading:

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

Marks Range	Level	Letter Grade	Grade Point
≥ 90	Outstanding	A+	10
80-89	Excellent	A	9
70-79	Very Good	B	8
60-69	Good	C	7
50-59	Fair	D	6
40-49	Satisfactory	E	5
< 40	Fail	F	0
-	Absent	Ab	0

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

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

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

where,  $C_i$  is the number of credits of the  $i^{\text{th}}$  subject and  $G_i$  is the grade

point scored by the student in the  $i^{\text{th}}$  course

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

$$\text{CGPA} = \Sigma (C_i \times S_i) / \Sigma C_i$$

where 'S<sub>i</sub>' is the SGPA of the  $i^{\text{th}}$  semester and C<sub>i</sub> is the total number of credits in that semester

- iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- iv. While computing the SGPA/CGPA, the subjects in which the student is awarded Zero grade points will also be included.
- v. *Grade Point*: It is a numerical weight allotted to each letter grade on a 10-point scale.
- vi. *Letter Grade*: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.
- vii. As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

$$\text{Equivalent Percentage} = (\text{CGPA} - 0.50) \times 10$$

### 13. Award of Class:

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

Class Awarded	CGPA Secured
First Class with Distinction	$\geq 7.5$
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 4.0 < 5.5$

### 14. Gap - Year:

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be

counted for the maximum time for graduation. An evaluation committee at university level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

### **15. Curricular Framework for Mandatory Internships**

1. Two summer internships each with a minimum of six weeks duration, done at the end of second and third years, respectively are mandatory. The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs.
2. Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee. The report and the oral presentation shall carry 40% and 60% weightages respectively.
3. In the final semester, the student should mandatorily undergo internship and parallelly he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.
4. The College shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

### **16. Curricular Framework for Skill oriented**

1. For skill oriented/skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.
2. Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature. (See Annexure 1 for model skill courses)
3. A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements.

The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

4. The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies as approved by the concerned BoS.
5. The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.
6. If a student chooses to take a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.
7. If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.
8. A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and appropriate grades/marks are to be approved by the University/Academic Council.

### **17. Curricular Framework for Honors Programme**

1. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.
2. A student shall be permitted to register for Honors program at the beginning of 4<sup>th</sup> semester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2<sup>nd</sup> semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4<sup>th</sup> semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.



3. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.
4. In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).
5. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.
6. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.
7. The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.
8. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component. (Model pool list is enclosed in the Annexure-2)
9. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.
10. The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

11. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.
12. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
13. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor’s degree.

#### **18. Curricular Framework for Minor Programme:**

1. a) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering  
b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.
2. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.
3. The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

4. There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.
5. The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.
6. A student shall be permitted to register for Minors program at the beginning of 4<sup>th</sup> semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) upto the end of 2<sup>nd</sup> semester without any history of backlogs. It is expected that the 3<sup>rd</sup> semester results may be announced after the commencement of the 4<sup>th</sup> semester. If a student fails to acquire 8 SGPA upto 3<sup>rd</sup> semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.
7. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).
8. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.
9. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

10. Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.
11. A committee should be formed at the level of College/Universities/department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.
12. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.
13. In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
14. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor’s degree.

### **INDUSTRIAL COLLABORATIONS (CASE STUDY)**

University-Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Universities in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Universities/Institutions (Autonomous) are permitted to design any number of Industry

oriented minor tracks as the respective BoS feels necessary. In this process the Universities/Institutions can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs. Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Universities/Institutions shall also explore the possibilities of collaborations with major Industries in the core sectors and professional bodies to create specialized domain skills.

### **19. Conduct and discipline**

Students shall conduct themselves within and outside the premises of the institute in a manner befitting the students of our institution.

As per the order of Honourable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.

The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

Lack of courtesy and decorum, indecent behavior anywhere within or outside the campus.

Willful damage of college / individual property

Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

(iv) Mutilation or unauthorized possession of library books.

Noisy and unseemly behavior, disturbing studies of fellow students.

(vi) Hacking of computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber-crime etc.)

(vii) Usage of camera / cell phone in the campus (viii) Plagiarism of any nature

(ix) Any other acts of gross indiscipline as decided by the academic council from time to time.

Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debar from examination, disallowing the use of certain facilities of the institute, rustication for a specified period or even outright expulsion from the institute or even handing over the case to appropriate law enforcement or the judiciary, as required by the circumstances.

For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief warden, the head of the department and the principal respectively, shall have the authority to reprimand or impose fine.

Cases of adoption of unfair means and / or any malpractice in an examination shall be reported to the principal for taking appropriate action.

All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the academic council.

The institute level standing disciplinary action committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

The principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the programmes committee in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved by the appropriate authority, shall be reported to the academic council for ratification.

“Grievance and Redressal Committee” (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters

## **20. Punishments for Malpractice Cases – Guidelines**

The examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators/squad members etc; during end examinations. The punishment may be more severe or less severe depending on the merits of the individual cases.

<b>S. No</b>	<b>Nature of Malpractices/Improper conduct</b>	<b>Punishment</b>
1.	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the	Expulsion from the examination hall and cancellation of the performance in that subject only.

	student which can be used as an aid in the subject of the examination)	
2.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
3.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.

4.	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
5.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year.
6.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year.
7.	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.



<p>or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means</p> <p>or misconduct or has the tendency to disrupt the orderly conduct of the examination.</p>	
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9.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 7 to 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects including practical examinations and project work of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
12.	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed

		<p>over to the police and a case is registered against him.</p> <p>The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination including practicals and project work of that semsester/year.</p> <p>The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat</p>
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13. If any malpractice is detected which is not covered in the above clauses 1 to 12 it shall be reported to the college academic council for further action to award suitable punishment.

14.	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.
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**ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNA NAGAR  
I/IV B. TECH (I SEM) CURRICULAM – R20**

**CIVIL ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	CE 111	MATHEMATICS - I	3
2	CE112	ENGINEERING CHEMISTRY	3
3	CE113	BASIC ELECTRICAL ENGINEERING	3
4	CE114	ENGINEERING GRAPHICS	3
5	CE115	COMPUTER PROGRAMMING WITH C	3
6	CE 151	MECHANICAL WORK SHOP	1.5
7	CE152	ENGINEERING CHEMISTRY LAB	1.5
8	CE153	COMPUTER PROGRAMMING LAB	1.5

**MECHANICAL ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	ME 111	MATHEMATICS - I	3
2	ME112	ENGINEERING CHEMISTRY	3
3	ME113	BASIC ELECTRICAL ENGINEERING	3
4	ME114	ENGINEERING GRAPHICS	3
5	ME115	COMPUTER PROGRAMMING WITH C	3
6	ME 151	MECHANICAL WORK SHOP	1.5
7	ME152	ENGINEERING CHEMISTRY LAB	1.5
8	ME153	COMPUTER PROGRAMMING LAB	1.5

**ELECTRONICS AND COMMUNICATION ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	EC 111	MATHEMATICS - I	3
2	EC112	ENGINEERING CHEMISTRY	3
3	EC113	Professional Communication Skills	3
4	EC114	ENGINEERING GRAPHICS	3
5	EC115	COMPUTER PROGRAMMING WITH C	3
6	EC 151	COMMUNICATION SKILLS LAB	1.5
7	EC152	ENGINEERING CHEMISTRY LAB	1.5
8	EC153	COMPUTER PROGRAMMING LAB	1.5

**ELECTRICAL AND ELECTRONICS ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	EE 111	MATHEMATICS - I	3
2	EE112	ENGINEERING PHYSICS	3
3	EE113	Professional Communication Skills	3
4	EE114	ENGINEERING MECHANICS	3
5	EE115	COMPUTER PROGRAMMING WITH C	3
6	EE116	ENVIRONMENTAL SCIENCE (MANDATORY)	0
7	EE 151	COMMUNICATION SKILLS LAB	1.5
8	EE152	ENGINEERING PHYSICS LAB	1.5
9	EE153	COMPUTER PROGRAMMING LAB	1.5

**COMPUTER SCIENCE AND ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	CS 111	MATHEMATICS - I	3
2	CS112	ENGINEERING PHYSICS	3
3	CS113	BASIC ELECTRICAL ENGINEERING	3
4	CS114	ENGINEERING MECHANICS	3
5	CS115	COMPUTER PROGRAMMING WITH C	3
6	CS116	ENVIRONMENTAL SCIENCE (MANDATORY)	0
7	CS 151	BASIC ELECTRICAL ENGINEERING	1.5
8	CS152	ENGINEERING PHYSICS LAB	1.5
9	CS153	COMPUTER PROGRAMMING LAB	1.5

**ACHARYA NAGARJUNA UNIVERSITY:: NAGARJUNA NAGAR**  
**I/IV B. TECH (II SEM) CURRICULAM – R20**

**CIVIL ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	CE 121	MATHEMATICS - II	3
2	CE122	ENGINEERING PHYSICS	3
3	CE123	Professional Communication Skills	3
4	CE124	PYTHON	3
5	CE125	ENGINEERING MECHANICS	3
6	CE126	ENVIRONMENTAL SCIENCE (MANDATORY)	0
7	CE 161	ENGINEERING PHYSICS LAB	1.5
8	CE162	COMMUNICATION SKILLS LAB	1.5
9	CE163	PYTHON LAB	1.5

**MECHANICAL ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	ME 121	MATHEMATICS - II	3
2	ME122	ENGINEERING PHYSICS	3
3	ME123	Professional Communication Skills	3
4	ME124	PYTHON	3
5	ME125	ENGINEERING MECHANICS	3
6	ME126	ENVIRONMENTAL SCIENCE (MANDATORY)	0
7	ME 161	ENGINEERING PHYSICS LAB	1.5
8	ME162	COMMUNICATION SKILLS LAB	1.5
9	ME163	PYTHON LAB	1.5

**ELECTRONICS AND COMMUNICATION ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	EC 121	MATHEMATICS - II	3
2	EC122	ENGINEERING PHYSICS	3
3	EC123	BASIC ELECTRICAL ENGINEERING	3
4	EC124	PYTHON	3
5	EC125	ENGINEERING MECHANICS	3
6	EC126	ENVIRONMENTAL SCIENCE (MANDATORY)	0
7	EC 161	ENGINEERING PHYSICS LAB	1.5
8	EC162	BASIC ELECTRICAL ENGINEERING LAB	1.5
9	EC163	PYTHON LAB	1.5

**ELECTRICAL AND ELECTRONICS ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	EE 121	MATHEMATICS - II	3
2	EE122	ENGINEERING CHEMISTRY	3
3	EE123	BASIC ELECTRICAL ENGINEERING	3
4	EE124	PYTHON	3
5	EE125	ENGINEERING GRAPHICS	3
6	EE 161	ENGINEERING CHEMISTRY LAB	1.5
7	EE162	BASIC ELECTRICAL ENGINEERING LAB	1.5
8	EE163	PYTHON LAB	1.5

**COMPUTER SCIENCE AND ENGINEERING**

S.NO	SUBJECT CODE	SUBJECT NAME	NO. OF CREDITS
1	CS 121	MATHEMATICS - II	3
2	CS122	ENGINEERING CHEMISTRY	3
3	CS123	Professional Communication Skills	3
4	CS124	PYTHON	3
5	CS125	ENGINEERING GRAPHICS	3
6	CS 161	ENGINEERING CHEMISTRY LAB	1.5
7	CS162	COMMUNICATION SKILLS LAB	1.5
8	CS163	PYTHON LAB	1.5

## **CIVIL ENGINEERING**

# MATHEMATICS-I

(Calculus & Algebra)  
(Common to all branches of Engineering)

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

## Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

## Unit II: Mean Value Theorems

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

## Unit III: Multivariable calculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

## Unit IV: Double Integrals

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves.

## Unit V: Special Functions

Beta and Gamma functions and their properties, relation between beta and gamma functions.

### Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

### References:

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.



**ENGINEERING CHEMISTRY**  
(COMMON TO CIVIL, MECH AND ECE)

L T P C  
3 0 3 3

**UNIT-I: WATER TECHNOLOGY**

Various impurities of Water, WHO guidelines, Hardness unit and determination by EDTA method, water treatment for drinking purpose-sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Water treatment for industrial purpose: Boiler troubles, scales, sludges, caustic embrittlement, boiler Corrosion, priming and foaming- causes and prevention, Internal conditioning -Phosphate, Calgon and Carbonate treatment, External conditioning-Lime Soda process (simple problems), softening by ion- Exchange process, Desalination of Brackish water by Electro dialysis and Reverse osmosis.

**UNIT-II: POLYMER CHEMISTRY**

Introduction to polymers, Functionality of monomers, chain growth and step growth polymerization, Co-polymerization (Stereo specific polymerization) with specific examples and mechanisms of polymer formation.

PLASTICS: Thermoplastics and Thermosetting, preparation, properties and applications of Bakelite, Elastomers, Preparation, properties and applications of BUNA-S and BUNA-N Rubbers. Conducting Polymers- Introduction, examples, general applications and mechanism of Conduction on Polyacetylene.

Chemistry of Nano materials: Introduction to nano chemistry, preparation of nano materials - carbon nanotubes and fullerenes and their engineering applications.

**UNIT-III: ELECTRO CHEMISTRY AND APPLICATIONS**

Electrodes-concepts, types of cells, electro chemical series, Nernst equation.

BATTERIES: Primary cell (Dry cell), Secondary cell (Lead-acid), Lithium batteries and their advantages, Fuel cell ( $H_2$ - $O_2$  cell).

Corrosion:

Types of corruptions- chemical corrosion, dry corrosion, electro chemical corrosion and wet corrosion, galvanic series, pitting and differential aeration of corrosion, factors affecting corrosion.

Corrosion control: Cathodic protection, Corrosion Inhibitors, Electro plating (Au) & (Ni).

Learning Outcomes:

**UNIT-IV: INSTRUMENTAL METHODS**

Electromagnetic spectrum-Absorption of Radiation: Beer-Lambert's law-Principle and applications of Ultra-Violet, Infra-Red and Nuclear Magnetic Resonance Spectroscopy. Principle and applications of Gas Chromatography and HPLC Techniques.

**UNIT-V:**

**(i) Cement and Concrete Chemistry:** Introduction to Building Materials, Portland Cement, Constituents, Manufacturing Process, Setting and Hardening Cement.

**(ii) Organic reactions and synthesis of a drug molecule:** Introduction to reactions involving substitution ( $SN_1$  and  $SN_2$ ), elimination reactions ( $E_1$  and  $E_2$ ), Synthesis of commonly used drug molecule – Aspirin and Paracetamol.

**Prescribed Text Books**

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. Shashi chawla, A text book of engineering chemistry, 3<sup>rd</sup> Edition, Dhanpat rai & co new delhi, 2007.

5. Gurudeep raj & chatwal anand , “Instrumental methods of analysis “, 7<sup>th</sup> edition,CBS publications,1986.
6. Quantitative analysis by day&underwood.
7. A Text book of Instrumental methods by Skoog and West.
8. H.W. Wilard and demerit, “Instrumental methods of analysis “, 7<sup>th</sup> edition,CBS publications,1986.
9. Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University press.

# Basic Electrical Engineering

(CIVIL, MECH & CSE)

**L-T-P-C**  
**3-1-3-5.5**

## **UNIT – I: DC & AC Circuits**

Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Nodal and loop analysis. Thevenin's and Superposition Theorems

Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits. Series Resonance and band width.

## **UNIT-II: Poly phase & Magnetic circuits**

Generation of 3-phase voltages - phase sequence - star & delta connections - voltage, current & power in star & delta connected systems - analysis of 3-phase balanced circuits - measurement of 3-phase power by 2 wattmeter method.

Faraday's Laws of Electromagnetic Induction .Dynamically induced EMF –Statically induced EMF – Self Inductance – Mutual Inductance - Coefficient of coupling –Inductances in Series – Inductances in parallel – Dot convention.

## **UNIT-III: DC Machines**

Principle and operation of DC Generator - EMF equation - OCC characteristics of DC generator – Principle and operation of DC Motor – Performance Characteristics of DC Motors - Speed control of DC Motors.

## **UNIT-IV: AC Machines:**

Principle and operation of Single Phase Transformer - EMF equations-losses in transformers, regulation and efficiency. OC and SC test on transformer – auto transformer.

Principle, operation and construction of Three phase Induction Motor –torque equation and torque slip characteristics-power losses and efficiency.

## **UNIT-V: Semiconductor Devices:**

Characteristics of Semiconductor junction Diode, Zener diode, transistor, JFET, UJT, SCR and their applications. Half-wave, Full-wave rectifiers and Bridge rectifier, with (L and LC) and without filters.

Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitter configuration, Transistor amplifying action, Common collector configuration, Operating point

## **Text Books:**

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

## **References:**

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

## **I YEAR I SEM**

### **Engineering Graphics**

**(CIVIL/MECHANICAL/ECE)**

#### **UNIT-I**

**Introduction to Engineering graphics:** Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions. Dimensioning principles and conventional representations

- a) Conic sections including the rectangular-hyperbola- general method only,
- b) Cycloid, epicycloids and hypocycloid
- c) Involute

**(2L + 6P hrs)**

#### **UNIT-II**

**Projection of points, lines and planes:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

**(2L + 6P hrs)**

#### **UNIT-III**

**Projections of solids:** Projections of regular solids inclined to one or both planes by rotational.

**(1L + 3P hrs)**

**Sections of solids:** Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

**(1L + 3P hrs)**

#### **UNIT-IV**

**Development of surfaces:** Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

**(1L + 6P hrs)**

**Isometric Projections:** Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

**(2L + 6P hrs)**

#### **UNIT-V**

Orthographic Projections: Systems of Projections, Orthographic Projection (Simple Figures)

**(3L+9P hrs)**

#### **UNIT-VI**

**(DEMONSTRATION ONLY)**

Computer Aided Drafting(Using any standard package): Setting up a drawing: starting ,main menu (New, Open, Save, Save As etc.), Opening screen, error correction on screen,units, co-ordinate system, limits, grid, snap, ortho.

Tool bars: Draw tool bar, object snap tool bar, modify tool bar, dimension tool Bar

Practice of 2D Drawings: Exercises of Orthographic views for simple solids using all commands in various tool bars.

## TEXTBOOKS

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

## Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. BasantAgarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.
6. Youtube: [http://sewor,Carleton.ca/gkardos/88403/drawings.html](http://sewor.Carleton.ca/gkardos/88403/drawings.html) conic sections-online, red woods.edu

**CE/ME/EE/EC/CS 115 (R20)**

## **CS 115 Problem Solving and Programming(Using C)**

**(Common to all branches)**

**L-T-P-C :**

**3-1-3-5.5**

### **Unit – 1: Flowchart design through Raptor**

Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers

Example problems(section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

### **Unit 2: C Basics**

C-Basics: C-character set, Data types, Constants, Expressions, Structure of C program, Operators and their precedence & associativity, Simple programs in C using all the operators, Type casting ,type coercion.

### **Unit 3: Control Structures and Functions**

Control Structures, Basic input and output statements, Preprocessor directives.

Functions: Concept of a function, passing the parameters, automatic variables, scope and extent of variables, storage classes, recursion, iteration vs recursion, types of recursion, Simple recursive and non recursive programs, Towers of Hanoi problem.

#### **Unit 4: Arrays and Pointers**

Arrays: Single and multidimensional Arrays, Character array as a string, string functions, Programs using arrays and string manipulation.

Pointers: Pointers declarations, Pointer expressions, Pointer parameters to functions. Pointers, Pointers and array, Pointer arithmetic.

#### **Unit 5: Structures and Files**

Structures: Declaring and using structures, operations on structures, structures and arrays, user defined data types, pointers to structures. Command line arguments.

Files: Introduction, file structure, file handling functions, file types, file error handling, Programs using file functions.

#### **Text Books:**

1. <https://raptor.martincarlisle.com/>
2. Programming with C-Gottfried-Schaums Outline Series-TMH
3. C Programming – AnithaGoel/Ajay Mittal/E.Sreenivasa Reddy-Pearson India

#### **References:**

1. Problem Solving with C- Somasekharan-PHI.
2. C Programming- Behrouz A forouzan – CENGAGE Learning
3. Test your c skills-Yaswanthkanithker
4. Let us C- Yaswanthkanithker

**CE/ME 151 (R20)**

**I B. Tech I Semester**

### **Mechanical Engineering Workshop (CIVIL & MECH)**

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

#### **Foundry Practice: (2 Sessions)**

- i. a) Determination of average grain size for sand sample using sieve shaker  
b) Preparation of a green sand mould using single piece pattern
- ii. Preparation of a green sand mould using split piece pattern with core and demonstration of casting.

#### **Welding Practice: (2 Sessions)**

- i. Lap joint, butt joint and T joint using arc welding.
- ii. a) Lap joint using resistance spot welding

b) Lap and butt joints using gas welding

**Assembling/Disassembling Practice: (3 Sessions)**

- i. Bicycle
- ii. Clutch and carburetor
- iii. Two wheeler engine

**Manufacture of a Plastic Component (2 Sessions)**

- i. Use of injection moulding machine
- ii. FRP composite using hand layup method
- iii. Joining of plastic components

**Design and manufacture any two domestic utility products with any material (2 Sessions)**

**Use of Power Tools (2 Sessions)**

**ENGINEERING CHEMISTRY LABORATORY**

## Course Objectives:

- Verify the fundamental concepts with experiments

## LIST OF EXPERIMENTS:

1. Determination of hardness of water by EDTA method
2. Estimation of Mohr's salt by Permanganometry
3. Estimation of Mohr's salt by Dicrometry
4. Determination of alkalinity of water
5. Percentage of purity of washing soda
6. Determination of available chlorine in bleaching powder
7. Preparation of Urea-formaldehyde resin
8. Determination on strength of NaoH using HCl conductometrically
9. Acid-Base titration by P<sup>H</sup> meter
10. Acid-Base titration by Potentiometer
11. Determination of viscosity of lubricating oil
12. Determination of Surface tension

## Course Outcomes:

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

- measure the strength of an acid present in secondary batteries (L3)
- determine the cell constant and conductance of solutions (L3)
- prepare advanced polymer materials (L2)
- determine the physical properties like surface tension, adsorption and viscosity (L3)
- estimate the Iron and Calcium in cement (L3)
- calculate the hardness of water (L4)



## Problem Solving & Programming Using C Lab

### Cycle 1:

1. Construct flowcharts to
  - a. calculate the maximum, minimum and average of N numbers
  - b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
2. Construct flowcharts with separate procedures to
  - a. calculate simple and compound interest for various parameters specified by the user
  - b. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
3. Construct flowcharts with procedures to
  - a. generate first N numbers in the Fibonacci series
  - b. generate N Prime numbers
4. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
5. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
6. Design a flowchart to determine the number of characters and lines in a text file specified by the user

### Cycle 2:

- 1.Exercises on data types and operators?
  - a) Practice exercises 3.1 to 3.16 and 4.1 to 4.17 and 14.1 to 14.20 Test your C Skills - yaswanthkanitkar text book.
  - b) Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
  - c) Write a program to find greatest of three numbers using conditional operator?
  - d) Write a program to swap two numbers with and without temp variable?
  - e) Practice a program using multiple unary increment and decrement operators in arithmetic expressions?
2. Exercises on control structures?
  - a) Practice exercise 2.1 to 2.15 Test your C Skills - yaswanthkanitkar text book.
  - b)Write a program to find greatest of three numbers? Use nested if, if else if and switch statements?
  - c) Write a program to read marks of a student and print the sum and average?
  - d) Display the grade based on the sum of marks?
  - e) write a program to count the digits of a number? Use for loop
  - f) Write a program to check whether a number is perfect or not? Use do-while
  - g) Write a program to check whether a number is strong or not? Use while
  - h) Write a program to check whether a number is amstrong or not? Use for
  - i) Write a program to check whether a number is palindrome or not? Use for
  - j) Write a program to find the Fibonacci series upto the given number? Use while
  - k) Write a program to print the pascals triangle? Used do-while
  - l) Write a program to print the result of the series  $1+x^2/2+x^3/3+\dots+x^n/n$

### 3. Exercises on functions?

- a) Practice exercise 5.1 to 5.14 Test your C skills –yaswanth kanitkar text book.
- b) Write program to swap two variables using functions? Write a program to perform menu driven arithmetic operations using functions?
- c) Write a program to find the factorial of a number using recursive and non- recursive functions?
- d) Write a program to find the Fibonacci series using recursive functions?
- e) Write a program to find the solution for towers of Hanoi using recursive function?
- f) Write a program to pass parameters to a functions using call by value and call by reference?

### 4. Exercises on Arrays?

- a) Practice exercise 9.1 to 9.17 Test your C skills – yaswanth kanitkar text book.
- b) Write a program to read n numbers and sort them?
- c) Write a program to find the minimum and maximum numbers of the array?
- d) Write a program to read two matrices and find their sum, difference and product of them?
- e) Find the transpose of a matrix?
- f) Write a program to print upper and lower triangle of a given matrix?

### 5. Exercises on strings?

- a) Practice exercise 10.1 to 10.15 yaswanth kanitkar text book.
- b) Write a program to demonstrate the use of string manipulation functions?
- c) Write a program to compare two strings?
- d) Write a program to sort the names in Alphabetical order?

### 6. Exercises on pointers?

- a) Practice exercise 7.1 to 8.26 yaswanth kanitkar text book.
- b) Write a program to read dynamic array and sort the elements?
- c) Write a program to read dynamic array and find the minimum and maximum of the elements?
- d) Write a program to perform pointer arithmetic?
- e) Write a program on pointers for strings?
- f) Write a program to use array of pointers?

### 7. Exercises on structures?

- a) Practice exercise 11.1 to 11.30 yaswanthkanitkar text book.
- b) Write a program to create student structure and read marks of three subjects and find the sum and total of the student?
- c) Write a program on arrays of structures for 60 students record using the above student structure?

- d) Write a program for complex structure? Perform addition, subtraction and multiplication of two complex numbers?
- e) Write a program for addition and multiplication of two polynomials?

8. Write a program on Files?

- a) Practice exercise 12.1 to 12.20 yaswanthkanitkar text book.
- b) write a program to append content of a file?
- c) Write a program to display the content of a file?
- d) Write a program to copy content of one file to other file?
- e) Write a program to count the no of characters in a file?
- f) Write a program to compare the contents of two files?

**References:**

1. Test your C Skills by – YaswanthKanithkar-BPB Publishers
2. C programming; Test your skills-A.N.Kamthane-Pearson India

**Mathematics-II**  
**(ODE, PDE and Multivariable Calculus)**  
**(Common to all branches)**

**UNIT I: Linear Differential Equations of Higher Order**

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

**UNIT II: Equations Reducible to Linear Differential Equations and Applications**

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, **UNIT**

**III: Partial Differential Equations – First order****8 hrs**

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Solutions to homogenous and non-homogenous higher order linear partial differential equations.

**UNIT IV: Multivariable Calculus (Vector differentiation)**

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

**UNIT V: Multivariable Calculus (Vector integration)**

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

**Textbooks:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

**References:**

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

**UNIT-I:****(10 hrs)**

**Interference :** Principle of Superposition-Interference of light-Theory of Interference fringes-Conditions for sustained Interference-Interference in thin films by reflected light-Newton's Rings-Determination of Wavelength.

**Diffraction:** Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum -Determination of Wavelength.

**UNIT-II****(12 Periods)**

**Lasers:** Laser characteristics, Spontaneous and Stimulated emissions, Basic requirements of a laser, Population inversion – Solid state laser (Ruby laser), Gas (He-Ne) laser, Semiconductor (GaAs) laser, applications of lasers.

**Fiber optics:** Introduction to Optical Fibers-Principle of optical fiber-Critical angle, Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, Modes-Propagation of electromagnetic wave through optical fiber - Fiber optic Communication system-applications of Optical fibers.

**Unit – III****(14 hrs)**

**Dielectrics:** Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations-Lorentz (internal) field - Claussius -Mossotti equation.

**Magnetics:** Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment-Classification of Magnetic materials-Hysteresis-soft and hard magnetic materials- applications of magnetic materials.

**Unit – IV: Semiconductors****(12 hrs)**

Origin of energy band formation in solids-Classification of materials into conductors, semi- conductors & insulators – Semiconductors-Intrinsic semiconductors-dependence of Fermi level on carrier concentration and temperature(Qualitative)- Extrinsic semiconductors - P-type & N-type-dependence of Fermi level on carrier concentration and temperature (Qualitative)- Direct and Indirect band gap semiconductors-Hall effect- applications of Semiconductors.

**Unit-V****(12 hrs)**

**Principles of Quantum Mechanics:** Dual nature of light, Matter waves & properties, de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and application (non-existence of electron in nucleus). One dimensional time independent Schrodinger's wave equation, Physical significance of the wave function, Particle in a box (one dimensional).

**Superconductivity:** First experiment, critical parameters (T<sub>c</sub>, H<sub>c</sub>, I<sub>c</sub>), Meissner effect, BCS Theory (in brief) and Applications of superconductors.

**Text books:**

1. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017
2. H.K.Malik & A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018
3. Gaur R.K. and Gupta S.L., "Engineering Physics"- Dhanpat Rai publishers, 2012

**Reference Books:**

1. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill ,2008
2. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
3. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015

# Professional Communication Skills

[L: 3; T: 0; P: 0 (3 credits)]

Lectures: 3 Periods/week

Sessional Marks: 30

University Exam: 3 Hrs.

University Examination Marks: 70

## Syllabus:

UNIT-1: 8 Hrs.

1. Reading: Listening Skills – The Boy who broke the Bank (English & Soft Skills)
2. Writing: Paragraph Writing
3. Grammar: Common Errors in Nouns- Pronoun Agreement
4. Vocabulary Building: Functional word list -100

UNIT- II: 8 Hrs.

1. Reading: Assertive Skills – The Verger (English & Soft Skills)
2. Writing: Letter Writing (Formal and Informal)
3. Grammar: Correction of Errors in Subject- Verb Agreement
4. Vocabulary Building: Sign Post

UNIT - III: 8 Hrs.

1. Reading: Learning Skills – Three Questions (English & Soft Skills)
2. Writing: Note Making, Note Taking
3. Grammar: Correction of in Tense Usage
4. Vocabulary Building: One Word Substitutes

UNIT - IV: 8 Hrs.

1. Reading: Adaptability Skills – Senor Payroll (English & Soft Skills)
2. Writing: Pictorial Description
3. Grammar: Correction of Errors in Adjectives, Articles, Prepositions
4. Vocabulary Building: Synonyms and Antonyms

UNIT - V: 8 Hrs.

1. Reading: Written Communication Skills - Gateman's Gift (English & Soft Skills)
2. Writing: Information Transfer
3. Grammar: Correction of Errors in Wh- questions, Question Tags

#### 4. Vocabulary Building: Idioms and Phrasal Words (200)

#### **TEXT BOOK:**

- Dhanavel S. P. *English and Soft Skills*, Orient Black Swan Pvt. Limited, 2013.
- Barun K Mitra, *Effective Technical Communication*, Oxford University Publication, 2014.

#### **REFERENCE BOOKS:**

1. Bailey, Stephen. *Academic writing: A handbook for International Students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2<sup>nd</sup> Edition, 2018.
3. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4. Michael Swan. *Practical English Usage*, OUP. 1995.
5. F.T. Wood. *Remedial English Grammar*, Macmillan.2007
6. Liz Hamp-Lyons and Ben Heasley. *Study Writing*, Cambridge University Press. 2006.
7. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.
8. Sharon J.Gerson, Steven M.Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
9. Sanjay Kumar and Pushp Lata, *Communication Skills*, Noida: Oxford University Press, 2012.
10. Dr. Shalini Verma, *Word Power Made Handy*, S. Chand & Co Ltd., 2009.

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**Unit I****12 hours**

**Introduction to Engineering Mechanics:** Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

**Friction:** Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction. Free body diagrams involving frictional forces.

**Unit II****10 hours**

**Analysis of Structures:** Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.

**Properties of Surfaces and Volumes:** Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-Guldinus.

**Unit III****10 hours**

**Moment of Inertia:** Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes - thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

**Learning****Outcomes:****Unit IV****10 hours**

**Kinematics:** Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity -projectile motion, use of rectangular coordinates, tangential and normal coordinates.

**Unit V****10 hours**

**Kinetics:** Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.

**Ideal Systems:** Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse.

**Textbo****oks:**

1. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
2. S Timoshenko, DH Young, JV Rao, SukumarPati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 20
3. S SBhavikatti, Engineering Mechanics, 4/e, New Age International, 2008.

