ANNA UNIVERSITY : : CHENNAI - 600 025

AFFILIATED INSTITUTIONS

REGULATIONS 2017

CHOICE BASED CREDIT SYSTEM

Common to all B.E. / B.Tech. Full-Time Programmes

(For the students admitted to B.E. / B.Tech. Programme at various Affiliated Institutions)

DEGREE OF BACHELOR OF ENGINEERING / BACHELOR OF TECHNOLOGY

This Regulations is applicable to the students admitted to B.E/B.Tech. Programmes at all Engineering Colleges affiliated to Anna University, Chennai (other than Autonomous Colleges) and to all the University Colleges of Engineering of Anna University, Chennai from the academic year 2017-2018 onwards.

1. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires:

I) "**Programme**" means Degree Programme, that is B.E./B.Tech. Degree Programme.

II) "**Discipline**" means specialization or branch of B.E./B.Tech. Degree Programme, like Civil Engineering, Textile Technology, etc.

III) "**Course**" means a theory or practical subject that is normally studied in a semester, like Mathematics, Physics, etc.

IV) **"Director,Academic Courses"** means the authority of the University who isresponsible for all academic activities of the Academic Programmes for implementation of relevant rules of this Regulations pertaining to the Academic Programmes.

V) **"Chairman"** means the Head of the Faculty.

VI) **"Head of the Institution"** means the Principal of the College.

VII) **"Head of the Department"** means head of the Department concerned.

VIII) **"Controller of Examinations"** means the authority of the University who isresponsible for all activities of the University Examinations.

IX) **"University"** means ANNA UNIVERSITY, CHENNAI.

2. ADMISSION

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

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

(OR)

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

2.2 **Lateral entry admission**

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

(OR)

(ii)The candidates who possess the Degree in Science (B.Sc.,) (10+2+3 stream) with Mathematics as a subject at the B.Sc. Level are eligible to apply for Lateral entry admission to the third semester of B.E. / B.Tech.

Such candidates shall undergo two additional Engineering subject(s) in the **third andfourth semesters** as prescribed by the University.

3. PROGRAMMES OFFERED

B.E. / B.Tech.Programmes under the Faculty of Civil Engineering, Faculty of Mechanical Engineering, Faculty of Electrical Engineering, Faculty of Information and Communication Engineering and Faculty of Technology.

4. STRUCTURE OF PROGRAMMES

4.1 Categorization of Courses

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

i. **Humanities and Social Sciences (HS)** courses include Technical English,Engineering Ethics and Human Values, Communication skills, Environmental Science and Engineering.

ii. **Basic Sciences (BS)** courses include Mathematics, Physics, Chemistry, Biology, etc.

iii. **Engineering Sciences (ES)** courses include Engineering practices, EngineeringGraphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering, Instrumentation etc.

iv. **Professional Core (PC)** courses include the core courses relevant to the chosenspecialization/branch.

v. **Professional Elective (PE)** courses include the elective courses relevant to thechosen specialization/ branch.

vi. **Open Elective (OE)** courses include the courses from other branches which astudent can choose from the list specified in the curriculum of the students B.E. / B. Tech. / B. Arch. Programmes.

vii. **Employability Enhancement Courses (EEC)** include Project Work and/orInternship, Seminar, Professional Practices, Case Study and Industrial/Practical Training.

4.2 Personality and Character Development

All students shall enroll, on admission, in any one of the personality and character development programmes (NCC/NSS/NSO/YRC) and undergo training for about 80 hours and attend a camp of about seven days. The training shall include classes on hygiene and health awareness and also training in first-aid.

National Cadet Corps (NCC) will have about 20 parades.

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

National Sports Organization (NSO) will have sports, Games, Drills and Physical exercises.

Youth Red Cross (YRC) will have activities related to social services in and aroundCollege/Institutions.

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

4.3 Number of courses per semester

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

4.4 Credit Assignment

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

Contact period per week	**CREDITS**
1 Lecture Period	1
2 Tutorial Periods	1
2 Laboratory Periods (also for EEC courses like / Seminar / Project Work / Case study / etc.)	1

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

4.5. Industrial Training / Internship

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

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

4.6 Industrial Visit

Every student is required to go for at least one Industrial Visit every year starting from the second year of the Programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

4.7 Value Added Courses

The Students may optionally undergo Value Added Courses and the credits earned through the Value Added Courses shall be over and above the total credit requirement prescribed in the curriculum for the award of the degree. One / Two credit courses shall be offered by a Department **of an institution with the prior approval from the Head of the Institution.** The details of the syllabus, time table and faculty may be sent to the Centre for Academic Courses and the Controller of Examinations after approval from the **Head of the Institution** concerned atleast one month before the course is offered. **Students can take a maximumof two one credit courses / one two credit course** during the entire duration of theProgramme.

4.8 Online Courses

4.8.1 Students may be permitted to credit only one online course of 3 credits with the approval of **Head of the Institution** and Centre for Academic Courses.

4.8.2 Students may be permitted to credit one online course (which are provided with certificate) subject to a maximum of three credits. The approved list of online courses will be provided by the Centre for Academic courses from time to time. The student needs to obtain certification or credit to become eligible for writing the End Semester Examination to be conducted by Controller of Examinations, Anna

University. The details regarding online courses taken up by students should be sent to the Controller of Examinations, Anna University and Centre for Academic Courses one month before the commencement of End Semester Examination.

4.9 The students satisfying the following conditions shall be permitted to carry out their final semester Project work for six months in industry/research organizations.

Thestudent should not have current arrears and shall have CGPA of 7.50 and above.

The student shall undergo the eighth semester courses in the sixth and seventh semesters. The Head of Department, in consultation with the faculty handling the said courses shall forward the proposal recommended by the Head of Institution to the Controller of Examinations through the Director, Centre for Academic courses for approval at least 4 weeks before the commencement of the sixth semester of the programme for approval.

4.10 Medium of Instruction

The medium of instruction is English for all courses, examinations, seminar presentations and project / thesis / dissertation reports except for the programmes offered in Tamil Medium.

5. DURATION OF THE PROGRAMME

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

5.1.1 A student is ordinarily expected to complete the B.E. Mechanical Engineering (Sandwich) Programme in 10 semesters (five academic years) but in any case not more than 18 Semesters for HSC (or equivalent) candidates.

5.2 Each semester shall normally consist of 75 working days or 540 periods of 50 minutes each. The Head of the Institution shall ensure that every teacher imparts instruction as per the number of periods specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

5.3 The Head of the Institution may conduct additional classes for improvement, special coaching, conduct of model test etc., over and above the specified periods. But for the purpose of calculation of attendance requirement for writing the end semester examinations (as per clause 6) by the students, following method shall be used.

$$\text{Percentage of Attendance} = \frac{\text{Total no. of periods attended in all the courses per semester}}{\text{(No.of periods / week as prescribed in the curriculum) x 15 taken together for all courses of the semester}} \times 100$$

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

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

6. COURSE REGISTRATION

6.1 The Institution is responsible for registering the courses that each student is proposing to undergo in the ensuing semester. Each student has to register for all courses to be undergone in the curriculum of a particular semester (with the facility to drop courses to a maximum of 6 credits (vide clause 6.5). The student can also register for courses for which the student has failed in the earlier semesters. In such cases the student shall do **reappearance registration** for those courses for which the attendance requirement is not compulsory. However, the student have the option to take up some other professional elective or open elective that he has failed to pass. **But, the total number of credits that a student is allowed to register persemester cannot exceed 36.** The registration details of the candidates may be approved bythe Head of the Institution and forwarded to the Controller of Examinations. This registration is for undergoing the course as well as for writing the End Semester Examinations. No course shall be offered by any department of any institution unless a minimum 10 students register for the course.

