INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal, Hyderabad - 500 043, Telangana

OUTCOME BASED EDUCATION
WITH
CHOICE BASED CREDIT SYSTEM

BACHELOR OF TECHNOLOGY
ELECTRICAL AND ELECTRONICS ENGINEERING

ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI UNDER AUTONOMOUS STATUS

B.Tech Regular Four Year Degree Programme

(for the batches admitted from the academic year 2016- 2017)

&

B.Tech (Lateral Entry Scheme)

(for the batches admitted from the academic year 2017 - 2018)

FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

CONTENTS

"Take up one idea.
Make that one idea your life-think of it, dream of it, live on that idea. Let the brain muscles, nerves, every part of your body be full of that idea and just leave every other idea alone.
This is the way to success"

Swami Vivekananda

PRELIMINARY DEFINITIONS AND NOMENCLATURES

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., (one odd + one even) and one supplementary semester.

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University, Hyderabad) and State Government.

Backlog Course: A course is considered to be a backlog course if the student has obtained a failure grade (F) in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry, Biology etc., are considered to be foundational in nature.

Betterment: Betterment is a way that contributes towards improvement of the students' grade in any course(s). It can be done by either (a) re-appearing or (b) re-registering for the course.

Board of Studies (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Branch: Means specialization in a program like B.Tech degree program in Civil Engineering, B.Tech degree program in Computer Science and Engineering etc.

Certificate course: It is a course that makes a student gain hands-on expertise and skills required for holistic development in a specific area/field.

Choice Based Credit System: The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Commission: Means University Grants Commission (UGC), New Delhi.

Continuous Internal Examination: It is an examination conducted towards sessional assessment.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

Credit point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff and other resources in the process of study for a degree.

Detention in a course: Student who does not obtain minimum prescribed attendance in a course shall be detained in that particular course.

Dropping from the Semester: A student who doesn't want to register for any semester can apply in writing in prescribed format before commencement of that semester.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

Grade Point: It is a numerical weight allotted to each letter grade on a 10 - point scale.

Institute: Means Institute of Aeronautical Engineering, Hyderabad unless indicated otherwise by the context.

Massive Open Online Course (MOOC): MOOC courses inculcate the habit of self learning. MOOCs courses would be additional choices in all the elective group courses.

Pre-requisite: A course, the knowledge of which is required for registration into higher level course.

Core: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Means, Bachelor of Technology (B.Tech) degree program / PG degree program: M.Tech.

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

Re-Appearing: A student can reappear only in the semester end examination for the theory component of a course, subject to the regulations contained herein.

Registration: Process of enrolling into a set of courses in a semester of a Program.

Regulations: The regulations, common to all M.Tech programs offered by Institute, are designated as "IARE Regulations R-16" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. The odd Semester starts usually in July and even semester in December.

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

S/he: Means "she" and "he" both.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

University: Means the Jawaharlal Nehru Technological University Hyderabad, Hyderabad.

Withdraw from a Course: Withdrawing from a course means that a student can drop from a course within the first two weeks of the odd or even semester (deadlines are different for summer sessions). However s/he can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

1.0. CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions (HEI's) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester system at first year itself. The semester system helps in accelerating the teaching-learning process and enables vertical and horizontal mobility in learning.

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

Choice-Based Credit System (CBCS) is a flexible system of learning and provides choice for students to select from the prescribed elective courses. A course defines learning objectives and learning outcomes and comprises of lectures / tutorials / laboratory work / field work / project work / viva / seminars / assignments / presentations / self-study etc. or a combination of some of these.

Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

The CBCS permits students to:

1. Choose electives from a wide range of elective courses offered by the departments.
2. Undergo additional courses of interest.
3. Adopt an inter-disciplinary approach in learning.
4. Make the best use of expertise of the available faculty.

2.0 MEDIUM OF INSTRUCTION

The medium of instruction shall be English for all courses, examinations, seminar presentations and project work. The curriculum will comprise courses of study as given in curriculum section 28.0 in accordance with the prescribed syllabi.

3.0 TYPES OF COURSES

Courses in a programme may be of three kinds: **Foundation, Core and Elective.**

3.1 Foundation Course:

Foundation courses are the courses based upon the content leads to enhancement of skill and knowledge as well as value-based and are aimed at man-making education.

3.2 Core Course:

There may be a core course in every semester. This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

3.3 Elective Course:

Electives provide breadth of experience in respective branch and applications areas. Elective course is a course which can be chosen from a pool of courses. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

An elective may be discipline centric (Professional Elective) focusing on those courses which add generic proficiency to the students or may be chosen from an unrelated discipline called as "Open Elective".

There are six professional elective groups; students can choose not more than one course from each group. Overall, Students can opt for four professional elective courses which suit their project work in consultation with the faculty advisor/mentor. Nevertheless, one course from each of the two open electives has to be selected. A student may also opt for more elective courses in his area of interest.

4.0 SEMESTER STRUCTURE

Each academic year is divided into three semesters, TWO being MAIN SEMESTERS (one odd + one even) and ONE being a SUPPLEMENTARY SEMESTER. Main Semesters are for regular class work. Supplementary Semester is primarily for failed students. i.e. registration for a course for the first time is generally not permitted in the supplementary semester. However, the following cases are exempted:

4.1 Students admitted under Lateral Entry Scheme in the subjects 'Environmental Science', 'Audit course', 'Advanced Programming Lab' and 'Value Added Course'

4.2 Students admitted on transfer from JNTU affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.

4.3 Each main semester shall be of 23 weeks (Table – 1) duration and this period includes time for registration of courses, course work, examination preparation, conduct of examinations, assessment and declaration of final results.

4.4 Each main semester shall have a minimum of 90 working days; out of which number of contact days for teaching / practical are 75 and exam conduct and preparation days are 15.

4.5 The supplementary semester shall be a fast – track semester consisting of eight weeks and this period includes time for registration of courses, course work, examination preparation, conduct of examinations, assessment and declaration of final results.

4.6 All subjects may not be offered in the supplementary semester. The student has to pay a stipulated fee prescribed by the Institute to register for a course in the supplementary semester. The supplementary semester is provided to help the student in not losing an academic year. It is optional for a student to make use of supplementary semester. **Supplementary semester is a special semester and the student cannot demand it as a matter of right** and will be offered based on availability of faculty and other institute resources.

4.7 The institute may use **supplementary semester** to arrange add-on courses for regular students and / or for deputing them for practical training / FSI.

4.8 The academic calendar shown in Table – 1 is declared at the start of the year.

Table 1: Academic Calendar

FIRST SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Exams			2 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation & Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Summer Vacation, Supplementary Semester and Remedial Exams			8 weeks

5.0 REGISTRATION / DROPPING / WITHDRAWAL

5.1. Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses in time. The registration will be organized departmentally under the supervision of the Head of the Department.

5.2. IN ABSENTIA registration will not be permitted under any circumstance.

5.3. At the time of registration, students should have cleared all the dues of Institute and Hostel in the previous semesters, paid the prescribed fees for the current semester, and not been debarred from institute for a specified period on disciplinary or any other ground.

5.4. The student has to normally register for a minimum of 20 credits and may register up to a maximum of 30 credits, in consultation with HOD/faculty mentor. On an average, a student is expected to register for 25 credits.

5.5. **Dropping of Courses:** Within one week after the last date of first internal assessment test or by the date notified in the academic calendar, the student may in consultation with his / her faculty mentor/adviser, drop one or more courses without prejudice to the minimum number of credits as specified in clause 5.3. The dropped courses are not recorded in the Grade Card. Student must complete the dropped subject by registering in the supplementary semester / forthcoming semester in order to earn the required credits. Student must complete the dropped subject by registering in the supplementary semester / forthcoming semester in order to earn the required credits.

5.6. **Withdrawal from Courses:** A student is permitted to withdraw from a course by the date notified in the academic calendar. Such withdrawals will be permitted without prejudice to the minimum number of credits as specified in clause 5.3. A student cannot withdraw a course more than once and withdrawal of reregistered subjects is not permitted.

5.7. After **Dropping and / or Withdrawal** of courses, minimum credits registered shall be 20. A student can register for a maximum number of 15 credits during a supplementary semester.

6.0 UNIQUE COURSE IDENTIFICATION CODE

Every course of the B Tech programme will be placed in one of the nine groups of courses with minimum credits as listed in the Table 2.

Table 2: Group of Courses

S. No	Branch	Code
1	Civil Engineering	01
2	Electrical and Electronics Engineering	02
3	Mechanical Engineering	03
4	Electronics and Communication Engineering	04
5	Computer Science & Engineering	05
6	Information Technology	06
7	Aeronautical Engineering	07
8	Humanities and Basic Sciences	08

7.0 CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Core courses, Foundation courses and Elective courses, Laboratory Course, Audit Course, Term Paper, Mini Project, Internship and Project work. The list of elective courses may include subjects from allied disciplines also.