**Reference Books:**

1. Basudeb Bhattacharya., Engineering Mechanics, 2/e, Oxford University Press (India), 2015.
2. Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynam-ics, 4/e, Pearson, 2009.
3. K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 2010



**Environmental Science**  
**(Common to CE/ME/EC)**

**UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II: Ecosystems, Biodiversity, and its Conservation**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION :** Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT – III: Environmental Pollution and Solid Waste Management**

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

**SOLID WASTE MANAGEMENT :** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

**UNIT – IV: Social Issues and the Environment**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

## **UNIT – V: Human Population and the Environment**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK :** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

### **TEXT BOOKS :**

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

### **REFERENCES :**

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

CE/ME/EC161(R20)

**ENGINEERING PHYSICS LABORATORY SYLLABUS**

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

**Learning Outcomes:**

**List of Physics Experiments**

1. Determination of the radius of curvature of the lens by Newton's ring method.
2. Determination of wavelength by plane diffraction grating method.
3. Dispersive power of a Prism.
4. Resolving power of a grating.
5. Photo cell – I-V Characteristic curves and determination of stopping potential.
6. Magnetic field along the axis of a circular coil carrying current.
7. B-H Curve
8. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
9. Hall effect.
10. Photo voltaic cell - Determination of fill-factor.
11. To determine the energy gap of a semiconductor.
12. Determination of Acceleration due to gravity by using compound Pendulum.
13. Poisson's ratio of aluminium and rubber.
14. Rigidity modulus of material by wire-dynamic method (torsional pendulum).
15. Determination of a.c. Frequency – Sonometer.
16. Determine the wavelength of Laser source.

**References:**

1. S. Balasubramanian , M.N. Srinivasan “ A Text book of Practical Physics”- S Chand Publishers, 2017
2. <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University

**Communicative English Lab**

Lectures: 3 Periods

University Exam: 3 hours

Sessional Marks: 30

University Examination Marks: 70

**List of Activities**

1. Identifying phonic sounds, listening to the sounds, practice and record the sounds from the English learning software
2. Common mispronounced words
3. Listening to the short audios and complete the tasks based on the audios
4. Listening to motivational speeches and answering the questions
5. Comprehending Spoken material in British English & American English
6. Situational Dialogues
7. Role plays
8. Reading comprehension exercises for GRE, TOEFL, GATE etc
9. Reading articles from newspaper
10. Specific reading for enhancing vocabulary
11. Vocabulary building exercises
12. Extempore
13. JAM sessions
14. Small talks
15. Oral presentations

# MECHANICAL ENGINEERING

CE/ME/EE/EC/CS 111(R20)

## MATHEMATICS-I

(Calculus & Algebra)  
(Common to all branches of Engineering)

L	T	P	C
3	0	0	3

### Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

### Unit II: Mean Value Theorems

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

### Unit III: Multivariable calculus

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

### Unit IV: Double Integrals

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves.

### Unit V: Special Functions

Beta and Gamma functions and their properties, relation between beta and gamma functions.

### Textbooks:

3. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
4. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

### References:

4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
6. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

**ENGINEERING CHEMISTRY**  
(COMMON TO CIVIL, MECH AND ECE)

L T P C  
3 0 3 3

**UNIT-I: WATER TECHNOLOGY**

Various impurities of Water, WHO guidelines, Hardness unit and determination by EDTA method, water treatment for drinking purpose-sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Water treatment for industrial purpose: Boiler troubles, scales, sludges, caustic embrittlement, boiler Corrosion, priming and foaming- causes and prevention, Internal conditioning -Phosphate, Calgon and Carbonate treatment, External conditioning-Lime Soda process (simple problems), softening by ion- Exchange process, Desalination of Brackish water by Electro dialysis and Reverse osmosis.

**UNIT-II: POLYMER CHEMISTRY**

Introduction to polymers, Functionality of monomers, chain growth and step growth polymerization, Co-polymerization (Stereo specific polymerization) with specific examples and mechanisms of polymer formation.

PLASTICS: Thermoplastics and Thermosetting, preparation, properties and applications of Bakelite, Elastomers, Preparation, properties and applications of BUNA-S and BUNA-N Rubbers. Conducting Polymers- Introduction, examples, general applications and mechanism of Conduction on Polyacetylene.

Chemistry of Nano materials: Introduction to nano chemistry, preparation of nano materials - carbon nanotubes and fullerenes and their engineering applications.

**UNIT-III: ELECTRO CHEMISTRY AND APPLICATIONS**

Electrodes-concepts, types of cells, electro chemical series, Nernst equation.

BATTERIES: Primary cell (Dry cell), Secondary cell (Lead-acid), Lithium batteries and their advantages, Fuel cell ( $H_2$ - $O_2$  cell).

Corrosion:

Types of corrosions- chemical corrosion, dry corrosion, electro chemical corrosion and wet corrosion, galvanic series, pitting and differential aeration of corrosion, factors affecting corrosion. Corrosion control: Cathodic protection, Corrosion Inhibitors, Electro plating (Au) & (Ni).

Learning Outcomes:

**UNIT-IV: INSTRUMENTAL METHODS**

Electromagnetic spectrum-Absorption of Radiation: Beer-Lambert's law-Principle and applications of Ultra-Violet, Infra-Red and Nuclear Magnetic Resonance Spectroscopy. Principle and applications of Gas Chromatography and HPLC Techniques.

**UNIT-V:**

(i) **Cement and Concrete Chemistry:** Introduction to Building Materials, Portland Cement, Constituents, Manufacturing Process, Setting and Hardening Cement.

(ii) **Organic reactions and synthesis of a drug molecule:** Introduction to reactions involving substitution ( $SN_1$  and  $SN_2$ ), elimination reactions ( $E_1$  and  $E_2$ ), Synthesis of commonly used drug molecule – Aspirin and Paracetamol.

### **Prescribed Text Books**

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. Shashi chawla, A text book of engineering chemistry, 3<sup>rd</sup> Edition, Dhanpat rai & co new delhi, 2007.
5. Gurudeep raj & chatwal anand , “Instrumental methods of analysis “, 7<sup>th</sup> edition, CBS publications, 1986.
6. Quantitative analysis by day & underwood.
7. A Text book of Instrumental methods by Skoog and West.
8. H.W. Wilard and demerit, “Instrumental methods of analysis “, 7<sup>th</sup> edition, CBS publications, 1986.
9. Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University press.

**CE/ME/CS 113(R20)**

## **Basic Electrical Engineering**

**(CIVIL, MECH & CSE)**

**L-T-P-C**

**3-1-3-5.5**

### **UNIT – I: DC & AC Circuits**

Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Nodal and loop analysis. Thevenin's and Superposition Theorems

Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits. Series Resonance and band width.

### **.UNIT-II: Poly phase & Magnetic circuits**

Generation of 3-phase voltages - phase sequence - star & delta connections - voltage, current & power in star & delta connected systems - analysis of 3-phase balanced circuits - measurement of 3-phase power by 2 wattmeter method.

Faraday's Laws of Electromagnetic Induction .Dynamically induced EMF –Statically induced EMF – Self Inductance – Mutual Inductance - Coefficient of coupling –Inductances in Series – Inductances in parallel – Dot convention.

### **UNIT-III: DC Machines**

Principle and operation of DC Generator - EMF equation - OCC characteristics of DC generator – Principle and operation of DC Motor – Performance Characteristics of DC Motors - Speed control of DC Motors.

### **UNIT-IV: AC Machines:**

Principle and operation of Single Phase Transformer - EMF equations-losses in transformers, regulation and efficiency. OC and SC test on transformer – auto transformer.

Principle, operation and construction of Three phase Induction Motor –torque equation and torque slip characteristics-power losses and efficiency.

### **UNIT-V: Semiconductor Devices:**

Characteristics of Semiconductor junction Diode, Zener diode, transistor, JFET, UJT, SCR and their applications. Half-wave, Full-wave rectifiers and Bridge rectifier, with (L and LC) and without filters.

Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitterconfiguration, Transistor amplifying action, Common collector configuration, Operating point

### **Text Books:**

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

### **References:**

3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.



**I YEAR I SEM**

**Engineering Graphics**

**(CIVIL/MECHANICAL/ECE)**

**UNIT-I**

**Introduction to Engineering graphics:** Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions. Dimensioning principles and conventional representations

- a) Conic sections including the rectangular-hyperbola- general method only,
- b) Cycloid, epicycloids and hypocycloid
- c) Involute

**(2L + 6P hrs)**

**UNIT-II**

**Projection of points, lines and planes:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

**(2L + 6P hrs)**

**UNIT-III**

**Projections of solids:** Projections of regular solids inclined to one or both planes by rotational.

**(1L + 3P hrs)**

**Sections of solids:** Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

**(1L + 3P hrs)**

**UNIT-IV**

**Development of surfaces:** Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

**(1L + 6P hrs)**

**Isometric Projections:** Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

**(2L + 6P hrs)**

**UNIT-V**

Orthographic Projections: Systems of Projections, Orthographic Projection (Simple Figures)

**(3L+9P hrs)**

## **UNIT-VI**

### **(DEMONSTRATION ONLY)**

Computer Aided Drafting(Using any standard package): Setting up a drawing: starting ,main menu (New, Open, Save, Save As etc.), Opening screen, error correction on screen,units, co-ordinate system, limits, grid, snap, ortho.

Tool bars: Draw tool bar, object snap tool bar, modify tool bar, dimension tool Bar

Practice of 2D Drawings: Exercises of Orthographic views for simple solids using all commands in various tool bars.

### **TEXTBOOKS**

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

### **Reference Books:**

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. BasantAgarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.
6. Youtube: [http://sewor,Carleton.ca/g.kardos/88403/drawings.html](http://sewor.Carleton.ca/g.kardos/88403/drawings.html) conic sections-online, red woods.edu

**CE/ME/EE/EC/CS 115 (R20)**

## **CS 115 Problem Solving and Programming(Using C)**

**(Common to all branches)**

**L-T-P-C :**

**3-1-3-5.5**

### **Unit – 1: Flowchart design through Raptor**

Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers

Example problems(section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

## **Unit 2: C Basics**

C-Basics: C-character set, Data types, Constants, Expressions, Structure of C program, Operators and their precedence & associativity, Simple programs in C using all the operators, Type casting ,type coercion.

## **Unit 3: Control Structures and Functions**

Control Structures, Basic input and output statements, Preprocessor directives.

Functions: Concept of a function, passing the parameters, automatic variables, scope and extent of variables, storage classes, recursion, iteration vs recursion, types of recursion, Simple recursive and non recursive programs, Towers of Hanoi problem.

## **Unit 4: Arrays and Pointers**

Arrays: Single and multidimensional Arrays, Character array as a string, string functions, Programs using arrays and string manipulation.

Pointers: Pointers declarations, Pointer expressions, Pointer parameters to functions. Pointers, Pointers and array, Pointer arithmetic.

## **Unit 5: Structures and Files**

Structures: Declaring and using structures, operations on structures, structures and arrays, user defined data types, pointers to structures.Command line arguments.

Files: Introduction, file structure, file handling functions, file types, file error handling, Programs using file functions.

### **Text Books:**

1. <https://raptor.martincarlisle.com/>
2. Programming with C-Gottfried-Schaums Outline Series-TMH
3. C Programming – AnithaGoel/Ajay Mittal/E.Sreenivasa Reddy-Pearson India

### **References:**

1. Problem Solving with C- Somasekharan-PHI.
2. C Programming- Behrouz A forouzan – CENGAGE Learning
3. Test your c skills-Yaswanthkanithker
4. Let us C- Yaswanthkanithker

**CE/ME 151 (R20)**

**I B. Tech I Semester**

## **Mechanical Engineering Workshop (CIVIL & MECH)**

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

### **Foundry Practice: (2 Sessions)**

- ii. a) Determination of average grain size for sand sample using sieve shaker  
b) Preparation of a green sand mould using single piece pattern
- ii. Preparation of a green sand mould using split piece pattern with core and demonstration of casting.

### **Welding Practice: (2 Sessions)**

- iii. Lap joint, butt joint and T joint using arc welding.

- iv. a) Lap joint using resistance spot welding
- b) Lap and butt joints using gas welding

#### **Assembling/Disassembling Practice: (3 Sessions)**

- iv. Bicycle
- v. Clutch and carburetor
- vi. Two wheeler engine

#### **Manufacture of a Plastic Component (2 Sessions)**

- iv. Use of injection moulding machine
- v. FRP composite using hand layup method
- vi. Joining of plastic components

#### **Design and manufacture any two domestic utility products with any material (2 Sessions)**

#### **Use of Power Tools (2 Sessions)**

CE/ME/EC 152 (R20)

### **ENGINEERING CHEMISTRY LABORATORY**

#### **Course Objectives:**

- Verify the fundamental concepts with experiments

#### **LIST OF EXPERIMENTS:**

13. Determination of hardness of water by EDTA method
14. Estimation of Mohr's salt by Permanganometry
15. Estimation of Mohr's salt by Dicrometry
16. Determination of alkalinity of water
17. Percentage of purity of washing soda
18. Determination of available chlorine in bleaching powder
19. Preparation of Urea-formaldehyde resin
20. Determination on strength of NaOH using HCl conductometrically
21. Acid-Base titration by  $P^H$  meter
22. Acid-Base titration by Potentiometer
23. Determination of viscosity of lubricating oil
24. Determination of Surface tension

#### **Course Outcomes:**

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

- measure the strength of an acid present in secondary batteries (L3)
- determine the cell constant and conductance of solutions (L3)
- prepare advanced polymer materials (L2)

- determine the physical properties like surface tension, adsorption and viscosity (L3)
- estimate the Iron and Calcium in cement (L3)
- calculate the hardness of water (L4)

## **CE/ME/EE/EC/CS 153**

### **Problem Solving & Programming Using C Lab**

#### **Cycle 1:**

7. Construct flowcharts to
  - a. calculate the maximum, minimum and average of N numbers
  - b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
8. Construct flowcharts with separate procedures to
  - c. calculate simple and compound interest for various parameters specified by the user
  - d. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
9. Construct flowcharts with procedures to
  - c. generate first N numbers in the Fibonacci series
  - d. generate N Prime numbers
10. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
11. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
12. Design a flowchart to determine the number of characters and lines in a text file specified by the user

#### **Cycle 2:**

- 1.Exercises on data types and operators?
  - a) Practice exercises 3.1 to 3.16 and 4.1 to 4.17 and 14.1 to 14.20 Test your C Skills - yaswanthkanitkar text book.
  - b) Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
  - c) Write a program to find greatest of three numbers using conditional operator?
  - d) Write a program to swap two numbers with and without temp variable?

e) Practice a program using multiple unary increment and decrement operators in arithmetic expressions?

## 2. Exercises on control structures?

- a) Practice exercise 2.1 to 2.15 Test your C Skills - yaswanthkanitkar text book.
- b) Write a program to find greatest of three numbers? Use nested if, if else if and switch statements?
- c) Write a program to read marks of a student and print the sum and average?
- d) Display the grade based on the sum of marks?
- e) write a program to count the digits of a number? Use for loop
- f) Write a program to check whether a number is perfect or not? Use do-while
- g) Write a program to check whether a number is strong or not? Use while
- h) Write a program to check whether a number is amstrong or not? Use for
- i) Write a program to check whether a number is palindrome or not? Use for
- j) Write a program to find the Fibonacci series upto the given number? Use while
- k) Write a program to print the pascals triangle? Used do-while
- l) Write a program to print the result of the series  $1+x^2/2+x^3/3+\dots+x^n/n$

## 3. Exercises on functions?

- a) Practice exercise 5.1 to 5.14 Test your C skills –yaswanth kanitkar text book.
- b) Write program to swap two variables using functions? Write a program to perform menu driven arithmetic operations using functions?
- c) Write a program to find the factorial of a number using recursive and non- recursive functions?
- d) Write a program to find the Fibonacci series using recursive functions?
- e) Write a program to find the solution for towers of Hanoi using recursive function?
- f) Write a program to pass parameters to a functions using call by value and call by reference?

## 4. Exercises on Arrays?

- a) Practice exercise 9.1 to 9.17 Test your C skills – yaswanth kanitkar text book.
- b) Write a program to read n numbers and sort them?
- c) Write a program to find the minimum and maximum numbers of the array?
- d) Write a program to read two matrices and find their sum, difference and product of them?
- e) Find the transpose of a matrix?
- f) Write a program to print upper and lower triangle of a given matrix?

## 5. Exercises on strings?

- a) Practice exercise 10.1 to 10.15 yaswanth kanitkar text book.
- b) Write a program to demonstrate the use of string manipulation functions?

c) Write a program to compare two strings?

d) Write a program to sort the names in Alphabetical order?

6. Exercises on pointers?

a) Practice exercise 7.1 to 8.26 yaswanth kanitkar text book.

b) Write a program to read dynamic array and sort the elements?

c) Write a program to read dynamic array and find the minimum and maximum of the elements?

d) Write a program to perform pointer arithmetic?

e) Write a program on pointers for strings?

f) Write a program to use array of pointers?

7. Exercises on structures?

a) Practice exercise 11.1 to 11.30 yaswanthkanitkar text book.

b) Write a program to create student structure and read marks of three subjects and find the sum and total of the student?

c) Write a program on arrays of structures for 60 students record using the above student structure?

d) Write a program for complex structure? Perform addition, subtraction and multiplication of two complex numbers?

e) Write a program for addition and multiplication of two polynomials?