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

i. Courses of the current semester.
ii. The core (Theory/Lab /EEC) courses that the student has not cleared in the previous semesters.
iii. Elective courses which the student failed (either the same elective or a different elective instead)

6.2 Flexibility to Drop courses

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

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

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

7. ATTENDANCE REQUIREMENTS FOR COMPLETION OF THE SEMESTER

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

Ideally every student is expected to attend all classes of all the courses and secure 100% attendance. However, in order to give provision for certain unavoidable reasons such as Medical / participation in sports, the student is expected to attend atleast 75% of the classes.

Therefore, he/she shall **secure not less than 75%** (after rounding off to the nearest integer) of overall attendance as calculated as per clause 5.3.

7.2 However, a candidate who secures overall attendance between 65% and 74% in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) / Participation in Sports events may be permitted to appear for the current semester examinations subject to the condition that the candidate shall submit the medical certificate / sports participation certificate attested by the Head of the Institution. The same shall be forwarded to the Controller of Examinations for record purposes.

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

8. CLASS ADVISOR

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

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

9. CLASS COMMITTEE

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

- Solving problems experienced by students in the class room and in the laboratories.
- **Clarifying the regulations of the degree programme and the details of rules therein particularly (clause 5 and 7) which should be displayed on college Notice-Board.**
- Informing the student representatives, the academic schedule including the dates of assessments and the syllabus coverage for each assessment.
- Informing the student representatives the details of Regulations regarding weightage used for each assessment. In the case of practical courses (laboratory / drawing / project work / seminar etc.) the breakup of marks for each experiment / exercise / module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.
- Identifying the weak students, if any, and requesting the teachers concerned to provide some additional help or guidance or coaching to such weak students.

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

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

9.4 At least 4 student representatives (usually 2 boys and 2 girls) shall be included in the class committee.

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

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

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

9.8 The first meeting of the class committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments within the framework of the Regulations. Two or three subsequent meetings may be held in a semester at suitable intervals. **The Class Committee Chairmanshall put on the Notice Board the cumulative attendance particulars of each student at the end of every such meeting to enable the students to know their attendance details to satisfy the clause 6 of this Regulation.**During these meetings the student membersrepresenting the entire class, shall meaningfully interact and express the opinions and suggestions of the other students of the class in order to improve the effectiveness of the teaching-learning process.

10. COURSE COMMITTEE FOR COMMON COURSES

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

11. SYSTEM OF EXAMINATION

11.1 Performance in each course of study shall be evaluated based on (i) continuous internal assessment throughout the semester and (ii) University examination at the end of the semester.

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

For all theory and practical courses including project work, the continuous internal assessment will carry **20 marks** while the End - Semester University examination will carry **80 marks.**

11.3 Industrial training and seminar shall carry 100 marks and shall be evaluated through internal assessment only.

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

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

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

12. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

For all theory and practical courses (including project work) the continuous assessment shall be for a maximum of 20 marks. The above continuous assessment shall be awarded as per the procedure given below:

12.1 THEORY COURSES

Three tests each carrying 100 marks shall be conducted during the semester by the Department / College concerned. The total marks obtained in all tests put together out of 300, shall be proportionately reduced for 20 marks and rounded to the nearest integer (This also implies equal weightage to all the three tests).

12.2 LABORATORY COURSES

The maximum marks for Internal Assessment shall be 20 in case of practical courses. Every practical exercise / experiment shall be evaluated based on conduct of experiment / exercise and records maintained. There shall be at least one test. The criteria for arriving at the Internal Assessment marks of 20 is as follows: 75 marks shall be awarded for successful completion of all the prescribed experiments done in the Laboratory and 25 marks for the test. The total mark shall be reduced to 20 and rounded to the nearest integer.

12.3 THEORY COURSES WITH LABORATORY COMPONENT

If there is a theory course with Laboratory component, there shall be three tests: the first two tests (each 100 marks) will be from theory portions and the third test (maximum mark 100) will be for laboratory component. The sum of marks of first two tests shall be reduced to 60 marks and the third test mark shall be reduced to 40 marks. The sum of these 100 marks may then be arrived at for 20 and rounded to the nearest integer.

12.4 PROJECT WORK

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

The Head of the Institutions shall constitute a review committee for project work for each branch of study. There shall be three reviews during the semester by the review committee. The student shall make presentation on the progress made by him / her before the committee. The total marks obtained in the three reviews shall be **reduced for 20 marks** and rounded to the nearest integer (as per the scheme given in 12.4.1).

12.4.1 The project report shall carry a maximum 30 marks. The project report shall be submitted asper the approved guidelines as given by Director, Academic Courses. Same mark shall be awarded to every student within the project group for the project report. The viva-voce examination shall carry 50 marks. Marks are awarded to each student of the project group based on the individual performance in the viva-voce examination.

Review I	Review II	Review III	End semester Examinations				
			Thesis Submission (30)		Viva-Voce (50)		
5	7.5	7.5	Internal	External	Internal	External	Supervisor
			15	15	15	20	15

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

12.5 OTHER EMPLOYABILITY ENHANCEMENT COURSES

(a) The seminar / Case study is to be considered as purely INTERNAL (with 100% internal marks only). Every student is expected to present a minimum of 2 seminars per semester before the evaluation committee and for each seminar, marks can be equally apportioned. The three member committee appointed by Head of the Institution will evaluate the seminar and at the end of the semester the marks can be consolidated and taken as the final mark. The evaluation shall be based on the seminar paper (40%), presentation (40%) and response to the questions asked during presentation (20%).

(b) The Industrial / Practical Training, Summer Project, Internship, shall carry 100 marks and shall be evaluated through internal assessment only. At the end of Industrial / Practical training / internship / Summer Project, the candidate shall submit a certificate from the organization where he / she has undergone training and a brief report. The evaluation will be made based on this report and a Viva-Voce Examination, conducted internally by a three member Departmental Committee constituted by the Head of the Institution. The certificates (issued by the organization) submitted by the students shall be attached to the mark list sent by the Head of the Institution to the Controller of Examinations.

12.6 ASSESSMENT FOR VALUE ADDED COURSE

The one / two credit course shall carry 100 marks and shall be evaluated through **continuousassessments only**. Two Assessments shall be conducted during the semester by the Departmentconcerned. The total marks obtained in the tests shall be reduced to 100 marks and rounded to the nearest integer. A committee consisting of the Head of the Department, staff handling the course and a senior Faculty member nominated by the Head of the Institution shall monitor the evaluation process. The list of students along with the marks and the grades earned may be forwarded to the Controller of Examinations for appropriate action at least one month before the commencement of End Semester Examinations.