Each Theory and Laboratory course carries credits based on the number of hours/week as follows:

- **Lecture Hours (Theory):** 1 credit per lecture hour per week, 1 credit per tutorial hour per week.
- **Laboratory Hours (Practical):** 1 credit for 2 Practical hours, 2 credits for 3 or 4 hours of practicals per week.
- **Project Work:** 1 credit for 4 hours of project work per week.
- **Mini Project Work:** 2 credits

7.1 Credit distribution for courses offered is shown in Table 3.

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Theory Course (Core and Foundation)	4	4
2	Elective Courses	3	3
3	MOOCs Course	-	2
4	Laboratory Course	2 / 3	1 / 2
5	Audit Course		0
6	Comprehensive Examination		2

7	Mini Project		2
8	Summer Internship	-	0
9	Full Semester Internship (FSI) Project Work		16
10	Project Work		12

7.2 Semester wise course break-up

Following are the **TWO** models of course structure out of which any student shall choose or will be allotted with one model based on their academic performance.

i. Full Semester Internship (FSI) Model and

ii. Non Full Semester Internship (NFSI) Model.

7.3 For Four year regular program (FSI Model):

In the FSI Model, out of the selected students - half of students shall undergo Full Semester Internship in VII semester and the remaining students in VIII semester. In the Non FSI Model, all the selected students shall carry out the course work and Project work as specified in the course structure. A student who secures a minimum CGPA of 7.5 upto IV semester with no current arrears, and maintains the CGPA of 7.5 till VI Semester shall be eligible to opt for FSI.

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
I Semester	5 Foundation	4	24
II Semester	5 Foundation	4	24
III Semester	5 (2 Core + 3 Foundation)	3	25
IV Semester	5 (3 Core + 2 Foundation)	3	25
Summer Internship (Audit course)			00
V Semester	6 (5 Core + 1 Professional Elective)	2 + Term paper/Mini Project	29
VI Semester	6 + Audit course (3 Core + 1 Professional Elective + 1 Open Elective + 1 Foundation)	3 + Term paper/Mini Project	28
VII Semester	**Full Semester Internship (FSI) Project Work**		16
VIII Semester	4 (3 Core + 1 Professional Elective)	3	21
Total	**36 + 2 Audit courses (16 Foundation + 16 Core + 3 Professional Electives + 1 Open Electives)**	**22 + Term Paper + Mini Project + Project work**	**192**

.

7.4 For Four year regular program (Non FSI Model):

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
I Semester	5 Foundation	4	24
II Semester	5 Foundation	4	24
III Semester	5 (2 Core + 3 Foundation)	3	25
IV Semester	5 (3 Core + 2 Foundation)	3	25
Summer Internship (Audit course)			00
V Semester	5 (4 Core + 1 Professional Elective)	2 + Mini Project	25
VI Semester	5 + Audit course (3 Core + 1 Professional Elective + 1 Open Elective)	3 + Comprehensive test	25
VII Semester	5 (3 Core + 1 Professional Elective + 1 Open Elective)	3	24
VIII Semester	3 (1 Core + 1 Foundation + 1 Professional Elective)	Project Work	20
Total	**38 + 2 Audit courses (16 Foundation + 16 Core + 4 Professional Electives + 2 Open Electives)**	**22 + Term Paper + Mini Project + Project work**	**192**

7.5 For Three year lateral entry program (FSI Model):

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
III Semester	5 (2 Core + 3 Foundation)	3	25
IV Semester	5 (3 Core + 2 Foundation)	3	25
Summer Internship (Audit course)			00
V Semester	6 (5 Core + 1 Professional Elective)	2 + Term paper/Mini Project	29
VI Semester	6 + Audit course (3 Core + 1 Professional Elective + 1 Open Elective + 1 Foundation)	3 + Term paper/Mini Project	28
VII Semester	**Full Semester Internship (FSI)**		16
VIII Semester	4 (3 Core + 1 Professional Elective)	3	21
Total	**26 + 2 Audit courses (6 Foundation + 16 Core + 3 Professional Electives + 1 Open Electives)**	**14 + Term Paper + Mini Project + Project work**	**144**

7.6 For Three year lateral entry program (Non FSI Model):

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
III Semester	5 (2 Core + 3 Foundation)	3	25
IV Semester	5 (3 Core + 2 Foundation)	3	25
Summer Internship (Audit course)			00
V Semester	5 (4 Core + 1 Professional Elective)	2 + Term paper/Mini Project	25
VI Semester	5 + Audit course (3 Core + 1 Professional Elective + 1 Open Elective)	3 + Term paper/Mini project	25
VII Semester	5 (3 Core + 1 Professional Elective + 1 Open Elective)	3	24
VIII Semester	3 (1 Core + 1 Foundation + 1 Professional Elective)	Project Work	20
Total	**28 + 2 Audit courses (06 Foundation + 16 Core + 4 Professional Electives + 2 Open Electives)**	**14 + Term Paper + Mini Project + Project work**	**144**

7.7 Course wise break-up for the total credits (FSI Model):

Total Theory Courses Core Courses (16) + Foundation Courses (11+ 5) + Professional Electives (03) + Open Electives (01)	16 @ 4 credits + 11 @ 4 credits + 05 @ 3 credits + 03 @ 3 credits + 01 @ 3 credit	135
Total Laboratory Courses (15 + 07)	15 @ 2 credits + 07 @ 1 credits	37
Term Paper (01)	1 @ 2 credits	02
Mini Project (01)	1 @ 2 credits	02
Full Semester Internship (FSI)	1 @ 16 credits	16
TOTAL CREDITS		**192**

7.8 For Four year regular program (Non FSI Model):

Total Theory Courses Core Courses (16) + Foundation Courses (11+ 5) + Professional Electives (04) + Open Electives (02)	16 @ 4 credits + 11 @ 4 credits + 05 @ 3 credits + 04 @ 3 credits + 02 @ 3 credit	141
Total Laboratory Courses (15 + 07)	15 @ 2 credits + 07 @ 1 credits	37
Term Paper	1 @ 2 credits	02
Mini Project	1 @ 2 credits	02
Project work	1 @ 10 credits	10
TOTAL CREDITS		**192**

7.9 For three year lateral entry program (FSI Model):

Total Theory Courses Core Courses (16) + Foundation Courses (5+1) + Professional Electives (03) + Open Electives (01)	16 @ 4 credits + 05 @ 4 credits + 01 @ 3 credits + 03 @ 3 credits + 01 @ 3 credit	99
Total Laboratory Courses (11 + 03)	11 @ 2 credits + 03 @ 1 credits	25
Term Paper	1 @ 2 credits	02
Mini Project	1 @ 2 credits	02
Full Semester Internship (FSI)	1 @ 16 credits	16
TOTAL CREDITS		**144**

7.10 For three year lateral entry program (Non FSI Model):

Total Theory Courses Core Courses (16) + Foundation Courses (5+ 1) + Professional Electives (04) + Open Electives (02)	16 @ 4 credits + 05 @ 4 credits + 01 @ 3 credits + 04 @ 3 credits + 02 @ 3 credit	105
Total Laboratory Courses (11 + 03)	11 @ 2 credits + 03 @ 1 credits	25
Term Paper (01)	1 @ 2 credits	02
Mini Project (01)	1 @ 2 credits	02
Project work	1 @ 10 credits	10
TOTAL CREDITS		**144**

8.0 EVALUATION METHODOLOGY

8.1 Theory Course:

Each theory course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two sessional examinations or the marks scored in the make-up examination conducted.

8.1.1 Semester End Examination (SEE):

The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows.

Two full questions with 'either' 'or' choice will be drawn from each unit. Each question carries 14 marks. There could be a maximum of three sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept
30 %	To test the analytical skill of the concept
20 %	To test the application skill of the concept

8.1.2 Continuous Internal Assessment (CIA):

For each theory course the CIA shall be conducted by the faculty/teacher handling the course as given in Table-3. CIA is conducted for a total of 30 marks, with 25 marks for Continuous Internal Examination (CIE) and 05 marks for Quiz / Alternative Assessment Tool (AAT).

Table-3: Assessment pattern for Theory Courses

COMPONENT	THEORY		TOTAL MARKS
Type of Assessment	CIE Exam (Sessional)	Quiz / AAT	
Max. CIA Marks	25	05	30

8.1.2.1 Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 8th and 17th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams. The valuation and verification of answer scripts of CIE exams shall be completed within a week after the conduct of the Internal Examination.

8.1.2.2 Quiz / Alternative Assessment Tool (AAT)

Two Quiz exams shall be on line examination consisting of 20 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in the testing of knowledge, skills, application, analysis, evaluation and understanding of the students. Marks shall be awarded considering the average of two quizzes for every course.