8. Write a program on Files?

a) Practice exercise 12.1 to 12.20 yaswanthkanitkar text book.

b) write a program to append content of a file?

c) Write a program to display the content of a file?

d) Write a program to copy content of one file to other file?

e) Write a program to count the no of characters in a file?

f) Write a program to compare the contents of two files?

### **References:**

1. Test your C Skills by – YaswanthKanithkar-BPB Publishers

2. C programming; Test your skills-A.N.Kamthane-Pearson India

**Mathematics-II**  
**(ODE, PDE and Multivariable Calculus)**  
**(Common to all branches)**

**UNIT I: Linear Differential Equations of Higher Order**

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

**UNIT II: Equations Reducible to Linear Differential Equations and Applications**

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, **UNIT**

**III: Partial Differential Equations – First order** **8 hrs**

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Solutions to homogenous and non-homogenous higher order linear partial differential equations.

**UNIT IV: Multivariable Calculus (Vector differentiation)**

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

**UNIT V: Multivariable Calculus (Vector integration)**

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

**Textbooks:**

3. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
4. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

**References:**

6. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
7. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
8. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
9. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
10. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.



**UNIT-I:****(10 hrs)**

**Interference :** Principle of Superposition-Interference of light-Theory of Interference fringes-Conditions for sustained Interference-Interference in thin films by reflected light-Newton's Rings-Determination of Wavelength.

**Diffraction:** Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum -Determination of Wavelength.

**UNIT-II****(12 Periods)**

**Lasers:** Laser characteristics, Spontaneous and Stimulated emissions, Basic requirements of a laser, Population inversion – Solid state laser (Ruby laser), Gas (He-Ne) laser, Semiconductor (GaAs) laser, applications of lasers.

**Fiber optics:** Introduction to Optical Fibers-Principle of optical fiber-Critical angle, Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, Modes-Propagation of electromagnetic wave through optical fiber - Fiber optic Communication system-applications of Optical fibers.

**Unit – III****(14 hrs)**

**Dielectrics:** Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations-Lorentz (internal) field - Claussius -Mossotti equation.

**Magnetics:** Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment-Classification of Magnetic materials-Hysteresis-soft and hard magnetic materials- applications of magnetic materials.

**Unit – IV: Semiconductors****(12 hrs)**

Origin of energy band formation in solids-Classification of materials into conductors, semi- conductors & insulators – Semiconductors-Intrinsic semiconductors-dependence of Fermi level on carrier concentration and temperature(Qualitative)- Extrinsic semiconductors - P-type & N-type-dependence of Fermi level on carrier concentration and temperature (Qualitative)- Direct and Indirect band gap semiconductors-Hall effect- applications of Semiconductors.

**Unit-V****(12 hrs)**

**Principles of Quantum Mechanics:** Dual nature of light, Matter waves & properties, de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and application (non-existence of electron in nucleus). One dimensional time independent Schrodinger's wave equation, Physical significance of the wave function, Particle in a box (one dimensional).

**Superconductivity:** First experiment, critical parameters (T<sub>c</sub>, H<sub>c</sub>, I<sub>c</sub>), Meissner effect, BCS Theory (in brief) and Applications of superconductors.

**Text books:**

4. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017
5. H.K.Malik & A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018
6. Gaur R.K. and Gupta S.L., "Engineering Physics"- Dhanpat Rai publishers, 2012

**Reference Books:**

4. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill ,2008
5. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
6. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015

**CE/ME123**

## **Professional Communication Skills**

[L: 3; T: 0; P: 0 (3 credits)]

Lectures: 3 Periods/week

Sessional Marks: 30

University Exam: 3 Hrs.

University Examination Marks: 70

### **Syllabus:**

UNIT-1: 8 Hrs.

1. Reading: Listening Skills – The Boy who broke the Bank (English & Soft Skills)
2. Writing: Paragraph Writing
3. Grammar: Common Errors in Nouns- Pronoun Agreement
4. Vocabulary Building: Functional word list -100

UNIT- II: 8 Hrs.

1. Reading: Assertive Skills – The Verger (English & Soft Skills)
2. Writing: Letter Writing (Formal and Informal)
3. Grammar: Correction of Errors in Subject- Verb Agreement
4. Vocabulary Building: Sign Post

UNIT - III: 8 Hrs.

1. Reading: Learning Skills – Three Questions (English & Soft Skills)
2. Writing: Note Making, Note Taking
3. Grammar: Correction of in Tense Usage
4. Vocabulary Building: One Word Substitutes

UNIT - IV: 8 Hrs.

1. Reading: Adaptability Skills – Senior Payroll (English & Soft Skills)
2. Writing: Pictorial Description
3. Grammar: Correction of Errors in Adjectives, Articles, Prepositions
4. Vocabulary Building: Synonyms and Antonyms

UNIT - V:

8 Hrs.

1. Reading: Written Communication Skills - Gateman's Gift (English & Soft Skills)
2. Writing: Information Transfer
3. Grammar: Correction of Errors in Wh- questions, Question Tags
4. Vocabulary Building: Idioms and Phrasal Words (200)

#### **TEXT BOOK:**

- Dhanavel S. P. *English and Soft Skills*, Orient Black Swan Pvt. Limited, 2013.
- Barun K Mitra, *Effective Technical Communication*, Oxford University Publication, 2014.

#### **REFERENCE BOOKS:**

11. Bailey, Stephen. *Academic writing: A handbook for International Students*. Routledge, 2014.
12. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2<sup>nd</sup> Edition, 2018.
13. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
14. Michael Swan. *Practical English Usage*, OUP. 1995.
15. F.T. Wood. *Remedial English Grammar*, Macmillan. 2007
16. Liz Hamp-Lyons and Ben Heasley. *Study Writing*, Cambridge University Press. 2006.
17. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.
18. Sharon J. Gerson, Steven M. Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
19. Sanjay Kumar and Pushp Lata, *Communication Skills*, Noida: Oxford University Press, 2012.
20. Dr. Shalini Verma, *Word Power Made Handy*, S. Chand & Co Ltd., 2009.

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**Unit I**

**12 hours**

**Introduction to Engineering Mechanics:** Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

**Friction:** Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction. Free body diagrams involving frictional forces.

**Unit II**

**10 hours**

**Analysis of Structures:** Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.

**Properties of Surfaces and Volumes:** Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-guidinus.

**Unit III**

**10 hours**

**Moment of Inertia:** Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes -thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

**Learning**

**Outcomes:**

**Unit IV**

**10 hours**

**Kinematics:** Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity -projectile motion, use of rectangular coordinates, tangential and normal coordinates.

**Unit V**

**10 hours**

**Kinetics:** Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.

**Ideal Systems:** Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse.

**Textbo**

**oks:**

1. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
2. S Timoshenko, DH Young, JV Rao, SukumarPati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 20
3. S SBhavikatti, Engineering Mechanics, 4/e, New Age International, 2008.

**Reference Books:**

1. Basudeb Bhattacharya., Engineering Mechanics, 2/e, Oxford University Press (India), 2015.
2. Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynam-ics, 4/e, Pearson, 2009.
3. K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 2010

**Environmental Science**  
**(Common to CE/ME/EC)**

**UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II: Ecosystems, Biodiversity, and its Conservation**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- e. Forest ecosystem.
- f. Grassland ecosystem
- g. Desert ecosystem
- h. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION :** Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT – III: Environmental Pollution and Solid Waste Management**

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- h. Air Pollution.
- i. Water pollution
- j. Soil pollution
- k. Marine pollution
- l. Noise pollution
- m. Thermal pollution
- n. Nuclear hazards

**SOLID WASTE MANAGEMENT :** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

**UNIT – IV: Social Issues and the Environment**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air

(Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

#### **UNIT – V: Human Population and the Environment**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK :** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

#### **TEXT BOOKS :**

4. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
5. Environmental Studies by Palaniswamy – Pearson education
6. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

#### **REFERENCES :**

7. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
8. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
9. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
10. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
11. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
12. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

CE/ME/EC161(R20)

#### **ENGINEERING PHYSICS LABORATORY SYLLABUS**

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

#### **Learning Outcomes:**

##### **List of Physics Experiments**

17. Determination of the radius of curvature of the lens by Newton's ring method.
18. Determination of wavelength by plane diffraction grating method.
19. Dispersive power of a Prism.
20. Resolving power of a grating.

21. Photo cell – I-V Characteristic curves and determination of stopping potential.
22. Magnetic field along the axis of a circular coil carrying current.
23. B-H Curve
24. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
25. Hall effect.
26. Photo voltaic cell - Determination of fill-factor.
27. To determine the energy gap of a semiconductor.
28. Determination of Acceleration due to gravity by using compound Pendulum.
29. Poisson's ratio of aluminium and rubber.
30. Rigidity modulus of material by wire-dynamic method (torsional pendulum).
31. Determination of a.c. Frequency – Sonometer.
32. Determine the wavelength of Laser source.

**References:**

1. S. Balasubramanian , M.N. Srinivasan “ A Text book of Practical Physics”- S Chand Publishers, 2017
2. <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University

**Communicative English Lab**

Lectures: 3 Periods

University Exam: 3 hours

Sessional Marks: 30

University Examination Marks: 70

**List of Activities**

1. Identifying phonic sounds, listening to the sounds, practice and record the sounds from the English learning software
2. Common mispronounced words
3. Listening to the short audios and complete the tasks based on the audios
4. Listening to motivational speeches and answering the questions
5. Comprehending Spoken material in British English & American English
6. Situational Dialogues
7. Role plays
8. Reading comprehension exercises for GRE, TOEFL, GATE etc
9. Reading articles from newspaper
10. Specific reading for enhancing vocabulary
11. Vocabulary building exercises
12. Extempore
13. JAM sessions
14. Small talks
15. Oral presentations

**ELECTRONICS AND COMMUNICATION ENGINEERING**

**MATHEMATICS-I**

(Calculus & Algebra)

(Common to all branches of Engineering)



### **Unit I: Matrix Operations and Solving Systems of Linear Equations**

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

### **Unit II: Mean Value Theorems**

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

### **Unit III: Multivariable calculus**

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

### **Unit IV: Double Integrals**

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves.

### **Unit V: Special Functions**

Beta and Gamma functions and their properties, relation between beta and gamma functions.

#### **Textbooks:**

5. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
6. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

#### **References:**

7. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
8. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
9. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

**UNIT-I: WATER TECHNOLOGY**

Various impurities of Water, WHO guidelines, Hardness unit and determination by EDTA method, water treatment for drinking purpose-sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Water treatment for industrial purpose: Boiler troubles, scales, sludges, caustic embrittlement, boiler Corrosion, priming and foaming- causes and prevention, Internal conditioning -Phosphate, Calgon and Carbonate treatment, External conditioning-Lime Soda process (simple problems), softening by ion- Exchange process, Desalination of Brackish water by Electro dialysis and Reverse osmosis.

**UNIT-II: POLYMER CHEMISTRY**

Introduction to polymers, Functionality of monomers, chain growth and step growth polymerization, Co-polymerization (Stereo specific polymerization) with specific examples and mechanisms of polymer formation.

PLASTICS: Thermoplastics and Thermosetting, preparation, properties and applications of Bakelite, Elastomers, Preparation, properties and applications of BUNA-S and BUNA-N Rubbers. Conducting Polymers- Introduction, examples, general applications and mechanism of Conduction on Polyacetylene.

Chemistry of Nano materials: Introduction to nano chemistry, preparation of nano materials - carbon nanotubes and fullerenes and their engineering applications.

**UNIT-III: ELECTRO CHEMISTRY AND APPLICATIONS**

Electrodes-concepts, types of cells, electro chemical series, Nernst equation.

BATTERIES: Primary cell (Dry cell), Secondary cell (Lead-acid), Lithium batteries and their advantages, Fuel cell ( $H_2-O_2$  cell).

Corrosion:

Types of corrosions- chemical corrosion, dry corrosion, electro chemical corrosion and wet corrosion, galvanic series, pitting and differential aeration of corrosion, factors affecting corrosion.

Corrosion control: Cathodic protection, Corrosion Inhibitors, Electro plating (Au) & (Ni).

Learning Outcomes:

**UNIT-IV: INSTRUMENTAL METHODS**

Electromagnetic spectrum-Absorption of Radiation: Beer-Lambert's law-Principle and applications of Ultra-Violet, Infra-Red and Nuclear Magnetic Resonance Spectroscopy. Principle and applications of Gas Chromatography and HPLC Techniques.

**UNIT-V:**

**(i) Cement and Concrete Chemistry:** Introduction to Building Materials, Portland Cement, Constituents, Manufacturing Process, Setting and Hardening Cement.

**(ii) Organic reactions and synthesis of a drug molecule:** Introduction to reactions involving substitution ( $SN_1$  and  $SN_2$ ), elimination reactions ( $E_1$  and  $E_2$ ), Synthesis of commonly used drug molecule – Aspirin and Paracetamol.

**Prescribed Text Books**

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. Shashi chawla, A text book of engineering chemistry, 3<sup>rd</sup> Edition, Dhanpat rai & co new delhi, 2007.
5. Gurudeep raj & chatwal anand , "Instrumental methods of analysis ", 7<sup>th</sup> edition, CBS publications, 1986.
6. Quantitative analysis by day&underwood.
7. A Text book of Instrumental methods by Skoog and West.

8. H.W. Wilard and demerit, "Instrumental methods of analysis ", 7<sup>th</sup> edition, CBS publications, 1986.
9. Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University press.

**EE/EC 113(R20)**

## **Professional Communication Skills**

(EEE, ECE)

[L: 3; T: 0; P: 0 (3 credits)]

Lectures: 3 Periods/week

Sessional Marks: 30

University Exam: 3 Hrs.

University Examination Marks: 70

### **Syllabus:**

UNIT-1: 8 Hrs.

1. Reading: Listening Skills – The Boy who broke the Bank (English & Soft Skills)
2. Writing: Paragraph Writing
3. Grammar: Common Errors in Nouns- Pronoun Agreement
4. Vocabulary Building: Functional word list -100

UNIT- II: 8 Hrs.

1. Reading: Assertive Skills – The Verger (English & Soft Skills)
2. Writing: Letter Writing (Formal and Informal)
3. Grammar: Correction of Errors in Subject- Verb Agreement
4. Vocabulary Building: Sign Post

UNIT - III: 8 Hrs.

1. Reading: Learning Skills – Three Questions (English & Soft Skills)
2. Writing: Note Making, Note Taking
3. Grammar: Correction of in Tense Usage
4. Vocabulary Building: One Word Substitutes

UNIT - IV: 8 Hrs.

1. Reading: Adaptability Skills – Senior Payroll (English & Soft Skills)

2. Writing: Pictorial Description
3. Grammar: Correction of Errors in Adjectives, Articles, Prepositions
4. Vocabulary Building: Synonyms and Antonyms

UNIT - V:

8 Hrs.

1. Reading: Written Communication Skills - Gateman's Gift (English & Soft Skills)
2. Writing: Information Transfer
3. Grammar: Correction of Errors in Wh- questions, Question Tags
4. Vocabulary Building: Idioms and Phrasal Words (200)

#### **TEXT BOOK:**

- Dhanavel S. P. *English and Soft Skills*, Orient Black Swan Pvt. Limited, 2013.
- Barun K Mitra, *Effective Technical Communication*, Oxford University Publication, 2014.

#### **REFERENCE BOOKS:**

21. Bailey, Stephen. *Academic writing: A handbook for International Students*. Routledge, 2014.
22. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2<sup>nd</sup> Edition, 2018.
23. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
24. Michael Swan. *Practical English Usage*, OUP. 1995.
25. F.T. Wood. *Remedial English Grammar*, Macmillan.2007
26. Liz Hamp-Lyons and Ben Heasley. *Study Writing*, Cambridge University Press. 2006.
27. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.
28. Sharon J.Gerson, Steven M.Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
29. Sanjay Kumar and Pushp Lata, *Communication Skills*, Noida: Oxford University Press, 2012.
30. Dr. Shalini Verma, *Word Power Made Handy*, S. Chand & Co Ltd., 2009.

**I YEAR I SEM**

**Engineering Graphics**

**(CIVIL/MECHANICAL/ECE)**

**UNIT-I**

**Introduction to Engineering graphics:** Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions. Dimensioning principles and conventional representations

- a) Conic sections including the rectangular-hyperbola- general method only,
- b) Cycloid, epicycloids and hypocycloid
- c) Involute

**(2L + 6P hrs)**

**UNIT-II**

**Projection of points, lines and planes:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

**(2L + 6P hrs)**

**UNIT-III**

**Projections of solids:** Projections of regular solids inclined to one or both planes by rotational.

**(1L + 3P hrs)**

**Sections of solids:** Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

**(1L + 3P hrs)**

**UNIT-IV**

**Development of surfaces:** Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

**(1L + 6P hrs)**

**Isometric Projections:** Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

**(2L + 6P hrs)**

**UNIT-V**

Orthographic Projections: Systems of Projections, Orthographic Projection (Simple Figures)

**UNIT-VI**

**(DEMONSTRATION ONLY)**

Computer Aided Drafting(Using any standard package): Setting up a drawing: starting ,main menu (New, Open, Save, Save As etc.), Opening screen, error correction on screen,units, co-ordinate system, limits, grid, snap, ortho.