12.7 ASSESSMENT FOR ONLINE COURSES

Students may be permitted to credit one online course (which are provided with certificate) subject to a maximum of three credits. The approved list of online courses will be provided by the Centre for Academic courses from time to time. **This online course of 3 credits can be consideredinstead of one elective course**. The student needs to obtain certification or credit to becomeeligible for writing the End Semester Examination to be conducted by Anna University. **Thecourse shall be evaluated through the End Semester Examination only conducted by Controller of Examinations, Anna University.**

12.8. Internal marks approved by the Head of the Institution shall be displayed by the respective HODs within 5 days from the last working day.

12.9 Attendance Record

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

13. REQUIREMENTS FOR APPEARING FOR UNIVERSITY EXAMINATIONS

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

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

14. PASSING REQUIREMENTS

14.1 A candidate who secures not less than 50% of total marks prescribed for the course [Internal Assessment + End semester University Examinations] with a minimum of 45% of the marks prescribed for the end-semester University Examination, shall be declared to have passed the course and acquired the relevant number of credits. This is applicable for both theory and practical courses (including project work).

14.2 If a student fails to secure a pass in a theory course (except electives), **the student shall doreappearance registration** for that course in the subsequent semester, when offered next,earn continuous assessment marks and attend the end semester examination.

14.3 If the course, in which the student has failed, is a professional elective or an open elective, the student may be permitted to register for the same or any other professional elective or open elective course in the subsequent semesters, attend the classes and fulfill the attendance requirements as per Clause 7.

14.4 If a student fails to secure a pass in a laboratory course, **the student shall register** for the course again, when offered next.

14.5 If a student fails to secure a pass in project work, **the student shall register** for the course again, when offered next.

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

14.7 If a student has failed in the final semester examination he/she may be allowed to register for the course in the next semester itself.

14.8 A student can apply for revaluation of the student's semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee along with prescribed application to the COE through the Head of the Institution. The COE will arrange for the revaluation and the results will be intimated to the student concerned through the Head of the Institution. Revaluation is not permitted for laboratory course and project work.

15. AWARD OF LETTER GRADES

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

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

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

'SA' denotes shortage of attendance (as per clause 7.3) and hence prevention from writing the end semester examinations. 'SA' will appear only in the result sheet.

"RA" denotes that the student has failed to pass in that course. "**W**" denotes **withdrawal** fromthe exam for the particular course. The grades RA and W will figure both in Marks Sheet as well as in Result Sheet). In both cases the student has to earn Continuous Assessment marks and appear for the End Semester Examinations.
If the grade W is given to course, the attendance requirement need not be satisfied.

If the grade RA is given to a core **theory course**, the attendance requirement need not be satisfied, but if the grade RA is given to a **Laboratory Course/ Project work / Seminar andany other EEC course,** the attendance requirements (vide clause 7) should be satisfied.

15.2 For the Co-curricular activities such as National Cadet Corps (NCC)/ National Service Scheme (NSS) / NSO / YRC, a satisfactory / not satisfactory grading will appear in the mark sheet. Every student shall put in a minimum of 75% attendance in the training and attend the camp compulsorily. The training and camp shall be completed during the first year of the programme. However, for valid reasons, the Head of the Institution may permit a student to complete this requirement in the second year. **A satisfactory grade in the above co-curricular activitiesis compulsory for the award of degree.**

15.3 The grades O, A+, A, B+, B obtained for the one credit course shall figure in the Mark sheet under the title **'Value Added Courses'**. The Courses for which the grades are RA, SA **will notfigure in the mark sheet.**

Grade sheet

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

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

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

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

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

where C_i is the number of Credits assigned to the course

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

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

16 ELIGIBILITY FOR THE AWARD OF THE DEGREE

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

i. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.

ii. Successfully completed the course requirements, appeared for the End-Semester examinations and passed all the subjects prescribed in all the 8 semesters / (10 Semesters for B.E. Mechanical Engineering (Sandwich)) within a maximum period of 7 years (9 years in case of B.E. Mechanical Engineering (Sandwich) and 6 years in the case of Lateral Entry) reckoned from the commencement of the first (third in the case of Lateral Entry) semester to which the candidate was admitted.

iii. Successfully passed any additional courses prescribed by the Director, Academic Courses whenever readmitted under regulations R-2017 (vide clause 18.3)

iv. Successfully completed the NCC / NSS / NSO / YRC requirements.

v. No disciplinary action pending against the student.

vi. The award of Degree must have been approved by the Syndicate of the University.

16.2 CLASSIFICATION OF THE DEGREE AWARDED

16.2.1 FIRST CLASS WITH DISTINCTION

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

- Should have passed the examination in all the courses of all the eight semesters (10 Semesters in case of Mechanical (Sandwich) and 6 semesters in the case of Lateral Entry) in the student's First Appearance within **five** years (Six years in the case of Mechanical (Sandwich) and Four years in the case of Lateral Entry). Withdrawal from examination (vide Clause 17) will not be considered as an appearance.

- Should have secured a CGPA of not less than 8.50
- One year authorized break of study (if availed of) is included in the five years (Six years in the case of Mechanical (Sandwich) and four years in the case of lateral entry) for award of First class with Distinction.
- Should NOT have been prevented from writing end semester examination due to lack of attendance in any semester.

16.2.2 FIRST CLASS:

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

- Should have passed the examination in all the courses of all eight semesters (10 Semesters in case of Mechanical (Sandwich) and 6 semesters in the case of Lateral Entry) **within Six years**. (Seven years in case of Mechanical (Sandwich) and Five years in the case of Lateral Entry)
- One year authorized break of study (if availed of) or prevention from writing the End Semester examination due to lack of attendance (if applicable) is included in the duration of six years (Seven years in case of Mechanical (Sandwich) and five years in the case of lateral entry) for award of First class
- Should have secured a CGPA of not less than **7.00**

16.2.3 SECOND CLASS:

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

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

16.4 Photocopy / Revaluation

A candidate can apply for photocopy of his/her semester examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of Institutions. The answer script is to be valued and justified by a faculty member, who handled the subject and recommend for revaluation with breakup of marks for each question. Based on the recommendation, the candidate can register for the revaluation through proper application to the Controller of Examinations. The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate concerned through the Head of the Institutions. Revaluation is not permitted for practical courses and for project work.

A candidate can apply for revaluation of answer scripts for not exceeding 5 subjects at a time.

16.5 Review

Candidates not satisfied with Revaluation can apply for Review of his/ her examination answer paper in a theory course, within the prescribed date on payment of a prescribed fee through proper application to Controller of Examination through the Head of the Institution.

Candidates applying for Revaluation only are eligible to apply for Review.

17. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

17.1 A student may, for valid reasons, (medically unfit / unexpected family situations / sports approved by Chairman, sports board and HOD) be granted permission to withdraw from appearing for the end semester examination in any course or courses in **ANY ONE** of the semester examinations during the entire duration of the degree programme. The application shall be sent to Director, Student Affairs through the Head of the Institutions with required documents.

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

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

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

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

18. PROVISION FOR AUTHORISED BREAK OF STUDY

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

18.2 Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme. However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons, and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he / she applies to the Director, Student Affairs in advance, but not later than the last date for registering for the end semester examination of the semester in question, through the Head of the Institution stating the reasons therefore and the probable date of rejoining the programme.

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

18.4 The authorized break of study would not be counted towards the duration specified for passing all the courses for the purpose of classification (vide Clause 16.1).

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

18.6 If any student is prevented for want of required attendance, the period of prevention shall not be considered as authorized 'Break of Study' (Clause 18.1)

19. DISCIPLINE

19.1 Every student is required to observe disciplined and decorous behavior both inside and outside the college and not to indulge in any activity which will tend to bring down the prestige of the University / College. The Head of Institution shall constitute a disciplinary committee consisting of Head of Institution, Two Heads of Department of which one should be from the faculty of the student, to enquire into acts of indiscipline and notify the University about the disciplinary action recommended for approval. In case of any serious disciplinary action which leads to suspension or dismissal, then a committee shall be constituted including one representative from Anna University, Chennai. In this regard, the member will be nominated by the University on getting information from the Head of the Institution.

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

20. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

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

ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

Educational Objectives

Bachelor of Electrical and Electronics Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

1. Have successful technical and professional careers in their chosen fields such as circuit theory, Field theory, control theory and computationalplatforms.
2. Engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics and their applications in powerengineering.

Programme Outcomes

The graduates will have the ability to

a. Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and InstrumentationEngineering.
b. Identify and formulate Electrical and Electronics Engineering problems from research literature and be able to analyze the problem using first principles of Mathematics and Engineering Sciences.
c. Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmentalissues.
d. Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significantconclusion.
e. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems and also being conscious of thelimitations.
f. Understand the role and responsibility of the Professional Electrical and Electronics Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
g. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for sustainableDevelopment.
h. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethicalresponsibilities.
i. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinaryprojects.
j. Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and followinstructions.
k. Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and to apply them as member / leader in teams and multidisciplinaryenvironments.
l. Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadestsense.

PEO\PO	a	b	c	d	e	f	g	h	i	j	k	l
1	✓	✓	✓	✓	✓	✓	✓					✓
2	✓	✓	✓	✓	✓	✓		✓		✓		

SEMESTER	NAME OF THE SUBJECT	PROGRAM OUTCOMES								
		a	b	c	d	e	f	g	h	
	THEORY									
SEM I	Communicative English									✓
	Engineering Mathematics - I	✓	✓			✓				
	Engineering Physics	✓	✓	✓		✓		✓		
	Engineering Chemistry	✓	✓	✓		✓				
	Problem Solving and Python Programming	✓	✓	✓	✓	✓				
	Engineering Graphics			✓	✓					
	PRACTICAL									
	Problem Solving and Python Programming Laboratory	✓		✓	✓	✓	✓			
	Physics and Chemistry Laboratory	✓	✓							
	THEORY									
SEM II	Technical English									✓
	Engineering Mathematics - II	✓	✓	✓		✓				
	Physics For Electronics Engineering	✓	✓	✓		✓		✓		
	Basic Civil and Mechanical Engineering				✓		✓			
	Circuit Theory	✓	✓	✓	✓	✓				
	Environmental Science and Engineering	✓	✓			✓	✓	✓	✓	
	PRACTICALS									
	Engineering Practices Laboratory	✓		✓	✓	✓	✓			
	Electric Circuits Lab	✓		✓	✓	✓	✓			

ANNA UNIVERSITY, CHENNAI
AFFILIATED INSTITUTIONS
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM
B.E. ELECTRICAL AND ELECTRONICS ENGINEERING
CURRICULUM I TO VIII SEMESTERS AND SYLLABUS I & II SEMESTERS

SEMESTER I

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS8151	Communicative English	HS	4	4	0	0	4
2.	MA8151	Engineering Mathematics - I	BS	4	4	0	0	4
3.	PH8151	Engineering Physics	BS	3	3	0	0	3
4.	CY8151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE8151	Problem Solving and Python Programming	ES	3	3	0	0	3
6.	GE8152	Engineering Graphics	ES	6	2	0	4	4
PRACTICALS								
7.	GE8161	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8.	BS8161	Physics and Chemistry Laboratory	BS	4	0	0	4	2
			TOTAL	**31**	**19**	**0**	**12**	**25**

SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS8251	Technical English	HS	4	4	0	0	4
2.	MA8251	Engineering Mathematics - II	BS	4	4	0	0	4
3.	PH8253	Physics for Electronics Engineering	BS	3	3	0	0	3
4.	BE8252	Basic Civil and Mechanical Engineering	ES	4	4	0	0	4
5.	EE8251	Circuit Theory	PC	4	2	2	0	3
6.	GE8291	Environmental Science and Engineering	HS	3	3	0	0	3
PRACTICALS								
7.	GE8261	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	EE8261	Electric Circuits Laboratory	PC	4	0	0	4	2
			TOTAL	**30**	**20**	**2**	**8**	**25**

HS8151 **COMMUNICATIVEENGLISH**

L	T	P	C
4	0	0	4

OBJECTIVES:

- To develop the basic reading and writing skills of first year engineering and technologystudents.
- To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seekingclarifications.
- To help learners develop their speaking skills and speak fluently in realcontexts.
- To help learners develop vocabulary of a general kind by developing their readingskills

UNIT I SHARING INFORMATION RELATED TOONESELF/FAMILY&FRIENDS 12

Reading- short comprehension passages, practice in skimming-scanning and predicting- **Writing**- completing sentences- - developing hints. **Listening**- short texts- short formal and informal conversations. **Speaking-** introducing oneself - exchanging personal information- **Language development**- Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development-**- prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II GENERAL READING ANDFREEWRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening**- telephonic conversations. **Speaking –** sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

UNIT III GRAMMAR ANDLANGUAGEDEVELOPMENT 12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences **Listening**– listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking**- asking about routine actions and expressing opinions. **Language development**- degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development –** single word substitutes- adverbs.

UNIT IV READING ANDLANGUAGEDEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing**- letter writing, informal or personal letters-e-mails-conventions of personal email- **Listening**- listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend- **Language development-** Tenses- simple present-simple past-present continuous and past continuous- **Vocabulary development**- synonyms-antonyms- phrasal verbs

UNITV EXTENDEDWRITING **12**

Reading- longer texts- close reading –**Writing**- brainstorming -writing short essays **–** developing an outline- identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks-conversations- **Speaking –** participating in conversations- short group conversations-**Language development**-modal verbs- present/ past perfect tense - **Vocabulary development**-collocations-fixed and semi-fixedexpressions

TOTAL: 60 PERIODS

OUTCOMES: At the end of the course, learners will be able to:

- Read articles of a general kind in magazines andnewspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions inEnglish.
- Comprehend conversations and short talks delivered inEnglish
- Write short essays of a general kind and personal letters and emails inEnglish.