In order to encourage innovative methods while delivering a course, the faculty members have been encouraged to use the Alternative Assessment Tool (AAT) in place of two quizzes. This AAT enables faculty to design own assessment patterns during the CIA. However, the usage of AAT is completely optional. The AAT enhances the autonomy (freedom and flexibility) of individual faculty and enables them to create innovative pedagogical practices. If properly applied, the AAT converts the classroom into an effective learning centre. The AAT may include seminars, assignments, term paper, open ended experiments, micro-projects, two minute videos, MOOCs etc.

However, it is mandatory for a faculty to obtain prior permission from the concerned HOD and spell out the teaching/assessment pattern of the AAT prior to commencement of the classes.

8.2 Laboratory Course:

8.2.1 Each lab will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal

assessment, continuous lab assessment will be done for 10 marks for the day to day performance and 20 marks for the final internal lab assessment. The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

8.2.2 All the drawing related courses are evaluated in line with lab courses. The distribution shall be 30 marks for internal evaluation (10 marks for day–to–day work, and 20 marks for internal tests) and 70 marks for semester end lab examination. There shall be ONE internal test for 20 marks each in a semester.

8.3 MOOCs Course:

Meeting with the global requirements, to inculcate the habit of self learning and in compliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives.

8.3.1 The proposed MOOCs courses would be additional choices in all the elective groups subject to the availability during the respective semesters and respective departments will declare the list of the courses at the beginning of the semester. Course content for the selected MOOCs courses shall be drawn from respective MOOCs links or shall be supplied by the department. Course will be mentored by faculty members and Assessment & Evaluation of the courses shall be done by the Department.

8.3.2 There shall be one Mid Sessional Examination (Quiz exam for 30 marks) after 8 weeks of the commencement of the course and semester end evaluation (Descriptive exam for 70 marks) shall be done along with the other regular courses.

8.3.3 Two credits will be awarded upon successful completion of each MOOCs course. Students need to complete three such MOOCs courses to compensate any two elective courses (one open and one professional) having three credits.

8.3.4 Students interested in doing MOOCs courses shall register the course title at their department office at the start of the semester against the courses that are announced by the department.

8.4 Audit Courses:

Audit courses are among the compulsory courses and do not carry any credits.

Audit Course #1:

a) List of the courses under audit course#1 will be notified at the beginning of the third semester for all students and the student has to choose one audit course for self-study mode at the beginning of third semester. By the end of sixth semester, all the students (regular and lateral entry students) shall complete the audit course, preferably Gender Sensitivity with acceptable performance.

b) The students will have four chances in total to clear the audit course beginning from third semester. Further, the student has an option to change the audit course in case if s/he is unable to clear the audit course in the first two chances. However, the audit course should be completed by VI semester and its result will be given in the VI semester marks memo. Its result shall be declared with “Satisfactory” or “Not Satisfactory” performance.

Audit Course #2:

Internship:
All the students shall undergo the summer internship during summer break after IV semester. The minimum internship period is four weeks and the students have an option of choosing their own industry/area of interest, which may be related to their respective branch or any other service oriented task. A self study report for the internship shall be submitted and evaluated during the fifth semester and evaluation shall be conducted by two examiners, one of them being internship supervisor as internal examiner and a senior faculty nominated by the Principal from the panel of experts recommended by HOD. Its result shall be declared with "Satisfactory" or "Not Satisfactory" performance.

8.5 Comprehensive Examination

The comprehensive examination is aimed at assessing the student's understanding of various Foundation and Core courses studied by the end of VI semester and is intended to test the student's grasp of the chosen field of study. The comprehensive examination is an online test evaluated for 100 marks.

8.6 Mini Project

The Mini Project shall be carried out either during V or VI semester in choice with Term Paper along with other lab courses by having regular weekly slots. Students will take mini project batch-wise and the batches will be divided as per the guidelines issued. The topic of mini project should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of the mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with a specific outcome. Mini project report will be evaluated for 100 marks in total. Assessment will be done by the supervisor/guide for 30 marks based on the work and presentation/execution of the mini project. Subdivision for the remaining 70 marks is based on report, presentation, execution and viva-voce. Evaluation shall be done by a committee comprising the mini project supervisor, Head of the Department and an examiner nominated by the Principal from the panel of experts recommended by Chairman, BOS.

8.7 Project work

In the non-FSI Model, the project work shall be evaluated for 100 marks out of which 30 marks for internal evaluation and 70 marks for semester end evaluation. The project work shall be spread over in VII semester and in VIII semester. The project work shall be somewhat innovative in nature, exploring the research bent of the mind of the student. A project batch shall comprise not more than four students.

At the end of VII semester, students should submit synopsis summarizing the work done in VII semester. The project is expected to be completed by the end of VIII semester. In VII semester, a first mid-course review is conducted by Project Review Committee (PRC) (on the progress) for 10 marks.

In VIII semester, a second mid-course review by PRC on the progress for 10 marks. On completion of the project, a third evaluation is conducted for award of internal marks of another 10 marks before the report is submitted, making the total internal marks 30.

The end semester examination shall be based on the report submitted and a viva-voce exam for 70 marks by a committee comprising the Head of the Department, project supervisor and an external examiner nominated by the Principal. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

8.8 Full Semester Internship (FSI)

FSI is a full semester internship programme that carries 16 credits. During the FSI, student has to spend one full semester in an identified industry / firm / organization and has to carry out the internship as per the stipulated guidelines of that industry/firm/organization and the institute.

Following are the evaluation guidelines:

- Quizzes: 2 times
- Quiz #1 - About the industry profile. weightage: 5%
- Quiz #2 - Technical-project related, weightage: 5%
- Seminars - 2 times (once in six weeks), weightage: 7.5% + 7.5%
- Vivo-voce: 2 times (once in six weeks), weightage: 7.5% + 7.5%
- Project Report, weightage: 15%
- Internship Diary, weightage: 5 %
- Final Presentation, weightage: 40%

FSI shall be open to all the branches with a ceiling of maximum 10% distributed in both semesters. The selection procedure is:

- Choice of the students
- CGPA (> 8.0) up to IV semester
- Competency Mapping / Allotment

9.0 MAKE-UP EXAMINATION

The make-up examination facility shall be available to students who may have missed to attend CIE exams in one or more courses in a semester for valid genuine reasons. The make-up examination shall have comprehensive online objective type questions. The syllabus for the make-up examination shall be the whole syllabus covered till the end of the semester under consideration and will be conducted at the end of the semester.

10.0 ATTENDANCE REQUIREMENTS AND DETENTION POLICY

10.1 It is desirable for a candidate to put on 100% attendance in each course. In every course (theory/laboratory), student has to maintain a minimum of 80% attendance including the days of attendance in sports, games, NCC and NSS activities to be eligible for appearing in Semester End Examination of the course.

10.2 For cases of medical issues, deficiency of attendance in each course to the extent of 15% may be condoned by the College Academic Committee on the recommendation of Head of the Department if their attendance is between 80% to 65% in every course, subjected

to submission of medical certificates, medical case file and other needful documents to the concerned departments.

10.3 The basis for the calculation of the attendance shall be the period prescribed by the institute by its calendar of events. For late admission, attendance is reckoned from the date of admission to the programme.

10.3 However, in case of a student having less than 65% attendance in any course, s/he shall be detained in the course and in no case such process will be relaxed.

10.4 A candidate shall put in a minimum required attendance at least three (3) theory courses for getting promoted to next higher class / semester. Otherwise, s/he shall be declared detained and has to repeat semester.

10.5 Students whose shortage of attendance is not condoned in any subject are not eligible to write their semester end examination of that courses and their registration shall stand cancelled.

10.6 A prescribed fee shall be payable towards Condonation of shortage of attendance.

10.7 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

10.8 Any student against whom any disciplinary action by the institute is pending shall not be permitted to attend any SEE in that Semester.

11.0 CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

11.1 Semester end examination shall be conducted by the Controller of Examinations (COE) by inviting Question Papers from the External Examiners.

11.2 Question papers may be moderated for the coverage of syllabus, pattern of questions by an Semester End Examination Committee chaired by Head of the Department one day before the commencement of semester end examinations.

11.3 Internal Examiner shall prepare a detailed scheme of valuation.

11.4 The answer papers of semester end examination should be evaluated by the internal examiner immediately after the completion of exam and the award sheet should be submitted to COE in a sealed cover before the same papers are kept for second evaluation by external examiner.

11.5 In case of difference of more than 15% of marks, the answer paper shall be re-evaluated by a third examiner appointed by the Examination Committee and marks awarded by this examiner shall be taken as final.

11.6 COE shall invite 3-9 external examiners to evaluate all the end-semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

11.7 Examinations Control Committee shall consolidate the marks awarded by internal and external examiners and award grades.