Tool bars: Draw tool bar, object snap tool bar, modify tool bar, dimension tool Bar

Practice of 2D Drawings: Exercises of Orthographic views for simple solids using all commands in various tool bars.

**TEXTBOOKS**

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

**Reference Books:**

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. BasantAgarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.
6. Youtube: <http://sewor.carleton.ca/gkardos/88403/drawings.html> conic sections-online, red woods.edu

## **(Common to all branches)**

**L-T-P-C :**

**3-1-3-5.5**

### **Unit – 1: Flowchart design through Raptor**

Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers

Example problems(section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

### **Unit 2: C Basics**

C-Basics: C-character set, Data types, Constants, Expressions, Structure of C program, Operators and their precedence & associativity, Simple programs in C using all the operators, Type casting ,type coercion.

### **Unit 3: Control Structures and Functions**

Control Structures, Basic input and output statements, Preprocessor directives.

Functions: Concept of a function, passing the parameters, automatic variables, scope and extent of variables, storage classes, recursion, iteration vs recursion, types of recursion, Simple recursive and non recursive programs, Towers of Hanoi problem.

### **Unit 4: Arrays and Pointers**

Arrays: Single and multidimensional Arrays, Character array as a string, string functions, Programs using arrays and string manipulation.

Pointers: Pointers declarations, Pointer expressions, Pointer parameters to functions. Pointers, Pointers and array, Pointer arithmetic.

### **Unit 5: Structures and Files**

Structures: Declaring and using structures, operations on structures, structures and arrays, user defined data types, pointers to structures.Command line arguments.

Files: Introduction, file structure, file handling functions, file types, file error handling, Programs using file functions.

#### **Text Books:**

1. <https://raptor.martincarlisle.com/>
2. Programming with C-Gottfried-Schaums Outline Series-TMH
3. C Programming – AnithaGoel/Ajay Mittal/E.Sreenivasa Reddy-Pearson India

#### **References:**

1. Problem Solving with C- Somasekharan-PHI.
2. C Programming- Behrouz A forouzan – CENGAGE Learning
3. Test your c skills-Yaswanthkanithker
4. Let us C- Yaswanthkanithker

**EE/EC 151(R20)**

## **Communicative English Lab**

**(EEE, ECE)**

Lectures: 3 Periods  
University Exam: 3 hours

Sessional Marks: 30  
University Examination Marks: 70

### **List of Activities**

16. Identifying phonic sounds, listening to the sounds, practice and record the sounds from the English learning software
17. Common mispronounced words
18. Listening to the short audios and complete the tasks based on the audios
19. Listening to motivational speeches and answering the questions
20. Comprehending Spoken material in British English & American English
21. Situational Dialogues
22. Role plays
23. Reading comprehension exercises for GRE, TOEFL, GATE etc
24. Reading articles from newspaper
25. Specific reading for enhancing vocabulary
26. Vocabulary building exercises
27. Extempore
28. JAM sessions
29. Small talks
30. Oral presentations

CE/ME/EC 152 (R20)

## **ENGINEERING CHEMISTRY LABORATORY**

### **Course Objectives:**

- Verify the fundamental concepts with experiments

### **LIST OF EXPERIMENTS:**

25. Determination of hardness of water by EDTA method
26. Estimation of Mohr's salt by Permanganometry
27. Estimation of Mohr's salt by Dicrometry
28. Determination of alkalinity of water
29. Percentage of purity of washing soda
30. Determination of available chlorine in bleaching powder
31. Preparation of Urea-formaldehyde resin
32. Determination on strength of NaoH using HCl conductometrically
33. Acid-Base titration by P<sup>H</sup> meter
34. Acid-Base titration by Potentiometer
35. Determination of viscosity of lubricating oil



36. Determination of Surface tension

Course Outcomes:

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

- measure the strength of an acid present in secondary batteries (L3)
- determine the cell constant and conductance of solutions (L3)
- prepare advanced polymer materials (L2)
- determine the physical properties like surface tension, adsorption and viscosity (L3)
- estimate the Iron and Calcium in cement (L3)
- calculate the hardness of water (L4)

**CE/ME/EE/EC/CS 153**

**Problem Solving & Programming Using C Lab**

Cycle 1:

13. Construct flowcharts to
  - a. calculate the maximum, minimum and average of N numbers
  - b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
14. Construct flowcharts with separate procedures to
  - e. calculate simple and compound interest for various parameters specified by the user
  - f. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
15. Construct flowcharts with procedures to
  - e. generate first N numbers in the Fibonacci series
  - f. generate N Prime numbers
16. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)

17. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)

18. Design a flowchart to determine the number of characters and lines in a text file specified by the user

Cycle 2:

1.Exercises on data types and operators?

a) Practice exercises 3.1 to 3.16 and 4.1 to 4.17 and 14.1 to 14.20 Test your C Skills - yaswanthkanitkar text book.

b) Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?

c) Write a program to find greatest of three numbers using conditional operator?

d) Write a program to swap two numbers with and without temp variable?

e) Practice a program using multiple unary increment and decrement operators in arithmetic expressions?

2. Exercises on control structures?

a) Practice exercise 2.1 to 2.15 Test your C Skills - yaswanthkanitkar text book.

b)Write a program to find greatest of three numbers? Use nested if, if else if and switch statements?

c) Write a program to read marks of a student and print the sum and average?

d) Display the grade based on the sum of marks?

e) write a program to count the digits of a number? Use for loop

f) Write a program to check whether a number is perfect or not? Use do-while

g) Write a program to check whether a number is strong or not? Use while

h) Write a program to check whether a number is amstrong or not? Use for

i) Write a program to check whether a number is palindrome or not? Use for

j) Write a program to find the Fibonacci series upto the given number? Use while

k) Write a program to print the pascals triangle? Used do-while

l) Write a program to print the result of the series  $1+x^2/2+x^3/3+\dots+x^n/n$

3. Exercises on functions?

a) Practice exercise 5.1 to 5.14 Test your C skills –yaswanth kanitkar text book.

b) Write program to swap two variables using functions? Write a program to perform menu driven arithmetic operations using functions?

c) Write a program to find the factorial of a number using recursive and non- recursive functions?

d) Write a program to find the Fibonacci series using recursive functions?

e) Write a program to find the solution for towers of Hanoi using recursive function?

f) Write a program to pass parameters to a functions using call by value and call by reference?

4. Exercises on Arrays?

a) Practice exercise 9.1 to 9.17 Test your C skills – yaswanth kanitkar text book.

- b) Write a program to read n numbers and sort them?
- c) Write a program to find the minimum and maximum numbers of the array?
- d) Write a program to read two matrices and find their sum, difference and product of them?
- e) Find the transpose of a matrix?
- f) Write a program to print upper and lower triangle of a given matrix?

#### 5. Exercises on strings?

- a) Practice exercise 10.1 to 10.15 yaswanth kanitkar text book.
- b) Write a program to demonstrate the use of string manipulation functions?
- c) Write a program to compare two strings?
- d) Write a program to sort the names in Alphabetical order?

#### 6. Exercises on pointers?

- a) Practice exercise 7.1 to 8.26 yaswanth kanitkar text book.
- b) Write a program to read dynamic array and sort the elements?
- c) Write a program to read dynamic array and find the minimum and maximum of the elements?
- d) Write a program to perform pointer arithmetic?
- e) Write a program on pointers for strings?
- f) Write a program to use array of pointers?

#### 7. Exercises on structures?

- a) Practice exercise 11.1 to 11.30 yaswanthkanitkar text book.
- b) Write a program to create student structure and read marks of three subjects and find the sum and total of the student?
- c) Write a program on arrays of structures for 60 students record using the above student structure?
- d) Write a program for complex structure? Perform addition, subtraction and multiplication of two complex numbers?
- e) Write a program for addition and multiplication of two polynomials?

#### 8. Write a program on Files?

- a) Practice exercise 12.1 to 12.20 yaswanthkanitkar text book.
- b) write a program to append content of a file?
- c) Write a program to display the content of a file?
- d) Write a program to copy content of one file to other file?
- e) Write a program to count the no of characters in a file?
- f) Write a program to compare the contents of two files?

**References:**

1. Test your C Skills by – Yaswanth Kanithkar-BPB Publishers
2. C programming; Test your skills-A.N.Kamthane-Pearson India

CE/ME/EE/EC/CS121(R20)

**Mathematics-II**  
**(ODE, PDE and Multivariable Calculus)**  
**(Common to all branches)**

**UNIT I: Linear Differential Equations of Higher Order**

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

**UNIT II: Equations Reducible to Linear Differential Equations and Applications**

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, **UNIT**

**III: Partial Differential Equations – First order**

**8 hrs**

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Solutions to homogenous and non-homogenous higher order linear partial differential equations.

**UNIT IV: Multivariable Calculus (Vector differentiation)**

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

**UNIT V: Multivariable Calculus (Vector integration)**

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

**Textbooks:**

5. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
6. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

**References:**

11. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
12. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
13. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.

14. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
15. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

**CE/ME/EC 122(R20)**

**ENGINEERING PHYSICS**

**(CIVIL, MECH, ECE)**

**L T P C**  
**3 0 3 4.5**

**UNIT-I:**

**(10 hrs)**

**Interference :** Principle of Superposition-Interference of light-Theory of Interference fringes-Conditions for sustained Interference-Interference in thin films by reflected light-Newton's Rings-Determination of Wavelength.

**Diffraction:** Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum -Determination of Wavelength.

**UNIT-II**

**(12 Periods)**

**Lasers:** Laser characteristics, Spontaneous and Stimulated emissions, Basic requirements of a laser, Population inversion – Solid state laser (Ruby laser), Gas (He-Ne) laser, Semiconductor (GaAs) laser, applications of lasers.

**Fiber optics:** Introduction to Optical Fibers-Principle of optical fiber-Critical angle, Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, Modes-Propagation of electromagnetic wave through optical fiber - Fiber optic Communication system-applications of Optical fibers.

**Unit – III**

**(14 hrs)**

**Dielectrics:** Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations-Lorentz (internal) field - Claussius -Mossotti equation.

**Magnetics:** Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment-Classification of Magnetic materials-Hysteresis-soft and hard magnetic materials- applications of magnetic materials.

**Unit – IV: Semiconductors**

**(12 hrs)**

Origin of energy band formation in solids-Classification of materials into conductors, semi- conductors & insulators – Semiconductors-Intrinsic semiconductors-dependence of Fermi level on carrier concentration and temperature(Qualitative)- Extrinsic semiconductors - P-type & N-type-dependence of Fermi level on carrier concentration and temperature (Qualitative)- Direct and Indirect band gap semiconductors-Hall effect- applications of Semiconductors.

**Unit-V**

**(12 hrs)**

**Principles of Quantum Mechanics:** Dual nature of light, Matter waves & properties, de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and application (non-existence of electron in nucleus). One dimensional time independent Schrodinger's wave equation, Physical significance of the wave function, Particle in a box (one dimensional).

**Superconductivity:** First experiment, critical parameters (T<sub>c</sub>, H<sub>c</sub>, I<sub>c</sub>), Meissner effect, BCS Theory (in brief) and Applications of superconductors.

**Text books:**

7. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017
8. H.K.Malik & A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018
9. Gaur R.K. and Gupta S.L., "Engineering Physics"- Dhanpat Rai publishers, 2012

**Reference Books:**

7. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill ,2008
8. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
9. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015

**EE/EC 123(R20)**

# **Basic Electrical Engineering**

## **(EEE/ECE)**

### **UNIT – I: DC & AC Circuits**

Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Nodal and loop analysis. Thevenin's and Superposition Theorems

Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits. Series Resonance and band width.

### **.UNIT-II: Poly phase & Magnetic circuits**

Generation of 3-phase voltages - phase sequence - star & delta connections - voltage, current & power in star & delta connected systems - analysis of 3-phase balanced circuits - measurement of 3-phase power by 2 wattmeter method.

Faraday's Laws of Electromagnetic Induction .Dynamically induced EMF –Statically induced EMF – Self Inductance – Mutual Inductance - Coefficient of coupling –Inductances in Series – Inductances in parallel – Dot convention.

### **UNIT-III: DC Machines**

Principle and operation of DC Generator - EMF equation - OCC characteristics of DC generator – Principle and operation of DC Motor – Performance Characteristics of DC Motors - Speed control of DC Motors

### **UNIT-IV: AC Machines:**

Principle and operation of Single Phase Transformer - EMF equations-losses in transformers, regulation and efficiency. OC and SC test on transformer – auto transformer.

Principle, operation and construction of Three phase Induction Motor –torque equation and torque slip characteristics-power losses and efficiency.

### **UNIT-V: Semiconductor Devices:**

Characteristics of Semiconductor junction Diode, Zener diode, transistor, JFET, UJT, SCR and their applications. Half-wave, Full-wave rectifiers and Bridge rectifier, with (L and LC) and without filters.

Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitter configuration, Transistor amplifying action, Common collector configuration, Operating point

### **Text Books:**

5. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

### **References:**

5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

**I B.Tech I Semester  
ENGINEERING MECHANICS**

(CE/ME/EC/125(R20))

**Unit I**

**12 hours**

**Introduction to Engineering Mechanics:** Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

**Friction:** Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction. Free body diagrams involving frictional forces.

**Unit II**

**10 hours**

**Analysis of Structures:** Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.

**Properties of Surfaces and Volumes:** Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-Guldinus.

**Unit III**

**10 hours**

**Moment of Inertia:** Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes - thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

**Learning  
Outcomes:**

**Unit IV**

**10 hours**

**Kinematics:** Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity - projectile motion, use of rectangular coordinates, tangential and normal coordinates.

**Unit V**

**10 hours**

**Kinetics:** Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.

**Ideal Systems:** Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse.

**Textbo  
oks:**

1. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
2. S Timoshenko, DH Young, JV Rao, SukumarPati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 20
3. S SBhavikatti, Engineering Mechanics, 4/e, New Age International, 2008.

**Reference Books:**

1. Basudeb Bhattacharya., Engineering Mechanics, 2/e, Oxford University Press (India), 2015.
2. Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynam-ics, 4/e, Pearson, 2009.
3. K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 2010



**Environmental Science**  
**(Common to CE/ME/EC)**

**UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II: Ecosystems, Biodiversity, and its Conservation**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- i. Forest ecosystem.
- j. Grassland ecosystem
- k. Desert ecosystem
- l. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION :** Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT – III: Environmental Pollution and Solid Waste Management**

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- o. Air Pollution.
- p. Water pollution
- q. Soil pollution
- r. Marine pollution
- s. Noise pollution
- t. Thermal pollution
- u. Nuclear hazards

**SOLID WASTE MANAGEMENT :** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

**UNIT – IV: Social Issues and the Environment**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air

(Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

### **UNIT – V: Human Population and the Environment**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK :** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

### **TEXT BOOKS :**

7. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
8. Environmental Studies by Palaniswamy – Pearson education
9. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

### **REFERENCES :**

13. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
14. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
15. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
16. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
17. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
18. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

**CE/ME/EC161(R20)**

### **ENGINEERING PHYSICS LABORATORY SYLLABUS**

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

### **Learning Outcomes:**

#### **List of Physics Experiments**

33. Determination of the radius of curvature of the lens by Newton's ring method.
34. Determination of wavelength by plane diffraction grating method.
35. Dispersive power of a Prism.
36. Resolving power of a grating.
37. Photo cell – I-V Characteristic curves and determination of stopping potential.
38. Magnetic field along the axis of a circular coil carrying current.
39. B-H Curve
40. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.

41. Hall effect.
42. Photo voltaic cell - Determination of fill-factor.
43. To determine the energy gap of a semiconductor.
44. Determination of Acceleration due to gravity by using compound Pendulum.
45. Poisson's ratio of aluminium and rubber.
46. Rigidity modulus of material by wire-dynamic method (torsional pendulum).
47. Determination of a.c. Frequency – Sonometer.
48. Determine the wavelength of Laser source.