TEXT BOOKS:

1. Board of Editors. **Using English** ACoursebook for Undergarduate Engineers and Technologists**.** Orient BlackSwan Limited, Hyderabad:2015
2. Richards, C. Jack. **Interchange Students' Book-2** New Delhi: CUP,2015.

REFERENCES

1 Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.

2 Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking SkillsforBusinessEnglish.** Cambridge University Press, Cambridge: Reprint2011

3 Dutt P. Kiranmai and RajeevanGeeta. **Basic Communication Skills,** Foundation Books: 2013

4 Means,L. Thomas andElaine Langlois. **English & Communication ForColleges.** CengageLearning ,USA: 2007

5 Redston, Chris &Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi:2005

MA8151 ENGINEERING MATHEMATICS -I

L	T	P	C
4	0	0	4

OBJECTIVES :

- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among otherdisciplines.

UNIT I DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OFSEVERAL VARIABLES 12

Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III INTEGRAL CALCULUS 12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV MULTIPLEINTEGRALS 12

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

UNIT V DIFFERENTIALEQUATIONS 12

Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undeterminedcoefficients.

TOTAL : 60 PERIODS

OUTCOMES :

After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiatefunctions.
- Apply differentiation to solve maxima and minimaproblems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change ofvariables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration byparts.

- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differentialequations.

TEXT BOOKS :

1. Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rdEdition, 2014.
2. JamesStewart,"Calculus:EarlyTranscendentals",CengageLearning,7thEdition,NewDelhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES :

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10thEdition,2016.
2. Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 3rdEdition,2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., “Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press,2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12thEdition, Pearson India,2016.

PH8151	ENGINEERINGPHYSICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering andTechnology.

UNITI PROPERTIESOF MATTER 9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending inbeams.

UNITII WAVES ANDFIBEROPTICS 9

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein’s A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNITIII THERMAL PHYSICS 9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar waterheaters.

UNITIV QUANTUMPHYSICS 9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

UNITV CRYSTAL PHYSICS 9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growthtechniques.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course,

- the students will gain knowledge on the basics of properties of matter and itsapplications,
- the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibreoptics,
- the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heatexchangers,
- the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes,and
- the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press,2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers,2012.
3. Pandey, B.K. &Chaturvedi, S. "Engineering Physics". Cengage Learning India,2012.

REFERENCES:

1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley,2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. &Mosca, G. "Physics for Scientists and Engineers with ModernPhysics'. W.H.Freeman,2007.

CY8151 ENGINEERINGCHEMISTRY L TPC 3 0 03

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatmenttechniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance ofalloys.
- Preparation, properties and applications of engineeringmaterials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseousfuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER ANDITSTREATMENT 9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - ReverseOsmosis.

UNIT II SURFACE CHEMISTRYANDCATALYSIS 9

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollutionabatement.

Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS ANDPHASERULE 9

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinsonprocess.

UNIT IV FUELSANDCOMBUSTION 9

Fuels: Introduction - classification of fuels - coal - analysis of coal (proximate and ultimate) - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - manufacture of synthetic petrol (Bergius process) - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES ANDSTORAGEDEVICES 9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of

batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H_2-O_2 fuelcell.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi,2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi,2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi,2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi,2014.
2. PrasantaRath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi,2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi,2015.

GE8151 PROBLEM SOLVING AND PYTHONPROGRAMMING L T PC
3 0 0 3

COURSE OBJECTIVES:

- To know the basics of algorithmic problemsolving
- To read and write simple Pythonprograms.
- To develop Python programs with conditionals andloops.
- To define Python functions and callthem.
- To use Python data structures –- lists, tuples,dictionaries.
- To do input/output with files inPython.

UNITI ALGORITHMICPROBLEMSOLVING 9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers ofHanoi.

UNITII DATA,EXPRESSIONS,STATEMENTS 9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between twopoints.

UNITIII CONTROLFLOW,FUNCTIONS 9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binarysearch.

UNITIV LISTS,TUPLES,DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNITV FILES,MODULES,PACKAGES 9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- Develop algorithmic solutions to simple computationalproblems
- Read, write, execute by hand simple Pythonprograms.
- Structure simple Python programs for solvingproblems.
- Decompose a Python program intofunctions.
- Represent compound data using Python lists, tuples,dictionaries.
- Read and write data from/to files in PythonPrograms.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Allen B. Downey, ` ` Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016(http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.,2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition,2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revisedand expanded Edition, MIT Press ,2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning,2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC,2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd.,2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,,2015.

GE8152 ENGINEERING GRAPHICS L T PC 2
0 4 4

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineeringproducts.
- T o expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (NotforExamination) 1

Importance ofgraphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding ofdrawing sheets – Lettering and dimensioning.

UNITI PLANE CURVES ANDFREEHANDSKETCHING 7+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction ofinvolutes of square and circle – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNITII PROJECTION OF POINTS, LINES ANDPLANESURFACE 6+12

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

UNITIII PROJECTIONOFSOLIDS 5+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNITIV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENTOF SURFACES 5+12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.

UNITV ISOMETRIC ANDPERSPECTIVEPROJECTIONS 6+12

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:

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

- familiarize with the fundamentals and standards of Engineeringgraphics
- perform freehand sketching of basic geometrical constructions and multiple views ofobjects.
- project orthographic projections of lines and planesurfaces.
- draw projections and solids and development ofsurfaces.
- visualize and to project isometric and perspective sections of simplesolids.

TEXT BOOK:

1. NatrajanK.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
2. VenugopalK. and Prabhu Raja V., “Engineering Graphics”, New AgeInternational (P) Limited,2008.

REFERENCES:

1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi,2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore,2007.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi,2005.
5. N S ParthasarathyAnd Vela Murali, “Engineering Graphics”, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation –Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – ProjectionMethods.

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consistof drawing sheets of A3 size only. The studentswill be permitted to use appropriate scale to fit solution within A3size.
4. The examination will be conducted in appropriate sessions on the sameday

GE8161	PROBLEM SOLVING ANDPYTHONPROGRAMMING LABORATORY	LT PC 0 0 42

COURSE OBJECTIVES:

- To write, test, and debug simple Pythonprograms.
- To implement Python programs with conditionals andloops.
- Use functions for structuring Pythonprograms.
- Represent compound data using Python lists, tuples,dictionaries.
- Read and write data from/to files inPython.

LIST OF PROGRAMS

1. Compute the GCD of twonumbers.
2. Find the square root of a number (Newton'smethod)
3. Exponentiation (power of anumber)
4. Find the maximum of a list ofnumbers
5. Linear search and Binarysearch
6. Selection sort, Insertionsort
7. Mergesort
8. First n primenumbers
9. Multiplymatrices
10. Programs that take command line arguments (wordcount)
11. Find the most frequent words in a text read from afile
12. Simulate elliptical orbits inPygame
13. Simulate bouncing ball usingPygame

PLATFORM NEEDED
Python 3 interpreter for Windows/Linux

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

- Write, test, and debug simple Pythonprograms.
- Implement Python programs with conditionals andloops.
- Develop Python programs step-wise by defining functions and callingthem.
- Use Python lists, tuples, dictionaries for representing compounddata.
- Read and write data from/to files inPython.