12.0 SCHEME FOR THE AWARD OF GRADE

12.1 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory course, if s/he secures

i. Not less than 35% marks for each theory course in the semester end examination, and

ii. A minimum of 40% marks for each theory course considering both internal and semester end examination.

12.2 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each Lab / Term Paper / Mini Project / Project, if s/he secures

i. Not less than 40% marks for each Lab / Term Paper / Mini Project / Project course in the semester end examination,

ii. A minimum of 40% marks for each Lab / Term Paper / Mini Project / Project course considering both internal and semester end examination.

12.3 If a candidate fails to secure a pass in a particular course, it is mandatory that s/he shall register and reappear for the examination in that course during the next semester when examination is conducted in that course. It is mandatory that s/he should continue to register and reappear for the examination till s/he secures a pass.

13.0 LETTER GRADES AND GRADE POINTS

13.1 Performances of students in each course are expressed in terms of marks as well as in Letter Grades based on absolute grading system. The UGC recommends a 10-point grading system with the following letter grades as given in the Table-4.

Table-4: Grade Points Scale (Absolute Grading)

Range of Marks	Grade Point	Letter Grade
90 – 100	10	S (Outstanding)
80 – 89	9	A+ (Excellent)
70 – 79	8	A (Very Good)
60 – 69	7	B+ (Good)
50 – 59	6	B (Above Average)
45 – 49	5	C (Average)
40 – 44	4	P (Pass)
Below 40	0	F (Fail)
Absent	0	Ab (Absent)
Authorized Break of Study	0	ABS

13.2 A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

13.3 For non credit courses, 'Satisfactory' or "Unsatisfactory' is indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

13.4 At the end of each semester, the institute issues grade sheet indicating the SGPA and CGPA of the student. However, grade sheet will not be issued to the student if s/he has any outstanding dues.

14.0 COMPUTATION OF SGPA AND CGPA

The UGC recommends to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The credit points earned by a student are used for calculating the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA), both of which are important performance indices of the student. SGPA is equal to the sum of all the total points earned by the student in a given semester divided by the number of credits registered by the student in that semester. CGPA gives the sum of all the total points earned in all the previous semesters and the current semester divided by the number of credits registered in all these semesters. Thus,

$$SGPA = \sum_{i=1}^{n} (C_i G_i) / \sum_{i=1}^{n} C_i$$

Where, C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course and n represent the number of courses in which a students is registered in the concerned semester.

$$CGPA = \sum_{j=1}^{m} (C_j S_j) / \sum_{j=1}^{m} C_j$$

Where, S_j is the SGPA of the j^{th} semester and C_j is the total number of credits upto the semester and m represent the number of semesters completed in which a student registered upto the semester.

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

15.0 ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA

15.1 Illustration for SGPA

Course Name	Course Credits	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 x 8 = 24
Course 2	4	B+	7	4 x 7 = 28
Course 3	3	B	6	3 x 6 = 18
Course 4	3	O	10	3 x 10 = 30
Course 5	3	C	5	3 x 5 = 15
Course 6	4	B	6	4 x 6 = 24
	20			**139**

Thus, $SGPA = 139 / 20 = 6.95$

15.2 Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit: 20 SGPA: 6.9	Credit: 22 SGPA: 7.8	Credit: 25 SGPA: 5.6	Credit: 26 SGPA: 6.0
Semester 5	**Semester 6**		
Credit: 26 SGPA: 6.3	Credit: 25 SGPA: 8.0		

$$Thus,\ CGPA = \frac{20x6.9 + 22x7.8 + 25x5.6 + 26x6.0 + 26x6.3 + 25x8.0}{144} = 6.73$$

16.0 PHOTOCOPY / REVALUATION

A student, who seeks the re-valuation of the answer script is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s), within 2 working days from the declaration of results in the prescribed format to the Controller of Examinations through the Head of the Department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses.

17.0 PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements for promotion / completion of regular B.Tech programme of study.

17.1 For students admitted into B.Tech (Regular) programme

i. A student shall be promoted from IV semester to V semester of programme of study only if he fulfills the academic requirement of securing 50% of credits from the examinations held up to end of III semester including supplementary examinations.

ii. A student shall be promoted from VI semester to VII semester of programme of study only if he fulfills the academic requirements of securing 50% of credits out of which all 48 credits from I and II semesters shall be completed, from the examinations held up to V semester including supplementary examinations.

17.2 For students admitted into B.Tech (lateral entry students) programme

A student shall be promoted from VI semester to VII semester only if he fulfils the academic requirements of securing 50% credits from the examinations held up to V semester including supplementary examinations.

18.0 GRADUATION REQUIREMENTS

The following academic requirements shall be met for the award of the B.Tech degree.

18.1 Student shall register and acquire minimum attendance in all courses and secure 192 credits for regular program and 144 credits for lateral entry program.

18.2 A student of a regular program, who fails to earn 192 credits within eight consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

18.3 A student of a lateral entry program who fails to earn 144 credits within six consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

19.0 BETTERMENT OF MARKS IN THE COURSES ALREADY PASSED

Students who clear all the courses in their first attempt and wish to improve their CGPA shall register and appear for betterment of marks for one course of any theory courses within a period of subsequent two semesters. The improved marks shall be considered for classification / distinction but not for ranking. If there is no improvement, there shall not be any change in the original marks already awarded.

20.0 AWARD OF DEGREE

20.1 Classification of degree will be as follows:

CGPA $\geq$ 7.5	:	First Class with Distinction
CGPA $\geq$ 6.5 and < 7.5	:	First Class
CGPA $\geq$ 5.0 and < 6.5	:	Second Class
CGPA $\geq$ 4.0 and < 5.0	:	Pass Class
CGPA < 4.0	:	Fail

20.2. In order to extend the benefit to the students with one/two backlogs after either VI semester or VIII semester, GRAFTING option is provided to the students enabling their placements and fulfilling graduation requirements. Following are the guidelines for the Grafting:

a. Grafting will be done among the courses within the semester shall draw a maximum of 7 marks from the any one of the cleared courses in the semester and will be grafted to the failed course in the same semester.

b. Students shall be given a choice of grafting only once in the 4 years program, either after VI semester (Option #1) or after VIII semester (Option #2).

c. Option#1: Applicable to students who have maximum of TWO theory courses in V and / or VI semesters.

Option#2: Applicable to students who have maximum of TWO theory courses in VII and / or VIII semesters.

d. Eligibility for grafting:

i. Prior to the conduct of the supplementary examination after the declaration of the VI or VIII semester results.

ii. S/he must appear in all regular or supplementary examinations as per the provisions laid down in regulations for the courses s/he appeals for grafting.

iii. The marks obtained by her/him in latest attempt shall be taken into account for grafting of marks in the failed course(s).

20.3 Student who clears all the courses upto VII semester, shall have a chance to appear for Quick Supplementary Examination to clear the failed courses of VIII semester.

20.4 By the end of VI semester, all the students (regular and lateral entry students) shall complete one of the audit courses with acceptable performance.

20.5 In case a student takes more than one attempt in clearing a course, the final marks secured shall be indicated by * mark in the marks memo.

All the candidates who register for the semester end examination will be issued memorandum of marks by the Institute. Apart from the semester wise marks memos, the institute will issue the provisional certificate subject to the fulfillment of all the academic requirements.

21.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

21.1 A candidate is normally not permitted to break the study. However, if a candidate intends to temporarily discontinue the programme in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the programme in a later respective semester, s/he shall apply to the Principal in advance. Such application shall be submitted before the last date for payment of examination fee of the semester in question and forwarded through the Head of the Department stating the reasons for such withdrawal together with supporting documents and endorsement of his / her parent / guardian.

21.2 The Institute shall examine such an application and if it finds the case to be genuine, it may permit the student to temporarily withdraw from the programme. Such permission is accorded only to those who do not have any outstanding dues / demand at the College / University level including tuition fees, any other fees, library materials etc.

21.3 The candidate has to rejoin the programme after the break from the commencement of the respective semester as and when it is offered.

21.4 The total period for completion of the programme reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in clause 18.0. The maximum period includes the break period.

21.5 If any candidate is detained for any reason, the period of detention shall not be considered as 'Break of Study'.

22.0 TERMINATION FROM THE PROGRAM

The admission of a student to the program may be terminated and the student is asked to leave the institute in the following circumstances:

a. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

b. A student shall not be permitted to study any semester more than three times during the entire Programme of study.

c. The student fails to satisfy the norms of discipline specified by the institute from time to time.

23.0 WITH-HOLDING OF RESULTS

If the candidate has not paid any dues to the college / if any case of indiscipline / malpractice is pending against him, the results of the candidate will be withheld. The issue of the degree is liable to be withheld in such cases.