**References:**

1. S. Balasubramanian , M.N. Srinivasan “ A Text book of Practical Physics”- S Chand Publishers, 2017
2. <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University

**EC162**

**LABORATORY SYLLABUS**

**List of experiments: -**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Kirchhoff laws.
3. Verification of Superposition Theorem.
4. Verification of Thevenin's Theorems
5. Open circuit characteristics of a DC Shunt Generator.
6. Speed control of DC Shunt Motor.
7. Brake test on DC Shunt Motor.
8. OC & SC test of 1 – Phase Transformer.
9. Brake test on 3 - Phase Induction Motor.
10. Characteristics of PN junction and zener diode
11. Characteristics of transistor in common emitter configuration
12. Verification of transistor self bias circuit

**MATHEMATICS-I**  
(Calculus & Algebra)  
(Common to all branches of Engineering)

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

**Unit I: Matrix Operations and Solving Systems of Linear Equations**

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

**Unit II: Mean Value Theorems**

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

**Unit III: Multivariable calculus**

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

**Unit IV: Double Integrals**

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves.

**Unit V: Special Functions**

Beta and Gamma functions and their properties, relation between beta and gamma functions.

**Textbooks:**

7. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
8. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

**References:**

10. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
11. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
12. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

**UNIT-I:****(10 hrs)**

**Interference :** Principle of Superposition-Interference of light-Theory of Interference fringes-Conditions for sustained Interference-Interference in thin films by reflected light-Newton's Rings-Determination of Wavelength.

**Diffraction:** Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum -Determination of Wavelength.

**UNIT-II****(12 Periods)**

**Lasers:** Laser characteristics, Spontaneous and Stimulated emissions, Basic requirements of a laser, Population inversion – Solid state laser (Ruby laser), Gas (He-Ne) laser, Semiconductor (GaAs) laser, applications of lasers.

**Fiber optics:** Introduction to Optical Fibers-Principle of optical fiber-Critical angle, Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, Modes-Propagation of electromagnetic wave through optical fiber - Fiber optic Communication system-applications of Optical fibers.

**Unit – III****(14 hrs)**

**Dielectrics:** Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations-Lorentz (internal) field - Claussius -Mossotti equation.

**Magnetics:** Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment-Classification of Magnetic materials-Hysteresis-soft and hard magnetic materials- applications of magnetic materials.

**Unit – IV: Semiconductors****(12 hrs)**

Origin of energy band formation in solids-Classification of materials into conductors, semi- conductors & insulators – Semiconductors-Intrinsic semiconductors-dependence of Fermi level on carrier concentration and temperature(Qualitative)- Extrinsic semiconductors - P-type & N-type-dependence of Fermi level on carrier concentration and temperature (Qualitative)- Direct and Indirect band gap semiconductors-Hall effect- applications of Semiconductors.

**Unit-V****(12 hrs)**

**Principles of Quantum Mechanics:** Dual nature of light, Matter waves & properties, de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and application (non-existence of electron in nucleus). One dimensional time independent Schrodinger's wave equation, Physical significance of the wave function, Particle in a box (one dimensional).

**Superconductivity:** First experiment, critical parameters ( $T_c$ ,  $H_c$ ,  $I_c$ ), Meissner effect, BCS Theory (in brief) and Applications of superconductors.

**Text books:**

10. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017
11. H.K.Malik & A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018
12. Gaur R.K. and Gupta S.L., "Engineering Physics"- Dhanpat Rai publishers, 2012

**Reference Books:**

10. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill ,2008
11. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
12. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015

**Professional Communication Skills**

(EEE, ECE)

[L: 3; T: 0; P: 0 (3 credits)]

Lectures: 3 Periods/week

Sessional Marks: 30

University Exam: 3 Hrs.

University Examination Marks: 70

**Syllabus:**

UNIT-1: 8 Hrs.

1. Reading: Listening Skills – The Boy who broke the Bank (English & Soft Skills)
2. Writing: Paragraph Writing
3. Grammar: Common Errors in Nouns- Pronoun Agreement
4. Vocabulary Building: Functional word list -100

UNIT- II: 8 Hrs.

1. Reading: Assertive Skills – The Verger (English & Soft Skills)
2. Writing: Letter Writing (Formal and Informal)
3. Grammar: Correction of Errors in Subject- Verb Agreement
4. Vocabulary Building: Sign Post

UNIT - III: 8 Hrs.

1. Reading: Learning Skills – Three Questions (English & Soft Skills)
2. Writing: Note Making, Note Taking
3. Grammar: Correction of in Tense Usage
4. Vocabulary Building: One Word Substitutes

UNIT - IV: 8 Hrs.

1. Reading: Adaptability Skills – Senor Payroll (English & Soft Skills)
2. Writing: Pictorial Description
3. Grammar: Correction of Errors in Adjectives, Articles, Prepositions
4. Vocabulary Building: Synonyms and Antonyms

UNIT - V: 8 Hrs.

1. Reading: Written Communication Skills - Gateman's Gift (English & Soft Skills)

2. Writing: Information Transfer
3. Grammar: Correction of Errors in Wh- questions, Question Tags
4. Vocabulary Building: Idioms and Phrasal Words (200)

**TEXT BOOK:**

- Dhanavel S. P. *English and Soft Skills*, Orient Black Swan Pvt. Limited, 2013.
- Barun K Mitra, *Effective Technical Communication*, Oxford University Publication, 2014.

**REFERENCE BOOKS:**

31. Bailey, Stephen. *Academic writing: A handbook for International Students*. Routledge, 2014.
32. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2<sup>nd</sup> Edition, 2018.
33. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
34. Michael Swan. *Practical English Usage*, OUP. 1995.
35. F.T. Wood. *Remedial English Grammar*, Macmillan.2007
36. Liz Hamp-Lyons and Ben Heasley. *Study Writing*, Cambridge University Press. 2006.
37. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.
38. Sharon J.Gerson, Steven M.Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
39. Sanjay Kumar and Pushp Lata, *Communication Skills*, Noida: Oxford University Press, 2012.
40. Dr. Shalini Verma, *Word Power Made Handy*, S. Chand & Co Ltd., 2009.

**Unit I****12 hours**

**Introduction to Engineering Mechanics:** Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

**Friction:** Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction. Free body diagrams involving frictional forces.

**Unit II****10 hours**

**Analysis of Structures:** Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.

**Properties of Surfaces and Volumes:** Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-guldinus.

**Unit III****10 hours**

**Moment of Inertia:** Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes - thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

**Learning****Outcomes:****Unit IV****10 hours**

**Kinematics:** Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity -projectile motion, use of rectangular coordinates, tangential and normal coordinates.

**Unit V****10 hours**

**Kinetics:** Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.

**Ideal Systems:** Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse.

**Textbo****oks:**

1. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
2. S Timoshenko, DH Young, JV Rao, SukumarPati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 20
3. S SBhavikatti, Engineering Mechanics, 4/e, New Age International, 2008.

**Reference Books:**

1. Basudeb Bhattacharya., Engineering Mechanics, 2/e, Oxford University Press (India), 2015.
2. Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynam-ics, 4/e, Pearson, 2009.
3. K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 2010



## **CS 115 Problem Solving and Programming(Using C)**

**(Common to all branches)**

**L-T-P-C :**

**3-1-3-5.5**

### **Unit – 1: Flowchart design through Raptor**

Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers

Example problems(section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

### **Unit 2: C Basics**

C-Basics: C-character set, Data types, Constants, Expressions, Structure of C program, Operators and their precedence & associativity, Simple programs in C using all the operators, Type casting ,type coercion.

### **Unit 3: Control Structures and Functions**

Control Structures, Basic input and output statements, Preprocessor directives.

Functions: Concept of a function, passing the parameters, automatic variables, scope and extent of variables, storage classes, recursion, iteration vs recursion, types of recursion, Simple recursive and non recursive programs, Towers of Hanoi problem.

### **Unit 4: Arrays and Pointers**

Arrays: Single and multidimensional Arrays, Character array as a string, string functions, Programs using arrays and string manipulation.

Pointers: Pointers declarations, Pointer expressions, Pointer parameters to functions. Pointers, Pointers and array, Pointer arithmetic.

### **Unit 5: Structures and Files**

Structures: Declaring and using structures, operations on structures, structures and arrays, user defined data types, pointers to structures.Command line arguments.

Files: Introduction, file structure, file handling functions, file types, file error handling, Programs using file functions.

### **Text Books:**

1. <https://raptor.martincarlisle.com/>
2. Programming with C-Gottfried-Schaums Outline Series-TMH
3. C Programming – AnithaGoel/Ajay Mittal/E.Sreenivasa Reddy-Pearson India

### **References:**

1. Problem Solving with C- Somasekharan-PHI.
2. C Programming- Behrouz A forouzan – CENGAGE Learning
3. Test your c skills-Yaswanthkanithker
4. Let us C- Yaswanthkanithker

**EE/CS 116(R20)**

**Environmental Science**

**(Common to CE/ME/EC)**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

#### **UNIT – II: Ecosystems, Biodiversity, and its Conservation**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- m. Forest ecosystem.
- n. Grassland ecosystem
- o. Desert ecosystem
- p. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION :** Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

#### **UNIT – III: Environmental Pollution and Solid Waste Management**

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- v. Air Pollution.
- w. Water pollution
- x. Soil pollution
- y. Marine pollution
- z. Noise pollution
- aa. Thermal pollution
- bb. Nuclear hazards

**SOLID WASTE MANAGEMENT :** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

#### **UNIT – IV: Social Issues and the Environment**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

#### **UNIT – V: Human Population and the Environment**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK :** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

**TEXT BOOKS :**

10. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
11. Environmental Studies by Palaniswamy – Pearson education
12. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

**REFERENCES :**

19. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
  20. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
  21. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
  22. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
  23. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
- Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

## Communicative English Lab

(*EEE, ECE*)

Lectures: 3 Periods

University Exam: 3 hours

Sessional Marks: 30

University Examination Marks: 70

### List of Activities

1. Identifying phonic sounds, listening to the sounds, practice and record the sounds from the English learning software
2. Common mispronounced words
3. Listening to the short audios and complete the tasks based on the audios
4. Listening to motivational speeches and answering the questions
5. Comprehending Spoken material in British English & American English
6. Situational Dialogues
7. Role plays
8. Reading comprehension exercises for GRE, TOEFL, GATE etc
9. Reading articles from newspaper
10. Specific reading for enhancing vocabulary
11. Vocabulary building exercises
12. Extempore
13. JAM sessions
14. Small talks
15. Oral presentations

## ENGINEERING PHYSICS LABORATORY SYLLABUS

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

### Learning Outcomes:

#### List of Physics Experiments

49. Determination of the radius of curvature of the lens by Newton's ring method.
50. Determination of wavelength by plane diffraction grating method.
51. Dispersive power of a Prism.
52. Resolving power of a grating.
53. Photo cell – I-V Characteristic curves and determination of stopping potential.
54. Magnetic field along the axis of a circular coil carrying current.
55. B-H Curve
56. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
57. Hall effect.
58. Photo voltaic cell - Determination of fill-factor.
59. To determine the energy gap of a semiconductor.
60. Determination of Acceleration due to gravity by using compound Pendulum.
61. Poisson's ratio of aluminium and rubber.
62. Rigidity modulus of material by wire-dynamic method (torsional pendulum).
63. Determination of a.c. Frequency – Sonometer.
64. Determine the wavelength of Laser source.

### References:

1. S. Balasubramanian , M.N. Srinivasan “ A Text book of Practical Physics”- S Chand Publishers, 2017
2. <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University

**CE/ME/EE/EC/CS 153**

## Problem Solving & Programming Using C Lab

### Cycle 1:

19. Construct flowcharts to
  - a. calculate the maximum, minimum and average of N numbers
  - b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
20. Construct flowcharts with separate procedures to
  - g. calculate simple and compound interest for various parameters specified by the user
  - h. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
21. Construct flowcharts with procedures to
  - g. generate first N numbers in the Fibonacci series
  - h. generate N Prime numbers
22. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
23. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
24. Design a flowchart to determine the number of characters and lines in a text file specified by the user

### Cycle 2:

- 1.Exercises on data types and operators?
  - a) Practice exercises 3.1 to 3.16 and 4.1 to 4.17 and 14.1 to 14.20 Test your C Skills - yaswanthkanitkar text book.

- b) Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
- c) Write a program to find greatest of three numbers using conditional operator?
- d) Write a program to swap two numbers with and without temp variable?
- e) Practice a program using multiple unary increment and decrement operators in arithmetic expressions?

## 2. Exercises on control structures?

- a) Practice exercise 2.1 to 2.15 Test your C Skills - yaswanthkanitkar text book.
- b) Write a program to find greatest of three numbers? Use nested if, if else if and switch statements?
- c) Write a program to read marks of a student and print the sum and average?
- d) Display the grade based on the sum of marks?
- e) write a program to count the digits of a number? Use for loop
- f) Write a program to check whether a number is perfect or not? Use do-while
- g) Write a program to check whether a number is strong or not? Use while
- h) Write a program to check whether a number is amstrong or not? Use for
- i) Write a program to check whether a number is palindrome or not? Use for
- j) Write a program to find the Fibonacci series upto the given number? Use while
- k) Write a program to print the pascals triangle? Used do-while
- l) Write a program to print the result of the series  $1+x^2/2+x^3/3+\dots+x^n/n$

## 3. Exercises on functions?

- a) Practice exercise 5.1 to 5.14 Test your C skills –yaswanth kanitkar text book.
- b) Write program to swap two variables using functions? Write a program to perform menu driven arithmetic operations using functions?
- c) Write a program to find the factorial of a number using recursive and non- recursive functions?
- d) Write a program to find the Fibonacci series using recursive functions?
- e) Write a program to find the solution for towers of Hanoi using recursive function?
- f) Write a program to pass parameters to a functions using call by value and call by reference?

## 4. Exercises on Arrays?

- a) Practice exercise 9.1 to 9.17 Test your C skills – yaswanth kanitkar text book.
- b) Write a program to read n numbers and sort them?
- c) Write a program to find the minimum and maximum numbers of the array?
- d) Write a program to read two matrices and find their sum, difference and product of them?
- e) Find the transpose of a matrix?
- f) Write a program to print upper and lower triangle of a given matrix?

### 5. Exercises on strings?

- a) Practice exercise 10.1 to 10.15 yaswanth kanitkar text book.
- b) Write a program to demonstrate the use of string manipulation functions?
- c) Write a program to compare two strings?
- d) Write a program to sort the names in Alphabetical order?

### 6. Exercises on pointers?

- a) Practice exercise 7.1 to 8.26 yaswanth kanitkar text book.
- b) Write a program to read dynamic array and sort the elements?
- c) Write a program to read dynamic array and find the minimum and maximum of the elements?
- d) Write a program to perform pointer arithmetic?
- e) Write a program on pointers for strings?
- f) Write a program to use array of pointers?

### 7. Exercises on structures?

- a) Practice exercise 11.1 to 11.30 yaswanthkanitkar text book.
- b) Write a program to create student structure and read marks of three subjects and find the sum and total of the student?
- c) Write a program on arrays of structures for 60 students record using the above student structure?
- d) Write a program for complex structure? Perform addition, subtraction and multiplication of two complex numbers?
- e) Write a program for addition and multiplication of two polynomials?

### 8. Write a program on Files?

- a) Practice exercise 12.1 to 12.20 yaswanthkanitkar text book.
- b) write a program to append content of a file?
- c) Write a program to display the content of a file?
- d) Write a program to copy content of one file to other file?
- e) Write a program to count the no of characters in a file?
- f) Write a program to compare the contents of two files?

### References:

- 1. Test your C Skills by – Yaswanth Kanithkar-BPB Publishers
- 2. C programming; Test your skills-A.N.Kamthane-Pearson India

(Common to all branches)

### **UNIT I: Linear Differential Equations of Higher Order**

Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

### **UNIT II: Equations Reducible to Linear Differential Equations and Applications**

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, **UNIT**

### **III: Partial Differential Equations – First order**

**8 hrs**

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Solutions to homogenous and non-homogenous higher order linear partial differential equations.

### **UNIT IV: Multivariable Calculus (Vector differentiation)**

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

### **UNIT V: Multivariable Calculus (Vector integration)**

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

#### **Textbooks:**

7. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
8. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

#### **References:**

16. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
17. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
18. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
19. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
20. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

**EE/CS 122(R20)**

**ENGINEERING CHEMISTRY**  
(EEE, CSE)

L T P C  
3 0 3 3



## **UNIT-I: WATER TECHNOLOGY**

Various impurities of Water, WHO guidelines, Hardness unit and determination by EDTA method, water treatment for drinking purpose-sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Water treatment for industrial purpose: Boiler troubles, scales, sludges, caustic embrittlement, boiler Corrosion, priming and foaming- causes and prevention, Internal conditioning -Phosphate, Calgon and Carbonate treatment, External conditioning-Lime Soda process (simple problems), softening by ion- Exchange process, Desalination of Brackish water by Electro dialysis and Reverse osmosis.

## **UNIT-II: POLYMER CHEMISTRY**

Introduction to polymers, Functionality of monomers, chain growth and step growth polymerization, Co-polymerization (Stereo specific polymerization) with specific examples and mechanisms of polymer formation.