TOTAL :60 PERIODS

BS8161 **PHYSICS AND CHEMISTRYLABORATORY** **L T P C**
(Common to all branches of B.E. / B.TechProgrammes) **0 0 4 2**

OBJECTIVES:

- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter andliquids.

LISTOFEXPERIMENTS: PHYSICS LABORATORY (Any 5Experiments)

1. Determination of rigidity modulus – Torsionpendulum
2. Determination of Young's modulus by non-uniform bendingmethod
3. (a) Determination of wavelength, and particle size usingLaser
   (b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Discmethod.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonicinterferometer
6. Determination of wavelength of mercury spectrum – spectrometergrating
7. Determination of band gap of asemiconductor
8. Determination of thickness of a thin wire – Air wedgemethod

TOTAL: 30 PERIODS

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

- apply principles of elasticity, optics and thermal properties for engineeringapplications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

OBJECTIVES:

- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumentalanalysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometery.

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTAmethod.
3. Determination of DO content of water sample by Winkler'smethod.
4. Determination of chloride content of water sample by argentometricmethod.
5. Estimation of copper content of the given solution byIodometry.
6. Determination of strength of given hydrochloric acid using pHmeter.
7. Determination of strength of acids in a mixture of acids using conductivitymeter.
8. Estimation of iron content of the given solution usingpotentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1,10-Phenanthroline / thiocyanatemethod).
10. Estimation of sodium and potassium present in water using flamephotometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwaldviscometer.
12. Pseudo first order kinetics-esterhydrolysis.
13. Corrosion experiment-weight lossmethod.
14. Determination ofCMC.
15. Phase change in asolid.
16. Conductometric titration of strong acid vs strongbase.

OUTCOMES:

- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality relatedparameters.

TOTAL: 30 PERIODS

TEXTBOOKS:

1. Vogel's Textbook of Quantitative Chemical Analysis (8^{TH} edition, 2014)

HS8251	TECHNICAL ENGLISH	L	T	P	C
		4	0	0	4

OBJECTIVES: The Course prepares second semester engieering and Tecgnology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technologytexts.
- Foster their ability to write convincing job applications and effectivereports.
- Develop their speaking skills to make technical presentations , participate in groupdiscussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas ofspecialisation.

UNITI INTRODUCTIONTECHNICALENGLISH 12

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

UNITII READING ANDSTUDY SKILLS 12

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

UNITIII TECHNICAL WRITINGAND GRAMMAR 12

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

UNITIV REPORTWRITING 12

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing**- email etiquette- job application – cover letter –Résumé preparation(via email and hard copy)- analytical essays and issue based essays-- **Vocabulary Development**- finding suitable synonyms-paraphrasing-. **Language Development-** clauses- ifconditionals.

UNITV GROUP DISCUSSION ANDJOBAPPLICATIONS 12

Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey- **Vocabulary Development- verbal analogies Language Development-** reported speech

TOTAL : 60 PERIODS

OUTCOMES: At the end of the course learners will be able to:

- Read technical texts and write area- specific textseffortlessly.
- Listen and comprehend lectures and talks in their area of specialisationsuccessfully.
- Speak appropriately and effectively in varied formal and informalcontexts.
- Write reports and winning jobapplications.

TEXT BOOKS:

1. Boardofeditors.**FluencyinEnglishACoursebookforEngineeringandTechnology.** Orient Blackswan, Hyderabad: 2016
2. Sudharshana.N.P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: New Delhi,2016.

REFERENCES

1. Booth-L. Diana**, Project Work,** Oxford University Press**,** Oxford:2014.
2. Grussendorf, Marion, **English for Presentations,** Oxford University Press, Oxford:2007
3. Kumar, Suresh. E. **Engineering English**. Orient Blackswan:Hyderabad,2015
4. Means, L. Thomas and Elaine Langlois, **English & Communication ForColleges.** Cengage Learning, USA: 2007
5. Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: NewDelhi,2014.

Students can be asked to read Tagore, Chetan Bhagat and for suplementary reading.

MA8251 ENGINEERING MATHEMATICS –II L T P C
4 0 0 4

OBJECTIVES :

- This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNITI MATRICES 12

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadraticforms.

UNITII VECTORCALCULUS 12

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved

surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNITIII ANALYTICFUNCTIONS 12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c$, cz, $\frac{1}{z}$, z^2 - Bilineartransformation.

UNITIV COMPLEXINTEGRATION 12

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircularcontour.

UNITV LAPLACETRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES :

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similarmatrices.
- Gradient, divergence and curl of a vector point function and relatedidentities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and theirverification.
- Analytic functions, conformal mapping and complexintegration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constantcoefficients.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rdEdition,2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10thEdition, New Delhi,2016.

REFERENCES :

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7thEdition,2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", NarosaPublications, New Delhi , 3rdEdition,2007.
3. O'Neil, P.V. "Advanced Engineering Mathematics", Cengage Learning India Pvt., Ltd, New Delhi,2007.

4. Sastry, S.S, “Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi,2014.
5. Wylie, R.C. and Barrett, L.C., “Advanced Engineering Mathematics “Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi,2012.

		L	T	P	C
PH8253	**PHYSICS FOR ELECTRONICSENGINEERING** (Common to BME, ME, CC, ECE, EEE, E&I,ICE)	**3**	**0**	**0**	**3**

OBJECTIVES:

- To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic, dielectric and optical properties of materials and nano devices.

UNITI ELECTRICAL PROPERTIES OFMATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential: Bloch thorem – metals and insulators - Energy bands in solids– tight binding approximation - Electron effective mass – concept ofhole.

UNITII SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Carrier transport: Velocity-electric field relations – drift and diffusion transport - Einstein’s relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions - Ohmic contacts – tunnel diode - Schottky diode – MOS capacitor - powertransistor.

UNITIII MAGNETIC AND DIELECTRIC PROPERTIESOFMATERIALS 9

Magnetism in materials – magnetic field and induction – magnetization - magnetic permeability and susceptibility–types of magnetic materials – microscopic classification of magnetic materials - Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory. Dielectric materials: Polarization processes – dielectric loss – internal field – Clausius-Mosotti relation- dielectric breakdown – high-k dielectrics.

UNITIV OPTICAL PROPERTIES OFMATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and Semiconductors (concepts only) - photo current in a P- N diode – solar cell –photo detectors - LED – Organic LED – Laser diodes – excitons - quantum confined Stark effect – quantum dot laser.