24.0 GRADUATION DAY

The institute shall have its own annual Graduation Day for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

The college shall institute prizes and medals to meritorious students, and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

25.0 DISCIPLINE

Every student is required to observe discipline and decorum both inside and outside the institute and not to indulge in any activity which will tend to bring down the honor of the institute. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations he/she shall be liable for punitive action as prescribed by the Institute from time to time.

26.0 GRIEVANCE REDRESSAL COMMITTEE

The institute shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD as the members. This Committee shall solve all grievances related to the course under consideration.

27.0 TRANSITORY REGULATIONS

27.1 A student who has been detained in any semester of previous regulations for not satisfying the attendance requirements shall be permitted to join in the corresponding semester of this regulation.

27.2 Semester End Examination in each course under the regulations that precede immediately these regulations shall be conducted three times after the conduct of last regular examination under those regulations. Thereafter, the failed students, if any, shall take examination in the equivalent papers of these regulations as suggested by the Chairman, BOS concerned.

28.0 REVISION OF REGULATIONS AND CURRICULUM

The Institute may from time to time revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall come into force and shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

Electrical and Electronics Engineering

B. TECH - CURRICULUM

I Semester

Course Code	Course Name	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
			L	T	P		CIA	SEE	Total
THEORY									
A1802	Linear Algebra and Ordinary Differential Equations	Foundation	3	1	-	4	30	70	100
A1803	Computational Mathematics and Integral Calculus	Foundation	3	1	-	4	30	70	100
A1804	Engineering Physics	Foundation	3	-	-	3	30	70	100
A1805	Engineering Chemistry	Foundation	3	-	-	3	30	70	100
A1501	Computer Programming	Foundation	3	1	-	4	30	70	100
PRACTICAL									
A1807	Engineering Physics Laboratory	Foundation	-	-	2	1	30	70	100
A1502	Computer Programming Laboratory	Foundation	-	-	3	2	30	70	100
A1303	Computer Aided Engineering Drawing	Foundation	-	-	3	2	30	70	100
A1809	Computational Mathematics Laboratory	Foundation	-	-	2	1	30	70	100
TOTAL			**15**	**03**	**10**	**24**	**270**	**630**	**900**

II Semester

Course Code	Course Name	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
			L	T	P		CIA	SEE	Total
THEORY									
A2801	English for Communication	Foundation	3	-	-	3	30	70	100
A2803	Transformation Techniques	Foundation	3	1	-	4	30	70	100
A2807	Environmental Science and Engineering	Foundation	3	-	-	3	30	70	100
A2502	Data Structures with C	Foundation	3	1	-	4	30	70	100
A2201	Electrical Circuits	Foundation	3	1	-	4	30	70	100
PRACTICAL									
A2808	Communication Skills Laboratory	Foundation	-	-	2	1	30	70	100
A2503	Data Structures Laboratory	Foundation	-	-	3	2	30	70	100
A2202	Electrical Circuits Laboratory	Foundation	-	-	3	2	30	70	100
A2505	Engineering Practices Laboratory	Foundation	-	-	2	1	30	70	100
TOTAL			**15**	**03**	**10**	**24**	**270**	**630**	**900**

III Semester

Course Code	Course Name	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
			L	T	P		CIA	SEE	Total
THEORY									
A3201	Power Generation Systems	Core	3	1	-	4	30	70	100
A3202	DC Machines and Transformers	Core	3	1	-	4	30	70	100
A3203	Advanced Electrical Circuits	Foundation	3	1	-	4	30	70	100
A3804	Complex Analysis	Foundation	3	1	-	4	30	70	100
A3205	Electronic Devices and Circuits	Foundation	3	1	-	4	30	70	100
PRACTICAL									
A3206	DC Machines Laboratory	Core	-	-	3	2	30	70	100
A3207	Electric Circuits and Virtual Instrumentation Laboratory	Core	-	-	3	2	30	70	100
A3208	Electronic Devices and Circuits Laboratory	Core	-	-	3	1	30	70	100
TOTAL			**15**	**05**	**09**	**25**	**240**	**560**	**800**

IV Semester

Course Code	Course Name	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
			L	T	P		CIA	SEE	Total
THEORY									
A4201	Control Systems	Core	3	1	-	4	30	70	100
A4202	AC Machines	Core	3	1	-	4	30	70	100
A4203	Digital Electronic Circuits	Foundation	3	1	-	4	30	70	100
A4204	Power Electronics	Core	3	1	-	4	30	70	100
A4205	Electromagnetic Field Theory	Foundation	3	1	-	4	30	70	100
	Audit Course	Perspective	-	-	-	-			
PRACTICAL									
A4206	AC Machines Laboratory	Core	-	-	3	2	30	70	100
A4207	Power Electronics Laboratory	Core	-	-	3	2	30	70	100
A4208	Control Systems Laboratory	Core	-	-	3	1	30	70	100
TOTAL			**15**	**05**	**09**	**25**	**240**	**560**	**800**

V Semester

Course Code	Course Name	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
			L	T	P		CIA	SEE	Total
THEORY									
A5201	Integrated circuits	Foundation	3	1	-	4	30	70	100
A5202	Static Drives	Core	3	1	-	4	30	70	100
A5203	Microprocessors and Interfacing	Core	3	1	-	4	30	70	100
A5204	Transmission & Distribution Systems	Core	3	1	-	4	30	70	100
	Professional Elective - I	Core Elective	3	-	-	4	30	70	100
PRACTICAL									
A5205	Technical Writing and Content Development Laboratory	Skill	-	-	3	1	30	70	100
A5206	Power Electronic Drives Laboratory	Core	-	-	3	2	30	70	100
A5207	Mini Project	Skill	-	-	3	2	30	70	100
TOTAL			**15**	**04**	**09**	**25**	**240**	**560**	**800**

VI Semester

Course Code	Course Name	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
			L	T	P		CIA	SEE	Total
THEORY									
A6201	Power System Analysis	Core	3	1	-	4	30	70	100
A6202	Electrical Measurements and Instrumentation	Core	3	1	-	4	30	70	100
A6203	Object Oriented Programming through JAVA	Core	3	1	-	3	30	70	100
	Professional Elective - II / Available and Selected MOOCs Courses	Professional Elective	3	-	-	3	30	70	100
	Open Elective – I / Available and Selected MOOCs Courses	Open Elective	3	-	-	3	30	70	100
PRACTICAL									
A6204	Electrical Measurements and Instrumentation Laboratory	Core	-	-	3	2	30	70	100
A6205	Object Oriented Programming through JAVA Laboratory	Core	-	-	3	2	30	70	100
A6206	Microprocessor and Interfacing Laboratory	Core	-	-	3	2	30	70	100
A6207	Comprehensive Test	Skill			3	2	30	70	100
TOTAL			**15**	**03**	**12**	**25**	**270**	**630**	**900**

VII Semester

Course Code	Course Name	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
			L	T	P		CIA	SEE	Total
THEORY									
A7201	Power Systems Operation and Control	Core	3	1	-	4	30	70	100
A7202	High Voltage Engineering	Core	3	1	-	4	30	70	100
A7203	Power System Protection	Core	3	1	-	4	30	70	100
	Professional Elective - III Available and Selected MOOCs courses	Professional Elective	3	1	-	3	30	70	100
	Open Elective – II Available and Selected MOOCs courses	Open Elective	3	1	-	3	30	70	100
PRACTICAL									
A7204	High Voltage Engineering and Solar Laboratory	Core	-	-	3	2	30	70	100
A7205	Power Systems Protection and Design Laboratory	Core	-	-	3	2	30	70	100
A7206	PLC and Automation Laboratory	Core	-	-	3	2	30	70	100
AP201	Project Work (Phase- I)	Internship	-	-	-	-	-	-	-
TOTAL			**15**	**05**	**09**	**24**	**240**	**560**	**800**

VIII Semester

Course Code	Course Name	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
			L	T	P		CIA	SEE	Total
THEORY									
A8201	Embedded Systems	Core	3	1	-	4	30	70	100
A8801	Management Economics and Financial Accounting	Foundation	3	1	-	3	30	70	100
	Professional Elective - IV	Professional Elective	3	-	-	3	30	70	100
PRACTICAL									
AP201	Project Work (Phase- II)	Internship	-	-	6	10	30	70	100
TOTAL			**09**	**02**	**06**	**20**	**120**	**280**	**400**

PROFESSIONAL ELECTIVES

GROUP - I: POWER SYSTEMS ENGINEERING

Course Code	Course Title
IA16-A9201	Real Time Control of Power Systems
IA16-A9202	Power System Transients
IA16-A9203	Power System Automation
IA16-A9204	Energy Audit and Management
IA16-A9205	Extra High Voltage AC Transmission
IA16-A9206	Advanced Power System Protection
IA16-A9207	Power System Dynamics
IA16-A9208	Computer Aided Power System Analysis