PLASTICS: Thermoplastics and Thermosetting, preparation, properties and applications of Bakelite, Elastomers, Preparation, properties and applications of BUNA-S and BUNA-N Rubbers. Conducting Polymers- Introduction, examples, general applications and mechanism of Conduction on Polyacetylene.

Chemistry of Nano materials: Introduction to nano chemistry, preparation of nano materials - carbon nanotubes and fullerenes and their engineering applications.

## **UNIT-III: ELECTRO CHEMISTRY AND APPLICATIONS**

Electrodes-concepts, types of cells, electro chemical series, Nernst equation.

BATTERIES: Primary cell (Dry cell), Secondary cell (Lead-acid), Lithium batteries and their advantages, Fuel cell ( $H_2$ - $O_2$  cell).

Corrosion:

Types of corruptions- chemical corrosion, dry corrosion, electro chemical corrosion and wet corrosion, galvanic series, pitting and differential aeration of corrosion, factors affecting corrosion.

Corrosion control: Cathodic protection, Corrosion Inhibitors, Electro plating (Au) & (Ni).

Learning Outcomes:

## **UNIT-IV: INSTRUMENTAL METHODS**

Electromagnetic spectrum-Absorption of Radiation: Beer-Lambert's law-Principle and applications of Ultra-Violet, Infra-Red and Nuclear Magnetic Resonance Spectroscopy. Principle and applications of Gas Chromatography and HPLC Techniques.

## **UNIT-V:**

(i) **Cement and Concrete Chemistry:** Introduction to Building Materials, Portland Cement, Constituents, Manufacturing Process, Setting and Hardening Cement.

(ii) **Organic reactions and synthesis of a drug molecule:** Introduction to reactions involving substitution ( $SN_1$  and  $SN_2$ ), elimination reactions ( $E_1$  and  $E_2$ ), Synthesis of commonly used drug molecule – Aspirin and Paracetamol.

## **Prescribed Text Books**

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi
3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. Shashi chawla, A text book of engineering chemistry, 3<sup>rd</sup> Edition, Dhanpat rai & co new delhi, 2007.
5. Gurudeep raj & chatwal anand , "Instrumental methods of analysis ", 7<sup>th</sup> edition, CBS publications, 1986.
6. Quantitative analysis by day & underwood.
7. A Text book of Instrumental methods by Skoog and West.
8. H.W. Wilard and demerit, "Instrumental methods of analysis ", 7<sup>th</sup> edition, CBS publications, 1986.
9. Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University press.

## Basic Electrical Engineering (EEE/ECE)

### UNIT – I: DC & AC Circuits

Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Nodal and loop analysis. Thevenin's and Superposition Theorems

Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits. Series Resonance and band width.

### UNIT-II: Poly phase & Magnetic circuits

Generation of 3-phase voltages - phase sequence - star & delta connections - voltage, current & power in star & delta connected systems - analysis of 3-phase balanced circuits - measurement of 3-phase power by 2 wattmeter method.

Faraday's Laws of Electromagnetic Induction .Dynamically induced EMF –Statically induced EMF – Self Inductance – Mutual Inductance - Coefficient of coupling –Inductances in Series – Inductances in parallel – Dot convention.

### UNIT-III: DC Machines

Principle and operation of DC Generator - EMF equation - OCC characteristics of DC generator – Principle and operation of DC Motor – Performance Characteristics of DC Motors - Speed control of DC Motors

### UNIT-IV: AC Machines:

Principle and operation of Single Phase Transformer - EMF equations-losses in transformers, regulation and efficiency. OC and SC test on transformer – auto transformer.

Principle, operation and construction of Three phase Induction Motor –torque equation and torque slip characteristics-power losses and efficiency.

### UNIT-V: Semiconductor Devices:

Characteristics of Semiconductor junction Diode, Zener diode, transistor, JFET, UJT, SCR and their applications. Half-wave, Full-wave rectifiers and Bridge rectifier, with (L and LC) and without filters.

Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitterconfiguration, Transistor amplifying action, Common collector configuration, Operating point

### Text Books:

7. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

### References:

7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

**Introduction to Engineering graphics:** Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions. Dimensioning principles and conventional representations

- a) Conic sections including the rectangular-hyperbola- general method only,
- b) Cycloid, epicycloids and hypocycloid
- c) Involute

(2L + 6P hrs)

### **UNIT-II**

**Projection of points, lines and planes:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

(2L + 6P hrs)

### **UNIT-III**

**Projections of solids:** Projections of regular solids inclined to one or both planes by rotational.

(1L + 3P hrs)

**Sections of solids:** Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

(1L + 3P hrs)

### **UNIT-IV**

**Development of surfaces:** Development of surfaces of right regular solids-prism,

cylinder, pyramid, cone and their sectional parts.

(1L + 6P hrs)

**Isometric Projections:** Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

(2L + 6P hrs)

### **UNIT-V**

Orthographic Projections: Systems of Projections, Orthographic Projection (Simple Figures)

(3L+9P hrs)

### **UNIT-VI**

#### **(DEMONSTRATION ONLY)**

Computer Aided Drafting(Using any standard package): Setting up a drawing: starting ,main menu (New, Open, Save, Save As etc.), Opening screen, error correction on screen,units, co-ordinate system, limits, grid, snap, ortho.

Tool bars: Draw tool bar, object snap tool bar, modify tool bar, dimension tool Bar

Practice of 2D Drawings: Exercises of Orthographic views for simple solids using all commands in various tool bars.

## TEXTBOOKS

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

## Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. BasantAgarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.
6. Youtube: <http://sewor.carleton.ca/gkardos/88403/drawings.html> conic sections-online, red woods.edu

EE/CS 161 (R20)

## ENGINEERING CHEMISTRY LABORATORY EEE, CSE

### Course Objectives:

- Verify the fundamental concepts with experiments

### LIST OF EXPERIMENTS:

- 1.Determination of hardness of water by EDTA method
- 2.Estimation of Mohr's salt by Permanganometry
- 3.Estimation of Mohr's salt by Dicrometry
- 4.Determination of alkalinity of water
- 5.Percentage of purity of washing soda
- 6.Determination of available chlorine in bleaching powder
- 7.Preparation of Urea-formaldehyde resin
- 8.Determination on strength of NaoH using HCl conductometrically
- 9.Acids-Base titration by P<sup>H</sup> meter
- 10.Acids-Base titration by Potentiometer
- 11.Determination of viscosity of lubricating oil
- 12.Determination of Surface tension

**List of experiments: -**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Kirchhoff laws.
3. Verification of Superposition Theorem.
4. Verification of Thevenin's Theorems
5. Open circuit characteristics of a DC Shunt Generator.
6. Speed control of DC Shunt Motor.
7. Brake test on DC Shunt Motor.
8. OC & SC test of 1 – Phase Transformer.
9. Brake test on 3 - Phase Induction Motor.
10. Characteristics of PN junction and zener diode
11. Characteristics of transistor in common emitter configuration
12. Verification of transistor self bias circuit

**COMPUTER SCIENCE AND ENGINEERING**

CE/ME/EE/EC/CS 111(R20)

**MATHEMATICS-I**

(Calculus &amp; Algebra)

(Common to all branches of Engineering)

**L T P C****3 0 0 3****Unit I: Matrix Operations and Solving Systems of Linear Equations**

Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix, quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

### **Unit II: Mean Value Theorems**

Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);

### **Unit III: Multivariable calculus**

Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

### **Unit IV: Double Integrals**

Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves.

### **Unit V: Special Functions**

Beta and Gamma functions and their properties, relation between beta and gamma functions.

#### **Textbooks:**

9. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
10. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017.

#### **References:**

13. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
14. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
15. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.

**EE/CS 112(R20)**

## **ENGINEERING PHYSICS**

**(EEE & CSE)**

**L T P C  
3 0 3 4.5**

### **UNIT-I:**

**(10 hrs)**

**Interference :** Principle of Superposition-Interference of light-Theory of Interference fringes-Conditions for sustained Interference-Interference in thin films by reflected light-Newton's Rings-Determination of Wavelength.

**Diffraction:** Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum -Determination of Wavelength.

### **UNIT-II**

**(12 Periods)**

**Lasers:** Laser characteristics, Spontaneous and Stimulated emissions, Basic requirements of a laser, Population inversion – Solid state laser (Ruby laser), Gas (He-Ne) laser, Semiconductor (GaAs) laser, applications of lasers.

**Fiber optics:** Introduction to Optical Fibers-Principle of optical fiber-Critical angle, Acceptance angle-Numerical Aperture-Classification of fibers based on Refractive index profile, Modes-Propagation of electromagnetic wave through optical fiber - Fiber optic Communication system-applications of Optical fibers.

**Unit – III****(14 hrs)**

**Dielectrics:** Introduction to Dielectrics--Electric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations-Lorentz (internal) field - Claussius -Mossotti equation.

**Magnetics:** Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment-Classification of Magnetic materials-Hysteresis-soft and hard magnetic materials- applications of magnetic materials.

**Unit – IV: Semiconductors****(12 hrs)**

Origin of energy band formation in solids-Classification of materials into conductors, semi- conductors & insulators – Semiconductors-Intrinsic semiconductors-dependence of Fermi level on carrier concentration and temperature(Qualitative)- Extrinsic semiconductors - P-type & N-type-dependence of Fermi level on carrier concentration and temperature (Qualitative)- Direct and Indirect band gap semiconductors-Hall effect- applications of Semiconductors.

**Unit-V****(12 hrs)**

**Principles of Quantum Mechanics:** Dual nature of light, Matter waves & properties, de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and application (non-existence of electron in nucleus). One dimensional time independent Schrodinger's wave equation, Physical significance of the wave function, Particle in a box (one dimensional).

**Superconductivity:** First experiment, critical parameters ( $T_c$ ,  $H_c$ ,  $I_c$ ), Meissner effect, BCS Theory (in brief) and Applications of superconductors.

**Text books:**

13. M.N. Avadhanulu, P.G.Kshirsagar "A Text book of Engineering Physics"-S.Chand Publications,2017
14. H.K.Malik & A.K.Singh "Engineering Physics",- McGraw Hill Publishing Company Ltd, 2018
15. Gaur R.K. and Gupta S.L., "Engineering Physics"- Dhanpat Rai publishers, 2012

**Reference Books:**

13. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill ,2008
14. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
15. D.K. Bhattacharya and A. Bhaskaran, "Engineering Physics"- Oxford Publications-2015

**CE/ME/CS 113(R20)****Basic Electrical Engineering****(CIVIL, MECH & CSE)****L-T-P-C****3-1-3-5.5****UNIT – I: DC & AC Circuits**

Electrical circuit elements (R - L and C) - Kirchhoff laws - Series and parallel connection of resistances with DC excitation. Nodal and loop analysis. Thevenin's and Superposition Theorems

Representation of sinusoidal waveforms - peak and rms values - phasor representation - real power - reactive power - apparent power - power factor - Analysis of single-phase ac circuits consisting of RL - RC - RLC series circuits. Series Resonance and band width.

**.UNIT-II: Poly phase & Magnetic circuits**

Generation of 3-phase voltages - phase sequence - star & delta connections - voltage, current & power in star & delta connected systems - analysis of 3-phase balanced circuits - measurement of 3-phase power by 2 wattmeter method.

Faraday's Laws of Electromagnetic Induction .Dynamically induced EMF –Statically induced EMF – Self Inductance – Mutual Inductance - Coefficient of coupling –Inductances in Series – Inductances in parallel – Dot convention.

**UNIT-III: DC Machines**

Principle and operation of DC Generator - EMF equation - OCC characteristics of DC generator – Principle and operation of DC Motor – Performance Characteristics of DC Motors - Speed control of DC Motors.

**UNIT-IV: AC Machines:**

Principle and operation of Single Phase Transformer - EMF equations-losses in transformers, regulation and efficiency. OC and SC test on transformer – auto transformer.

Principle, operation and construction of Three phase Induction Motor –torque equation and torque slip characteristics-power losses and efficiency.

**UNIT-V: Semiconductor Devices:**

Characteristics of Semiconductor junction Diode, Zener diode, transistor, JFET, UJT, SCR and their applications. Half-wave, Full-wave rectifiers and Bridge rectifier, with (L and LC) and without filters.

Bipolar Junction Transistor: Transistor operation, Common base configuration, Common emitter configuration, Transistor amplifying action, Common collector configuration, Operating point

**Text Books:**

9. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
10. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.

**References:**

9. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
10. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.



**Unit I****12 hours**

**Introduction to Engineering Mechanics:** Composition and resolution of forces, parallelogram law, principle of transmissibility, types of force systems - concurrent and concurrent coplanar forces, resultant of coplanar force systems couple, moment of a force Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.

**Friction:** Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction. Free body diagrams involving frictional forces.

**Unit II****10 hours**

**Analysis of Structures:** Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.

**Properties of Surfaces and Volumes:** Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes - cylinder, cone, sphere, theorem of Pappus-guldinus.

**Unit III****10 hours**

**Moment of Inertia:** Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes - thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

**Learning Outcome****s:****Unit IV**  
**hours****10**

**Kinematics:** Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity -projectile motion, use of rectangular coordinates, tangential and normal coordinates.

**Unit V**  
**hours****10**

**Kinetics:** Principles of dynamics - Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.

**Ideal Systems:** Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse.

**Textbooks**  
**:**

1. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
2. S Timoshenko, DH Young, JV Rao, SukumarPati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 20
3. S SBhavikatti, Engineering Mechanics, 4/e, New Age International, 2008.

**Reference Books:**

1. Basudeb Bhattacharya., Engineering Mechanics, 2/e, Oxford University Press (India), 2015.

2. Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynamics, 4/e, Pearson, 2009.
3. K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 2010

**CE/ME/EE/EC/CS 115 (R20)**

## **CS 115 Problem Solving and Programming(Using C)**

**(Common to all branches)**

**L-T-P-C :**

**3-1-3-5.5**

### **Unit – 1: Flowchart design through Raptor**

Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems(section 1) – Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers

Example problems(section 2) - Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search.

### **Unit 2: C Basics**

C-Basics: C-character set, Data types, Constants, Expressions, Structure of C program, Operators and their precedence & associativity, Simple programs in C using all the operators, Type casting ,type coercion.

### **Unit 3: Control Structures and Functions**

Control Structures, Basic input and output statements, Preprocessor directives.

Functions: Concept of a function, passing the parameters, automatic variables, scope and extent of variables, storage classes, recursion, iteration vs recursion, types of recursion, Simple recursive and non recursive programs, Towers of Hanoi problem.

### **Unit 4: Arrays and Pointers**

Arrays: Single and multidimensional Arrays, Character array as a string, string functions, Programs using arrays and string manipulation.

Pointers: Pointers declarations, Pointer expressions, Pointer parameters to functions. Pointers, Pointers and array, Pointer arithmetic.

### **Unit 5: Structures and Files**

Structures: Declaring and using structures, operations on structures, structures and arrays, user defined data types, pointers to structures.Command line arguments.

Files: Introduction, file structure, file handling functions, file types, file error handling, Programs using file functions.

### **Text Books:**

1. <https://raptor.martincarlisle.com/>
2. Programming with C-Gottfried-Schaums Outline Series-TMH
3. C Programming – AnithaGoel/Ajay Mittal/E.Sreenivasa Reddy-Pearson India

**References:**

1. Problem Solving with C- Somasekharan-PHI.
2. C Programming- Behrouz A forouzan – CENGAGE Learning
3. Test your c skills-Yaswanthkanithker
4. Let us C- Yaswanthkanithker

**EE/CS 116(R20)**

**Environmental Science**  
**(Common to CE/ME/EC)**

**UNIT – I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II: Ecosystems, Biodiversity, and its Conservation**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- q. Forest ecosystem.
- r. Grassland ecosystem
- s. Desert ecosystem
- t. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION :** Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT – III: Environmental Pollution and Solid Waste Management**

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- cc. Air Pollution.
- dd. Water pollution
- ee. Soil pollution
- ff. Marine pollution
- gg. Noise pollution
- hh. Thermal pollution

- ii. Nuclear hazards

**SOLID WASTE MANAGEMENT :** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

#### **UNIT – IV: Social Issues and the Environment**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

#### **UNIT – V: Human Population and the Environment**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK :** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

#### **TEXT BOOKS :**

13. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
14. Environmental Studies by Palaniswamy – Pearson education
15. Environmental Studies by Dr.S.Azeem Unnisa, Academic Publishing Company

#### **REFERENCES :**

24. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
  25. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
  26. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
  27. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice hall of India Private limited.
  28. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
- Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Prentice hall of India Private limited.