UNITV NANOELECTRONICDEVICES 9

Introduction - electron density in bulk material – Size dependence of Fermi energy– quantum confinement – quantum structures - Density of states in quantum well, quantum wire and quantum dot structures –Zener-Bloch oscillations – resonant tunneling – quantum interference effects – mesoscopic structures: conductance fluctuations and coherent transport – Coulomb blockade effects - Single electron phenomena and Single electron Transistor – magnetic semiconductors– spintronics - Carbon nanotubes: Properties andapplications.

TOTAL : 45 PERIODS

OUTCOMES:

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

- gain knowledge on classical and quantum electron theories, and energy bandstructuues,
- acquire knowledge on basics of semiconductor physics and its applications in variousdevices,
- get knowledge on magnetic and dielectric properties ofmaterials,
- have the necessary understanding on the functioning of optical materials foroptoelectronics,
- understand the basics of quantum structures and their applications in spintronics and carbon electronics.

TEXT BOOKS:

1. Kasap, S.O. “Principles of Electronic Materials and Devices”, McGraw-Hill Education,2007.
2. Umesh K Mishra &Jasprit Singh, “Semiconductor Device Physics and Design”, Springer, 2008.
3. Wahab, M.A. “Solid State Physics: Structure and Properties of Materials”. Narosa Publishing House,2009.

REFERENCES

1. Garcia, N. & Damask, A. “Physics for Computer Science Students”. Springer-Verlag,2012.
2. Hanson, G.W. “Fundamentals of Nanoelectronics”. Pearson Education,2009
3. Rogers, B., Adams, J. &Pennathur, S. “Nanotechnology: Understanding Small Systems”. CRC Press,2014

BE8252 BASIC CIVIL ANDMECHANICALENGINEERING L T PC
4 0 0 4

OBJECTIVES:

- To impart basic knowledge on Civil and MechanicalEngineering.
- To familiarize the materials and measurements used in CivilEngineering.
- To provide the exposure on the fundamental elements of civil engineeringstructures.
- To enable the students to distinguish the components and working principle ofpower plant units, IC engines, and R & ACsystem.

A – OVER VIEW

UNITI SCOPE OF CIVIL ANDMECHANICALENGINEERING 10

Overview of Civil Engineering - Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental, Transportation and Water Resources Engineering

Overview of Mechanical Engineering - Mechanical Engineering contributions to the welfare of Society –Specialized sub disciplines in Mechanical Engineering - Production, Automobile, Energy Engineering - Interdisciplinary concepts in Civil and Mechanical Engineering.

B – CIVIL ENGINEERING

UNITII SURVEYING AND CIVILENGINEERINGMATERIALS 10

Surveying: Objects – classification – principles – measurements of distances – angles – leveling – determination of areas– contours - examples.

Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel - timber - modernmaterials

UNITIII BUILDING COMPONENTSANDSTRUCTURES 15

Foundations: Types of foundations - Bearing capacity and settlement – Requirement of good foundations.

Civil Engineering Structures: Brickmasonry – stonemasonry – beams – columns – lintels – roofing – flooring – plastering – floor area, carpet area and floor space index - Types of Bridges and Dams – water supply - sources and quality of water - Rain water harvesting - introduction to high way and rail way.

C – MECHANICAL ENGINEERING

UNITIV INTERNAL COMBUSTION ENGINES ANDPOWERPLANTS 15

Classification of Power Plants - Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Working principle of steam, Gas, Diesel, Hydro - electric and Nuclear Power plants –- working principle of Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and CentrifugalPumps

UNITV REFRIGERATION AND AIRCONDITIONINGSYSTEM 10

Terminology of Refrigeration and Air Conditioning.Principle of vapour compression and absorption system–Layout of typical domestic refrigerator–Window and Split type room Air conditioner.

OUTCOMES:

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

- appreciate the Civil and Mechanical Engineering components of Projects.
- explain the usage of construction material and proper selection of constructionmaterials.
- measure distances and area by surveying
- identify the components used in power plantcycle.
- demonstrate working principles of petrol and dieselengine.
- elaborate the components of refrigeration and Air conditioningcycle.

TOTAL: 60PERIODS

TEXTBOOKS:

1. ShanmugamGandPalanichamyMS,“Basic Civil and Mechanical Engineering”,Tata McGraw HillPublishingCo.,NewDelhi,1996.

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications,2010.
2. RamamruthamS.,“Basic Civil Engineering”, Dhanpat Rai Publishing Co.(P)Ltd.1999.
3. Seetharaman S.,“BasicCivilEngineering”,AnuradhaAgencies,2005.
4. ShanthaKumarSRJ.,“Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.

5. Venugopal K. and Prahu Raja V., “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam,2000.

EE8251 CIRCUITTHEORY L T P C
2 2 0 3

OBJECTIVES:

- To introduce electric circuits and itsanalysis
- To impart knowledge on solving circuit equations using networktheorems
- To introduce the phenomenon of resonance in coupledcircuits.
- To educate on obtaining the transient response ofcircuits.
- To introduce Phasor diagrams and analysis of three phasecircuits

UNITI BASICCIRCUITSANALYSIS 6+6

Resistive elements - Ohm’s Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNITII NETWORK REDUCTION AND THEOREMS FOR DC AND AC IRCUITS 6+6

Network reduction: voltage and current division, source transformation – star delta conversion. TheveninsandNortonTheorems–SuperpositionTheorem–Maximumpowertransfertheorem– Reciprocity Theorem – Millman'stheorem.

UNIT III TRANSIENTRESPONSE ANALYSIS 6+6

L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT IV THREEPHASECIRCUITS 6+6

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phasecircuits.

UNIT V RESONANCE ANDCOUPLEDCIRCUITS 6+6

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL: 60 PERIODS

OUTCOMES:

- Ability to analyse electricalcircuits
- Ability to apply circuittheorems
- Ability to analysetransients

TEXT BOOKS:

1. WilliamH.HaytJr,JackE.KemmerlyandStevenM.Durbin,“EngineeringCircuits Analysis”,McGrawHillpublishers,edition,NewDelhi,2013.
2. CharlesK.Alexander,MathewN.O.Sadiku,“FundamentalsofElectricCircuits”, Second Edition, McGraw Hill,2013.

3. AllanH.Robbins,WilhelmC.Miller,“CircuitAnalysisTheoryandPractice”,Cengage Learning India,2013.

REFERENCES

1. ChakrabartiA,“CircuitsTheory(Analysisandsynthesis),DhanpathRai&Sons,New Delhi,1999.
2. Jegatheesan,R.,“AnalysisofElectricCircuits,”McGrawHill,2015.
3. JosephA.Edminister,MahmoodNahri,“Electriccircuits”,Schaum’sseries,McGraw- Hill, New Delhi,2010.
4. MEVanValkenburg,“NetworkAnalysis”,Prentice-HallofIndiaPvtLtd,NewDelhi, 2015.
5. Mahadevan,K.,Chitra,C.,“ElectricCircuitsAnalysis,”Prentice-HallofIndiaPvtLtd., New Delhi,2015.
6. RichardC.DorfandJamesA.Svoboda,“IntroductiontoElectricCircuits”,7thEdition, John Wiley & Sons, Inc.2015.
7. SudhakarAandShyamMohanSP,“CircuitsandNetworkAnalysisandSynthesis”, McGraw Hill,2015.