GROUP - II: POWER ELECTRONICS

Course Code	Course Title
IA16-A9209	Flexible Alternating Current Transmission Systems
IA16-A9210	Microelectronic Devices and Circuits
IA16-A9211	Modern Power Electronics
IA16-A9212	Advanced Power Electronics
IA16-A9213	Power Electronic Applications in Power Systems
IA16-A9214	Power Electronics and Distributed Generation
IA16-A9215	Power Quality in Power Distribution Systems
IA16-A9216	Micro/Nano Processing Technology

GROUP - III: POWER SYSTEMS CONTROL

Course Code	Course Title
IA16-A9217	Industrial Automation and Control
IA16-A9218	Solar Energy and its Applications
IA16-A9219	Synchrophasor Technology in Power Systems
IA16-A9220	Motion Control
IA16-A9221	Power Systems Stability
IA16-A9222	Data Communication & Networks
IA16-A9223	Machine Vision
IA16-A9224	Smart Grid Technology

GROUP - IV: CONTROL SYSTEMS AND INDUSTRIAL ELECTRONICS

Course Code	Course Title
IA16-A9225	Power Plant Control and Instrumentation
IA16-A9226	Distributed Control & Communication Networks
IA16-A9227	Industrial Electronics
IA16-A9228	Wireless Sensor Networks
IA16-A9229	Advanced Control Systems
IA16-A9230	Modern Control Theory
IA16-A9231	Advanced Programmable Logic Controller
IA16-A9232	Computer Control of Power Systems

GROUP - V: ADVANCED POWER SYSTEMS

Course Code	Course Title
IA16-A9233	Electrical Insulation in Power Apparatus & Systems
IA16-A9234	Energy Management Systems and SCADA
IA16-A9235	Illumination Engineering
IA16-A9236	Energy Resources & Technology
IA16-A9237	Fabrication of Silicon VLSI Circuits using the MOS technology
IA16-A9238	Industrial Drives
IA16-A9239	Industrial Instrumentation
IA16-A9240	Modeling and Analysis of Electric Machines

GROUP - VI: ADVANCED ELECTRICAL ENGINEERING

Course Code	Course Title
IA16-A9241	Introduction to Hybrid and Electric Vehicles
IA16-A9242	Special Electrical Machines
IA16-A9243	Numerical Analysis
IA16-A9244	Optimal Control
IA16-A9245	Electro Magnetic Compatibility
IA16-A9246	Electromagnetic Energy: From Motors to Lasers
IA16-A9247	Electromagnetic and Applications
IA16-A9248	Digital Control Systems

OPEN ELECTIVES- I

Course Code	Course Title
AE401	Micro Electro -Mechanical Systems
AE101	Disaster Management
AE102	Geo Spatial Techniques
AE501	Operating System
IAE502	Object Oriented Programming through JAVA*
AE402	Embedded Systems*
AE403	Signal Analysis and Transform Techniques
AE301	Reliability Engineering
AE503	Robotics
AE701	Aerospace Propulsion and Combustion
Note: * indicates that subject not offered to the students of Electrical and Electronics Engineering Department	

OPEN ELECTIVES- II

Course Code	Course Title
AE404	Image Processing
AE801	Optimization Techniques
AE504	Data Base Management Systems
AE505	Information Security
AE802	Modeling and Simulation
AE201	Renewable Energy Sources
AE303	Finite Element Analysis
AE803	Research Methodologies
AE304	Composite Materials
AE702	Launch Vehicles and Controls
Note: * indicates that subject not offered to the students of Electrical and Electronics Engineering Department	

AUDIT COURSES

Course Code	Course Title
A4801	Intellectual Property Rights
A4802	Total Quality Management
A4803	Professional Ethics and Human Values
A4804	Legal Sciences
A4805	Gender Sensitivity
A4806	Clinical Psychology
A4807	English for Special Purposes
A4808	Entrepreneurship
A4809	Any Foreign Language
A4810	Design History

ADVANCED PROGRAMMING LABORATORY

Course Code	Course Title
AA201	Android Application Development Laboratory
AA202	MATLAB Programming – Simpower System
AA203	Python Application in EEE Laboratory
AA204	PSCAD Laboratory
AA205	Lab View
AA206	SciLab Laboratory

VALUE ADDED COURSES

Course Code	Course Title
AV201	Data Base Management Systems (Oracle)
AV202	Electrical Computer Aided Design
AV203	Material Handling
AV204	Big Data (Hudoop)
AV205	Testing Tools
AV206	Programmable Logic Controller
AV207	Electrical CAD

INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

ELECTRICAL AND ELECTRONICS ENGINEERING

SYLLABUS

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS
(Common for all Branches)

Semester: I

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A1802	Foundation	3	1	-	4	30	70	100
Contact Hours: 45	Tutorial Hours: 15	Total Contact Hours: 60				Practical Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Analyze and solve linear system of equations by using elementary transformations.
II. Determine the maxima and minima of functions of several variables by using partial differential coefficients.
III. Apply differential equations on real time applications.

UNIT-I	THEORY OF MATRICES	Hours: 08

Real Matrices**:** Symmetric, skew-symmetric and orthogonal matrices; Complex matrices: Hermitian, Skew-Hermitian and unitary matrices; Elementary row and column transformations, elementary matrix, finding rank of a matrix by reducing to Echelon form and normal form; Finding the inverse of a matrix using elementary row/column transformations: Gauss-Jordan method; Solving of linear system of equations by LU decomposition method.

UNIT-II	LINEAR TRANSFORMATIONS	Hours: 10

Cayley-Hamilton theorem: Statement, verification, finding inverse and powers of a matrix; Linear dependence and independence of vectors; Linear transformation; Orthogonal transformation; Eigen values and eigen vectors of a matrix; Properties of eigen values and eigen vectors of real and complex matrices; Diagonalization of matrix.

UNIT-III	FUNCTIONS OF SINGLE AND SEVERAL VARIABLES	Hours: 08

Mean value theorems: Rolle's theorem, Lagrange's theorem, Cauchy's theorem-without proof.

Functions of several variables: Partial differentiation, chain rule, total derivative, Euler's theorem, functional dependence, Jacobian, maxima and minima of functions of two variables without constraints and with constraints; Method of Lagrange multipliers;

UNIT-IV	DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS	Hours: 10

Formation of a differential equation; Differential equations of first order and first degree: Exact, non exact, linear equations; Bernoulli equation; Applications of first order differential equations: Orthogonal trajectories; Newton's law of cooling; Law of natural growth and decay.

UNIT-V	HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS	Hours: 09

Linear differential equations of second and higher order with constant coefficients, nonhomogeneous term of the type $f(x) = e^{ax}, \sin ax, \cos ax$ and $f(x) = x^n, e^{ax}v(x), x^n v(x)$; Method of variation of parameters; Applications to electrical circuits and simple harmonic motion.

Text Books:

1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012.

Reference Books:

1. B. V. Ramana, "Engineering Mathematics-1", Tata Mc Graw Hill Education, 4th Edition, 2009.
2. Ravish R Singh, Mukul Bhatt, "Engineering Mathematics-1", Tata Mc Graw Hill Education, 1st Edition, 2009.
3. Tom Apostal, "Calculus-Vol-I & II", Wiley Student Edition, 2011.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://ocw.mit.edu/resources/#Mathematics
3. http://www.sosmath.com/
4. http://mathworld.wolfram.com/

E-Text Books:

1. http://www.e-booksdirectory.com/details.php?ebook=10166
2. http://www.e-booksdirectory.com/details.php?ebook=7400re

COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS
(Common for CSE / ECE / EEE / IT)

Semester: I

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A1803	Foundation	3	1	-	4	30	70	100
Total Contact Hours: 45	Total Tutorials:15	Total Practical Classes: Nil				Total Hours: 60		

OBJECTIVES:

The course should enable the students to:

I. Enrich the knowledge of solving algebraic, transcendental and differential equation by numerical methods.
II. Apply multiple integration to evaluate mass, area and volume of the plane.
III. Analyze gradient, divergence and curl to evaluate the integration over a vector field.

UNIT-I	ROOT FINDING TECHNIQUES AND INTERPOLATION	Hours: 09

Root finding techniques: Solving algebraic and transcendental equations by bisection method, method of false position, iteration method and Newton-Raphson method; Interpolation: Finite differences, forward differences, backward differences and central differences; Symbolic relations; Newton's forward interpolation, Newton's backward interpolation; Gauss forward central difference formula, Gauss backward central difference formula; Interpolation of unequal intervals: Lagrange's interpolation, Newton's divided difference interpolation.

UNIT-II	NUMERICAL DIFFERENTIATION AND INTEGRATION	Hours: 08

Numerical Differentiation: Derivatives using Newton's forward formula, Derivatives using Newton's backward formula, central difference by Stirling formula, unequal intervals by Newton's divided difference; Numerical integration: Newton-Cote's formula, trapezoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule.