# Basic Electrical Engineering

(CSE)

## LABORATORY SYLLABUS

### Learning Outcomes:

#### List of experiments: -

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Kirchhoff laws.
3. Verification of Superposition Theorem.
4. Verification of Thevenin's Theorems
5. Open circuit characteristics of a DC Shunt Generator.
6. Speed control of DC Shunt Motor.
7. Brake test on DC Shunt Motor.
8. OC & SC test of 1 – Phase Transformer.
9. Brake test on 3 - Phase Induction Motor.
10. Characteristics of PN junction and zener diode
11. Characteristics of transistor in common emitter configuration
12. Verification of transistor self bias circuit

EE/CS 151(R20)

## ENGINEERING PHYSICS LABORATORY SYLLABUS

L T  
P C  
3 0 0 1.5

### Learning Outcomes:

#### List of Physics Experiments

65. Determination of the radius of curvature of the lens by Newton's ring method.
66. Determination of wavelength by plane diffraction grating method.
67. Dispersive power of a Prism.
68. Resolving power of a grating.
69. Photo cell – I-V Characteristic curves and determination of stopping potential.
70. Magnetic field along the axis of a circular coil carrying current.
71. B-H Curve
72. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle.
73. Hall effect.
74. Photo voltaic cell - Determination of fill-factor.
75. To determine the energy gap of a semiconductor.
76. Determination of Acceleration due to gravity by using compound Pendulum.
77. Poisson's ratio of aluminium and rubber.
78. Rigidity modulus of material by wire-dynamic method (torsional pendulum).
79. Determination of a.c. Frequency – Sonometer.
80. Determine the wavelength of Laser source.

### References:

1. S. Balasubramanian , M.N. Srinivasan “ A Text book of Practical Physics”- S Chand Publishers, 2017
2. <http://vlab.amrita.edu/index.php> -Virtual Labs, Amrita University

## **CE/ME/EE/EC/CS 153**

### **Problem Solving & Programming Using C Lab**

#### **Cycle 1:**

25. Construct flowcharts to
  - a. calculate the maximum, minimum and average of N numbers
  - b. develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
26. Construct flowcharts with separate procedures to
  - i. calculate simple and compound interest for various parameters specified by the user
  - j. calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
27. Construct flowcharts with procedures to
  - i. generate first N numbers in the Fibonacci series
  - j. generate N Prime numbers
28. Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)
29. Design a flowchart to perform Binary search on list of N sorted numbers(Iterative and recursive)
30. Design a flowchart to determine the number of characters and lines in a text file specified by the user

#### **Cycle 2:**

- 1.Exercises on data types and operators?
  - a) Practice exercises 3.1 to 3.16 and 4.1 to 4.17 and 14.1 to 14.20 Test your C Skills - yaswanthkanitkar text book.
  - b) Write a program which determines the largest and the smallest number that can be stored in different data types of like short, int., long, float and double. What happens when you add 1 to the largest possible integer number that can be stored?
  - c) Write a program to find greatest of three numbers using conditional operator?
  - d) Write a program to swap two numbers with and without temp variable?
  - e) Practice a program using multiple unary increment and decrement operators in arithmetic expressions?
2. Exercises on control structures?
  - a) Practice exercise 2.1 to 2.15 Test your C Skills - yaswanthkanitkar text book.
  - b)Write a program to find greatest of three numbers? Use nested if, if else if and switch statements?
  - c) Write a program to read marks of a student and print the sum and average?
  - d) Display the grade based on the sum of marks?
  - e) write a program to count the digits of a number? Use for loop

- f) Write a program to check whether a number is perfect or not? Use do-while
- g) Write a program to check whether a number is strong or not? Use while
- h) Write a program to check whether a number is amstrong or not? Use for
- i) Write a program to check whether a number is palindrome or not? Use for
- j) Write a program to find the Fibonacci series upto the given number? Use while
- k) Write a program to print the pascals triangle? Used do-while
- l) Write a program to print the result of the series  $1+x^2/2+x^3/3+\dots+x^n/n$

### 3. Exercises on functions?

- a) Practice exercise 5.1 to 5.14 Test your C skills –yaswanth kanitkar text book.
- b) Write program to swap two variables using functions? Write a program to perform menu driven arithmetic operations using functions?
- c) Write a program to find the factorial of a number using recursive and non- recursive functions?
- d) Write a program to find the Fibonacci series using recursive functions?
- e) Write a program to find the solution for towers of Hanoi using recursive function?
- f) Write a program to pass parameters to a functions using call by value and call by reference?

### 4. Exercises on Arrays?

- a) Practice exercise 9.1 to 9.17 Test your C skills – yaswanth kanitkar text book.
- b) Write a program to read n numbers and sort them?
- c) Write a program to find the minimum and maximum numbers of the array?
- d) Write a program to read two matrices and find their sum, difference and product of them?
- e) Find the transpose of a matrix?
- f) Write a program to print upper and lower triangle of a given matrix?

### 5. Exercises on strings?

- a) Practice exercise 10.1 to 10.15 yaswanth kanitkar text book.
- b) Write a program to demonstrate the use of string manipulation functions?
- c) Write a program to compare two strings?
- d) Write a program to sort the names in Alphabetical order?

### 6. Exercises on pointers?

- a) Practice exercise 7.1 to 8.26 yaswanth kanitkar text book.

- b) Write a program to read dynamic array and sort the elements?
- c) Write a program to read dynamic array and find the minimum and maximum of the elements?
- d) Write a program to perform pointer arithmetic?
- e) Write a program on pointers for strings?
- f) Write a program to use array of pointers?

#### 7. Exercises on structures?

- a) Practice exercise 11.1 to 11.30 yaswanthkanitkar text book.
- b) Write a program to create student structure and read marks of three subjects and find the sum and total of the student?
- c) Write a program on arrays of structures for 60 students record using the above student structure?
- d) Write a program for complex structure? Perform addition, subtraction and multiplication of two complex numbers?
- e) Write a program for addition and multiplication of two polynomials?

#### 8. Write a program on Files?

- a) Practice exercise 12.1 to 12.20 yaswanthkanitkar text book.
- b) write a program to append content of a file?
- c) Write a program to display the content of a file?
- d) Write a program to copy content of one file to other file?
- e) Write a program to count the no of characters in a file?
- f) Write a program to compare the contents of two files?

#### References:

1. Test your C Skills by – YaswanthKanithkar-BPB Publishers
2. C programming; Test your skills-A.N.Kamthane-Pearson India

**CE/ME/EE/EC/CS121(R20)**

#### **Mathematics-II**

**(ODE, PDE and Multivariable Calculus)**

**(Common to all branches)**

#### **UNIT I: Linear Differential Equations of Higher Order**



Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.

### **UNIT II: Equations Reducible to Linear Differential Equations and Applications**

Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients,

### **UNIT III: Partial Differential Equations – First order 8 hrs**

First order partial differential equations, solutions of first order linear and non-linear PDEs.

Solutions to homogenous and non-homogenous higher order linear partial differential equations.

### **UNIT IV: Multivariable Calculus (Vector differentiation)**

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

### **UNIT V: Multivariable Calculus (Vector integration)**

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

#### **Textbooks:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

#### **References:**

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011.
2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.
5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

### **UNIT-I: WATER TECHNOLOGY**

Various impurities of Water, WHO guidelines, Hardness unit and determination by EDTA method, water treatment for drinking purpose-sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

Water treatment for industrial purpose: Boiler troubles, scales, sludges, caustic embrittlement, boiler Corrosion, priming and foaming- causes and prevention, Internal conditioning - Phosphate, Calgon and Carbonate treatment, External conditioning-Lime Soda process (simple problems), softening by ion- Exchange process, Desalination of Brackish water by Electro dialysis and Reverse osmosis.

### **UNIT-II: POLYMER CHEMISTRY**

Introduction to polymers, Functionality of monomers, chain growth and step growth polymerization, Co-polymerization (Stereo specific polymerization) with specific examples and mechanisms of polymer formation.

PLASTICS: Thermoplastics and Thermosetting, preparation, properties and applications of Bakelite, Elastomers, Preparation, properties and applications of BUNA-S and BUNA-N Rubbers.

Conducting Polymers- Introduction, examples, general applications and mechanism of Conduction on Polyacetylene.

Chemistry of Nano materials: Introduction to nano chemistry, preparation of nano materials - carbon nanotubes and fullerenes and their engineering applications.

### **UNIT-III: ELECTRO CHEMISTRY AND APPLICATIONS**

Electrodes-concepts, types of cells, electro chemical series, Nernst equation.

BATTERIES: Primary cell (Dry cell), Secondary cell (Lead-acid), Lithium batteries and their advantages, Fuel cell ( $H_2$ - $O_2$  cell).

Corrosion:

Types of corrosions- chemical corrosion, dry corrosion, electro chemical corrosion and wet corrosion, galvanic series, pitting and differential aeration of corrosion, factors affecting corrosion.

Corrosion control: Cathodic protection, Corrosion Inhibitors, Electro plating (Au) & (Ni).

Learning Outcomes:

### **UNIT-IV: INSTRUMENTAL METHODS**

Electromagnetic spectrum-Absorption of Radiation: Beer-Lambert's law-Principle and applications of Ultra-Violet, Infra-Red and Nuclear Magnetic Resonance Spectroscopy. Principle and applications of Gas Chromatography and HPLC Techniques.

### **UNIT-V:**

(i) **Cement and Concrete Chemistry:** Introduction to Building Materials, Portland Cement, Constituents, Manufacturing Process, Setting and Hardening Cement.

(ii) **Organic reactions and synthesis of a drug molecule:** Introduction to reactions involving substitution ( $SN_1$  and  $SN_2$ ), elimination reactions ( $E_1$  and  $E_2$ ), Synthesis of commonly used drug molecule – Aspirin and Paracetamol.

### **Prescribed Text Books**

1. Engineering Chemistry, P.C. Jain and M. Jain - Dhanapathi Rai & Sons, Delhi
2. A text book of Engineering Chemistry, S.S. Dara - S. Chand & Co. New Delhi

3. Engineering Chemistry, B.K. Sharma - Krishna Prakashan, Meerut
4. Shashi chawla, A text book of engineering chemistry, 3<sup>rd</sup> Edition, Dhanpat rai & co new delhi, 2007.
5. Gurudeep raj & chatwal anand, "Instrumental methods of analysis", 7<sup>th</sup> edition, CBS publications, 1986.
6. Quantitative analysis by day & underwood.
7. A Text book of Instrumental methods by Skoog and West.
8. H.W. Wilard and demerit, "Instrumental methods of analysis", 7<sup>th</sup> edition, CBS publications, 1986.
9. Text book of Nano Science and Nano technology, B.S. Murthy and P. Shankar, University press.

**CE/ME123**

## **Professional Communication Skills**

[L: 3; T: 0; P: 0 (3 credits)]

Lectures: 3 Periods/week

Sessional Marks:

30

University Exam: 3 Hrs.

University Examination Marks: 70

### **Syllabus:**

UNIT-1:

8 Hrs.

1. Reading: Listening Skills – The Boy who broke the Bank (English & Soft Skills)
2. Writing: Paragraph Writing
3. Grammar: Common Errors in Nouns- Pronoun Agreement
4. Vocabulary Building: Functional word list -100

UNIT- II: 8 Hrs.

1. Reading: Assertive Skills – The Verger (English & Soft Skills)
2. Writing: Letter Writing (Formal and Informal)
3. Grammar: Correction of Errors in Subject- Verb Agreement
4. Vocabulary Building: Sign Post

UNIT - III: 8 Hrs.

1. Reading: Learning Skills – Three Questions (English & Soft Skills)
2. Writing: Note Making, Note Taking
3. Grammar: Correction of in Tense Usage
4. Vocabulary Building: One Word Substitutes

UNIT - IV: 8 Hrs.

1. Reading: Adaptability Skills – Senor Payroll (English & Soft Skills)
2. Writing: Pictorial Description
3. Grammar: Correction of Errors in Adjectives, Articles, Prepositions
4. Vocabulary Building: Synonyms and Antonyms

UNIT - V: 8 Hrs.

1. Reading: Written Communication Skills - Gateman's Gift (English & Soft Skills)
2. Writing: Information Transfer
3. Grammar: Correction of Errors in Wh- questions, Question Tags
4. Vocabulary Building: Idioms and Phrasal Words (200)

#### **TEXT BOOK:**

- Dhanavel S. P. *English and Soft Skills*, Orient Black Swan Pvt. Limited, 2013.

- Barun K Mitra, *Effective Technical Communication*, Oxford University Publication, 2014.

## REFERENCE BOOKS:

1. Bailey, Stephen. *Academic writing: A handbook for International Students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking*. Heinley ELT; 2<sup>nd</sup> Edition, 2018.
3. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4. Michael Swan. *Practical English Usage*, OUP. 1995.
5. F.T. Wood. *Remedial English Grammar*, Macmillan. 2007
6. Liz Hamp-Lyons and Ben Heasley. *Study Writing*, Cambridge University Press. 2006.
7. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad.
8. Sharon J. Gerson, Steven M. Gerson, *Technical Writing*, New Delhi: Pearson education, 2007.
9. Sanjay Kumar and Pushp Lata, *Communication Skills*, Noida: Oxford University Press, 2012.
10. Dr. Shalini Verma, *Word Power Made Handy*, S. Chand & Co Ltd., 2009.

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CS/EE/125(R20)

## I YEAR II SEM

### Engineering Graphics

(CIVIL/MECHANICAL/ECE)

#### UNIT-I

**Introduction to Engineering graphics:** Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions. Dimensioning principles and conventional representations

- a) Conic sections including the rectangular-hyperbola- general method only,

b) Cycloid, epicycloids and hypocycloid

c) Involute

(2L + 6P hrs)

### **UNIT-II**

**Projection of points, lines and planes:** Projection of points in any quadrant, lines inclined to one or both planes, finding true lengths, angle made by line. Projections of regular plane surfaces.

(2L + 6P hrs)

### **UNIT-III**

**Projections of solids:** Projections of regular solids inclined to one or both planes by rotational.

(1L + 3P hrs)

**Sections of solids:** Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone. True shapes of the sections.

(1L + 3P hrs)

### **UNIT-IV**

**Development of surfaces:** Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.

(1L + 6P hrs)

**Isometric Projections:** Principles of isometric projection- Isometric scale; Isometric views: lines, planes, figures, simple and compound solids.

(2L + 6P hrs)

### **UNIT-V**

Orthographic Projections: Systems of Projections, Orthographic Projection (Simple Figures)

(3L+9P hrs)

### **UNIT-VI**

#### **(DEMONSTRATION ONLY)**

Computer Aided Drafting(Using any standard package): Setting up a drawing: starting ,main menu (New, Open, Save, Save As etc.), Opening screen, error correction on screen,units, co-ordinate system, limits, grid, snap, ortho.

Tool bars: Draw tool bar, object snap tool bar, modify tool bar, dimension tool Bar

Practice of 2D Drawings: Exercises of Orthographic views for simple solids using all commands in various tool bars.

## TEXTBOOKS

1. K.L.Narayana&P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012.
2. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016.

## Reference Books:

1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2009
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. BasantAgarwal&C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.
6. Youtube: <http://sewor.carleton.ca/kardos/88403/drawings.html> conic sections-online, red woods.edu

EE/CS 161 (R20)

## **ENGINEERING CHEMISTRY LABORATORY EEE, CSE**

### Course Objectives:

- Verify the fundamental concepts with experiments

### LIST OF EXPERIMENTS:

- 1.Determination of hardness of water by EDTA method
- 2.Estimation of Mohr's salt by Permanganometry
- 3.Estimation of Mohr's salt by Dicrometry
- 4.Determination of alkalinity of water
- 5.Percentage of purity of washing soda
- 6.Determination of available chlorine in bleaching powder
- 7.Preparation of Urea-formaldehyde resin
- 8.Determination on strength of NaoH using HCl conductometrically
- 9.Acids-Base titration by P<sup>H</sup> meter
- 10.Acids-Base titration by Potentiometer
- 11.Determination of viscosity of lubricating oil

12.Determination of Surface tension

**CE/ME 162(R20)**

**Communicative English Lab**

Lectures: 3 Periods

Sessional Marks: 30

University Exam: 3 hours

University Examination Marks: 70

**List of Activities**

1. Identifying phonic sounds, listening to the sounds, practice and record the sounds from the English learning software
2. Common mispronounced words
3. Listening to the short audios and complete the tasks based on the audios
4. Listening to motivational speeches and answering the questions
5. Comprehending Spoken material in British English & American English
6. Situational Dialogues
7. Role plays
8. Reading comprehension exercises for GRE, TOEFL, GATE etc
9. Reading articles from newspaper
10. Specific reading for enhancing vocabulary
11. Vocabulary building exercises
12. Extempore
13. JAM sessions
14. Small talks
15. Oral presentations