GE8291 ENVIRONMENTAL SCIENCEANDENGINEERING L T PC
3 0 0 3

OBJECTIVES:

- To study the nature and facts aboutenvironment.
- To finding and implementing scientific, technological, economic and political solutions to environmentalproblems.
- To study the interrelationship between living organism andenvironment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and itsvalue.
- To study the dynamic processes and understand the features of the earth□s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNITI ENVIRONMENT, ECOSYSTEMSANDBIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - 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 (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical 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. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTALPOLLUTION 8

Definition – causes, 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 – solidwaste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial /Agricultural.

UNIT III NATURALRESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests 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: Growing energy needs, renewable and non renewable energy sources, useofalternateenergysources.casestudies–Landresources:Landasaresource,landdegradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNITIV SOCIAL ISSUES ANDTHEENVIRONMENT 7

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 – role of non-governmental organization- 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 production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNITV HUMAN POPULATION ANDTHEENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – 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.

TOTAL: 45 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing thecourse.
- Public awareness of environmental is at infantstage.
- Ignorance and incomplete knowledge has lead tomisconceptions
- Development and improvement in std. of living has lead to serious environmentaldisasters

TEXTBOOKS:

1. Benny Joseph, ‘Environmental Science and Engineering’, Tata McGraw-Hill, New Delhi,2006.

2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education,2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmentallaw', Prentice hall of India PVT LTD,NewDelhi, 2007.
2. ErachBharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hydrabad, 2015.
3. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi,2014.
4. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press,2005.

GE8261 ENGINEERINGPRACTICESLABORATORY L TPC 0 0 42

OBJECTIVES:

- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and ElectronicsEngineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERINGPRACTICE 13

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safetyaspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in householdfittings.
(b) Study of pipe connections requirements for pumps andturbines.
(c) Preparation of plumbing line sketches for water supply and sewageworks.
(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

(e) Demonstration of plumbing requirements of high-risebuildings.

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows andfurniture.
(b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICALENGINEERINGPRACTICE 18

Welding:

(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arcwelding.
(b) Gas weldingpractice

Basic Machining:

(a) Simple Turning and Taperturning
(b) DrillingPractice

Sheet Metal Work:

(a) Forming &Bending:
(b) Model making – Trays andfunnels.
(c) Different type ofjoints.

Machine assembly practice:

(a) Study of centrifugalpump
(b) Study of airconditioner

Demonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headedbolt.
(b) Foundry operations like mould preparation for gear and step conepulley.
(c) Fitting – Exercises – Preparation of square fitting and V – fittingmodels.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERINGPRACTICE 13

1. Residential house wiring using switches, fuse, indicator, lamp and energymeter.
2. Fluorescent lampwiring.
3. Stair casewiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLCcircuit.
5. Measurement of energy using single phase energymeter.
6. Measurement of resistance to earth of an electricalequipment.

IV ELECTRONICSENGINEERINGPRACTICE 16

1. Study of Electronic components and equipments – Resistor, colourcoding measurement of AC signal parameter (peak-peak, rms period, frequency) usingCR.
2. Study of logic gates AND, OR, EX-OR andNOT.
3. Generation of ClockSignal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR andFWR.

TOTAL: 60 PERIODS

OUTCOMES:

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

- fabricate carpentry components and pipe connections including plumbingworks.
- use welding equipments to join thestructures.
- Carry out the basic machiningoperations
- Make the models using sheet metalworks
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings
- Carry out basic home electrical works andappliances
- Measure the electricalquantities
- Elaborate on the components, gates, solderingpractices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1.Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugsand otherfittings.	15Sets.
2. Carpentry vice (fitted toworkbench)	15Nos.
3. Standardwoodworkingtools	15Sets.
4. Models of industrial trusses, door joints,furniturejoints	5each
5. Power Tools: (a)RotaryHammer	2 Nos
(b) DemolitionHammer	2 Nos
(c) CircularSaw	2 Nos
(d) Planer	2 Nos
(e) HandDrilling Machine	2 Nos
(f) Jigsaw	2 Nos

MECHANICAL

1. Arc welding transformer with cablesandholders	5 Nos.
2. Welding booth withexhaustfacility	5 Nos.
3. Welding accessories like welding shield, chippinghammer, wirebrush,etc.	5Sets.
4. Oxygen and acetylene gas cylinders, blow pipe andother welding outfit.	2Nos.
5. Centrelathe	2 Nos.
6. Hearth furnace, anvil andsmithytools	2Sets.
7. Moulding table,foundrytools	2Sets.
8. Power Tool:AngleGrinder	2Nos
9. Study-purpose items: centrifugalpump,air-conditioner	One each.

ELECTRICAL

1. Assorted electrical components forhousewiring	15Sets
2. Electricalmeasuringinstruments	10Sets
3. Study purpose items: Iron box, fan and regulator,emergencylamp	1each
4. Megger(250V/500V)	1No.
5. Power Tools: (a)RangeFinder	2Nos
(b) DigitalLive-wiredetector	2Nos

ELECTRONICS

1. Soldering guns	10Nos.
2. Assorted electronic components formakingcircuits	50Nos.
3. SmallPCBs	10Nos.
4. Multimeters	10Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

EE8261 ELECTRICCIRCUITSLABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To simulate various electric circuits using Pspice/ Matlab/e-Sim /Scilab
- To gain practical experience on electric circuits and verification oftheorems.

LIST OF EXPERIMENTS

1. Simulation and experimental verification of electrical circuit problems usingKirchhoff's voltage and currentlaws.
2. Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4. Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5. Simulation and experimental verification of Maximum Power transferTheorem.
6. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and powerfactor.
7. Simulation and Experimental validation of R-C electric circuittransients.
8. Simulation and Experimental validation of frequency response of RLC electriccircuit.
9. Design and Simulation of series resonancecircuit.
10. Design and Simulation of parallel resonantcircuits.
11. Simulation of three phase balanced and unbalanced star, delta networkscircuits.

TOTAL: 60 PERIODS

OUTCOMES:

- Understand and apply circuit theorems and concepts in engineeringapplications.
- Simulate electriccircuits.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1	Regulated Power Supply: 0 – 15 V D.C - 10 Nos / Distributed PowerSource.
2	Function Generator (1 MHz) - 10Nos.
3	Single Phase Energy Meter - 1No.
4	Oscilloscope (20MHz) - 10 Nos.
5	Digital Storage Oscilloscope (20 MHz) – 1No.
6	10 Nos. of PC with Circuit Simulation Software (min 10 Users) (e-Sim / Scilab/ Pspice / MATLAB /other Equivalent software Package) and Printer (1No.)
7	AC/DC - Voltmeters (10 Nos.), Ammeters (10 Nos.) and Multi-meters (10Nos.)
8	Single Phase Wattmeter – 3Nos.
9	Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box - 6 Nos each.
10	Circuit Connection Boards - 10Nos.

Necessary Resistors, Inductors, Capacitors of various quantities (Quarter Watt to 10 Watt).