UNIT-III	NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	Hours: 10

Single step methods: Picard's method of successive approximations, Taylor's series method.

Step by step methods: Euler's, modified Euler's and Runge-Kutta method; Multi step methods: Predictor-corrector methods, Milne's method and Adams-Bashforth method.

UNIT-IV	MULTIPLE INTEGRALS	Hours: 08

Double and triple integrals; Change of order of integration; Change of variables: Polar, cylindrical and spherical; Finding the area of a region using double integration and volume of a region using triple integration.

UNIT-V	VECTOR CALCULUS	Hours: 10

Scalar and vector point functions; Gradient, divergence, curl and their related properties; Solenoidal and irrotational vector point functions; Scalar potential function; Laplacian operator; Line integral, surface integral and volume integral; Vector integral theorems: Green's theorem in a plane, Stoke's theorem; Gauss divergence theorem-statements and verification.

Text Books:

1. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012.

Reference Books:

1. B. V. Ramana, "Mathematical Methods", Tata Mc Graw Hill Education, 4th Edition, 2009.
2. S. S. Sastry, "Introduction methods of numerical analysis", Prentice-Hall of India Private Limited, 5th Edition, 2005.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://ocw.mit.edu/resources/#Mathematics
3. http://www.sosmath.com/
4. http://mathworld.wolfram.com

E-Text Books:

1. http://keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html
2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks

ENGINEERING PHYSICS
(Common for CSE / ECE / EEE / IT)

Semester: I

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A1804	Foundation	3	-	-	3	30	70	100
Total Contact Hours: 45	Total Tutorials: Nil	Total Practical Classes: Nil			Total Hours: 45			

OBJECTIVES:

The course should enable the students to:

I. Develop strong fundamentals of crystal structures and properties.
II. Meliorate the knowledge of theoretical and technological aspects of lasers and optical fibers.
III. Correlate principles with applications of the quantum mechanics, dielectric and magnetic materials.
IV. Enrich knowledge in modern engineering materials like semiconductors and superconductors.

UNIT-I	CRYSTALLOGRAPHY AND CRYSTAL STRUCTURES	Hours: 09

Crystallography and crystal structures: Space lattice, unit cell, lattice parameters, crystal systems, Bravais lattices, directions and planes in crystals, Miller indices, interplanar spacing of orthogonal crystal systems, atomic radius, coordination number and packing factor of SC, BCC, FCC, NaCl and diamond structures.

UNIT-II	LASERS AND FIBER OPTICS	Hours: 09

Lasers: Characteristics of lasers, spontaneous and stimulated emission of radiation, metastable state, population inversion, lasing action, ruby laser, semiconductor diode laser and applications of lasers. Fiber optics: Principle and construction of an optical fiber, acceptance angle, numerical aperture, types of optical fibers, losses in optical fibers and applications of optical fibers.

UNIT-III	DIELECTRIC AND MAGNETIC PROPERTIES	Hours: 09

Dielectric properties: Basic definitions, electronic, ionic and orientation polarizations (qualitative); Internal field in solids.

Magnetic properties: Basic definitions, origin of magnetic moment, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, domain theory of ferro magnetism on the basis of hysteresis curve.

UNIT-IV	QUANTUM AND STATISTICAL MECHANICS.	Hours: 09

Quantum mechanics: Waves and particles, De Broglie hypothesis, matter waves, Heisenberg's uncertainty principle, Davisson and Germer experiment, Schrodinger's time independent wave equation, physical significance of the wave function.
Statistical mechanics: Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (qualitative); Density of energy states, fermi energy.

UNIT-V	SEMICONDUCTOR PHYSICS AND SUPERCONDUCTIVITY	Hours: 09

Semiconductor physics: Intrinsic and extrinsic semiconductors, formation of p-n junction; Energy gap, direct and indirect band gap, Hall effect; Superconductivity: Introduction, Meissner effect, effect of

magnetic field, type-I and type-II superconductors, applications of superconductors.

Text Books:

1. V. Rajendran, "Engineering Physics", Tata Mc Graw Hill Book Publishers, 1st Edition, 2010.
2. P. K. Palanisamy, "Engineering Physics", Scitech Publishers, 4th Edition, 2014.

Reference Books:

1. R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 8th Edition, 2001.
2. A. J. Dekker, " Solid State Physics", Macmillan India ltd, 1st Edition, 2000.
3. Hitendra K. Malik, A. K. Singh, "Engineering Physics", Mc Graw Hill Education, 1st Edition, 2009.
4. Dr. K. Vijaya Kumar, Dr. S. Chandralingam, "Modern Engineering Physics", S. Chand & Co. New Delhi, 1st Edition, 2010.

Web References:

1. http://link.springer.com/book
2. http://www.thphys.physics.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com

E-Text Books:

1. http://www.peaceone.net/basic/Feynman
2. http://physicsdatabase.com/free-physics-books
3. http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf
4. http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html

ENGINEERING CHEMISTRY
(Common for all Branches)

Semester: I

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A1805	Foundation	3	-	-	3	30	70	100
Total Contact Hours: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Contact Hours: 45		

OBJECTIVES:

The course should enable the students to:

I. Apply the electrochemical principles in batteries.
II. Understand the fundamentals of corrosion and development of different techniques in corrosion control.
III. Analysis of water for its various parameters and its significance in industrial applications.
IV. Improve the fundamental science and engineering principles relevant to materials.

UNIT-I	ELECTROCHEMISTRY AND BATTERIES	Hours: 10

Electrochemistry: Basic concepts of electrochemistry; Conductance: Specific, equivalent and molar conductance and effect of dilution on conductance; Electrochemical cells: Galvanic cell (daniel cell); Electrode potential; Electrochemical series and its applications; Nernst equation; Types of electrodes: Calomel electrode, quinhydrone electrode; Batteries: Classification of batteries, primary cells (dry cells) and secondary cells (lead-acid battery, Ni-Cd cell), applications of batteries, numerical problems.

UNIT-II	CORROSION AND ITS CONTROL	Hours: 08

Corrosion: Introduction, causes and effects of corrosion; Theories of corrosion: Chemical and electrochemical corrosion with mechanism; Factors affecting the rate of corrosion: Nature of the metal and nature of the environment; Types of corrosion: Waterline and crevice corrosion; Corrosion control methods: Cathodic protection- sacrificial anodic protection and impressed current cathodic protection; Surface coatings: Metallic coatings, methods of application of metallic coatings-hot dipping(galvanizing, tinning), electroplating(copper plating); Organic coatings: Paints, its constituents and their functions.

UNIT-III	WATER TECHNOLOGY	Hours: 09

Water: Sources and impurities of water, hardness of water, expression of hardness-units; Types of hardness: Temporary hardness, permanent hardness and numerical problems; Estimation of temporary and permanent hardness of water by EDTA method; Determination of dissolved oxygen by Winkler's method; Boiler troubles: Priming, foaming, scales, sludges and caustic embrittlement.

Softening of water: Internal treatment- carbonate, calgon and phosphate conditioning, external treatment- Zeolite process and Ion exchange process; Potable water-its specifications, steps involved in treatment of potable water, sterilization of potable water by chlorination and ozonization, purification of water by reverse osmosis process.

UNIT-IV	MATERIALS CHEMISTRY	Hours: 10

Materials chemistry: Polymers-classification with examples, polymerization-addition, condensation and co-polymerization; Plastics: Thermoplastics and thermosetting plastics; Compounding of plastics; Preparation, properties and applications of Polyvinylchloride, Teflon, Bakelite and Nylon-6, 6; Rubbers: Natural rubber its process and vulcanization; Elastomers: Buna-s and Thiokol rubber; Fibers: Dacron;

Characteristics of fiber reinforced plastics; Cement: Composition of Portland cement, setting and hardening of Portland cement; Lubricants: Classification with examples, properties- viscosity, flash, fire, cloud and pour point; Refractories: Characteristics and classification with examples.

UNIT-V	FUELS AND COMBUSTION	Hours: 08

Fuel: Definition, classification of fuels and characteristics of a good fuels; Solid fuels: Coal, analysis of coal, proximate and ultimate analysis; Liquid fuels: Petroleum and its refining; Cracking: Fixed bed catalytic cracking; Knocking: Octane and cetane numbers; Gaseous fuels: Composition, characteristics and applications of Natural gas, LPG and CNG; Combustion: Calorific value-Gross(HCV) and net calorific value(LCV), calculation of air required for complete combustion of fuel, numerical problems.

Text Books:

1. P. C. Jain, Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, 15th Edition, 2015.
2. Shasi Chawla, "Text Book of Engineering Chemistry", Dhantpat Rai Publishing Company, New Delhi, 1st Edition, 2011.

Reference Books:

1. B. Siva Shankar, "Engineering Chemistry", Tata Mc Graw Hill Publishing Limited, 3rd Edition, 2015.
2. S. S. Dara, Mukkanti, "Text of Engineering Chemistry", S. Chand & Co, New Delhi, 12th Edition, 2006.
3. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5th Edition, 2013.
4. R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.

Web References:

1. www.tndte.com
2. nptel.ac.in/downloads
3. www.scribd.com
4. cuiet.info
5. www.sbtebihar.gov.in
6. www.ritchennai.org

E-Text Books:

1. Corrosion.ksc.nasa.gov/electrochem_cells.htm
2. www.science.uwaterloo.ca/~cchieh/cact/applychem/watertreatment.html
3. www.acs.org/content/acs/en/careers/college-to-career/areas-of-chemistry/polymer-chemistry.html
4. www.darvill.clara.net/altenerg/fossil.htm
5. Library.njit.edu/research helpdesk/subject guides/chemistry.php

COMPUTER PROGRAMMING
(Common for CSE / ECE / EEE / IT)

Semester: I

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A1501	Foundation	3	1	-	4	30	70	100
Total Contact Hours: 45	Total Tutorials: 15	Total Practical Classes: Nil				Total Hours: 60		

OBJECTIVES:

The course should enable the students to:

I. Learn adequate knowledge by problem solving techniques.
II. Understand programming skills using the fundamentals and basics of C Language.
III. Improve problem solving skills using arrays, strings, and functions.
IV. Understand the dynamics of memory by pointers.
V. Study file creation process with access permissions.

UNIT-I	INTRODUCTION	Hours: 10

Introduction to computers: Generation and classification of computers, programming languages, number system, problem solving techniques, algorithms, flowcharts, pseudo code.
Introduction to C language: History of C, basic structure of C programs, process of compiling and running a C program, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types; Operators and expressions: operators, arithmetic, relational and logical, assignment operators, increment and decrement operators, bitwise and conditional operators, special operators, operator precedence and associativity, evaluation of expressions, type conversions in expressions, formatted input and output.

UNIT-II	CONTROL STRUCTURES, ARRAYS AND STRINGS	Hours: 12

Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements; Arrays: Concepts, one dimensional arrays, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi dimensional arrays; Strings concepts: String handling functions, array of strings.

UNIT-III	FUNCTIONS AND POINTERS	Hours: 10

Functions: Need for user defined functions, function declaration, function prototype, category of functions, inter function communication, function calls, parameter passing mechanisms, recursion, passing arrays to functions, passing strings to functions, storage classes, preprocessor directives.

Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, pointers and arrays, pointers as functions arguments, functions returning pointers.

UNIT-IV	STRUCTURES AND UNIONS	Hours: 07

Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, passing structures through pointers, self referential structures, unions, bit fields, typedef, enumerations; Dynamic memory allocation: Basic concepts, library functions.

UNIT-V	FILES	Hours: 06

Files: Streams, basic file operations, file types, file opening modes, file input and output functions, file status functions, file positioning functions, command line arguments.

Text Books:

1. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.
2. Balagurusamy E, "Computer Programming", Tata Mc Graw Hill Education, 1st Edition, 2014.

Reference Books:

1. B. A. Forouzan, R. F. Gillberg, "C Programming and Data Structures", Cengage Learning, India, 3rd Edition, 2014.
2. W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd Edition, 1988.
3. Schildt Herbert, "C: The Complete Reference", Tata Mc Graw Hill Education, 4th Edition, 2014.
4. R. S. Bichkar, "Programming with C", Universities Press, 2nd Edition, 2012.
5. Dey Pradeep, Manas Ghosh, "Computer Fundamentals and Programming in C", Oxford University Press, 2nd Edition, 2006.

Web References:

1. www.bfoit.org/itp/Programming.html
2. https://www.khanacademy.org/computing/computer-programming
3. https://en.wikibooks.org/wiki/Computer_Programming
4. https://www.khanacademy.org/computing/computer-programming

E-Text Books:

1. http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download.htm
2. http://www.imada.sdu.dk/~svalle/courses/dm14-2005/mirror/c/
3. http://enggnotebook.weebly.com/uploads/2/2/7/1/22718186/ge6151-notes.pdf

MOOC Course

https://alison.com/courses/Introduction-to-Programming-in-c

ENGINEERING PHYSICS LABORATORY
(Common for CSE / ECE / EEE / IT)

Semester: I

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A1807	Foundation	-	-	2	1	30	70	100
Total Contact Hours: Nil	Total Tutorials: Nil	Total Practical Classes: 15				Total Hours: 30		

OBJECTIVES:

The course should enable the students to:

I. Elevate practical knowledge to understand technological aspects of LED, laser and solar cell.
II. Enrich real-time application aspect of R-C, LCR circuit and optical fiber.
III. Enlighten the phenomenon of magnetic induction, longitudinal and transverse modes.

LIST OF EXPERIMENTS

Week-l	**INTRODUCTION TO PHYSICS LABORATORY.**
Introduction to physics laboratory. Do's and Don'ts in physics lab.	
Week-2	**LED CHARACTERISTICS AND LASER CHARACTERISTICS.**
Batch I : V- I characteristics of LED. Batch II : Study of L-I characteristics of laser diode.	
Week-3	**LED CHARACTERISTICS AND LASER CHARACTERISTICS.**
Batch I : Study of L-I characteristics of laser diode. Batch II : V- I characteristics of LED.	
Week-4	**STEWART GEE'S METHOD AND LASER DIFFRACTION.**
Batch I: Magnetic field along the axis of current carrying coil-Stewart and Gee's method. Batch II: Wavelength of laser source-diffraction grating.	
Week-5	**STEWART GEE'S METHOD AND LASER DIFFRACTION.**
Batch I: Wavelength of laser source-diffraction grating. Batch II: Magnetic field along the axis of current carrying coil-Stewart and Gee's method.	
Week-6	**SOLAR CELL AND OPTICAL FIBER.**
Batch I: Study of characteristics of solar cell. Batch II: Evaluation of numerical aperture of given fiber and Bending losses of fibers.	
Week-7	**SOLAR CELL AND OPTICAL FIBER.**
Batch I: Evaluation of numerical aperture of given fiber and Bending losses of fibers. Batch II: Study of characteristics of solar cell.	
Week-8	**R C CIRCUIT AND FREQUENCY OF LONGITUDINAL WAVES.**
Batch I: Time constant of an R C circuit. Batch II: Determining frequency of longitudinal waves.	
Week-9	**R C CIRCUIT AND FREQUENCY OF LONGITUDINAL WAVES.**

Batch I: Determining frequency of longitudinal waves. Batch II: Time constant of an R C circuit.	
Week-10	**FREQUENCY OF TRANSVERSE WAVES AND SERIES COMBINATION- LCR CIRCUIT.**
Batch I: Calculating frequency of transverse waves. Batch II: Determining resonant frequency of LCR circuit.	
Week-11	**FREQUENCY OF TRANSVERSE WAVES AND SERIES COMBINATION- LCR CIRCUIT.**
Batch I: Determining resonant frequency of LCR circuit. Batch II: Calculating frequency of transverse waves.	
Week-12	**LCR PARALLEL CIRCUIT AND ENERGY GAP.**
Batch I: LCR parallel circuit. Batch II: Estimating energy gap of given semiconductor diode.	
Week-13	**LCR PARALLEL CIRCUIT AND ENERGY GAP.**
Batch I: Estimating energy gap of given semiconductor diode. Batch II: LCR parallel circuit.	
Week-14	**REVISION.**
Revision.	

Reference Books:

1. C. L. Arora, "Practical Physics", S. Chand & Co New India, 3rd Edition, 2012.
2. Vijay Kumar, Dr. T. Radhakrishna, "Practical Physics for Engineering students", S M Enterprises, 2nd Edition, 2014.
3. R. K. Shukla, Anchal Srivatsava, "Practical Physics", New age International,2nd Edition, 2011.

Web Reference:

1. http://www.iare.ac.in

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS

S. No	Name of the Component	Quantity	Range
1	LED board	10	I/P 0-10V DC, Resistors 1k Ω-4K Ω
2	Digital ammeter	10	Digital Meter DC 0-20mA
3	Digital voltmeter	10	Digital Meter DC 0-20V
4	Probe	30	Dia - 4mm
5	Laser Diode board	10	I/P 0-10V DC, Resistors 1k Ω-4K Ω
6	Stewart and Gees's set	10	Coil 2, 50, 200 turns
7	DC Ammeter	10	DC 0-5 A
8	Battery eliminator	10	Battery eliminator DC 2 A
9	Laser source with retort and round stand	10	Semiconductor laser 670nm
10	Grating	20	15000LPI
11	Solar cell Kit with panel	10	XL-10
12	Bulb	20	0 – 100W, 230V
13	Numerical Aperture kit	10	Optical power meter 660nm
14	Bending loss tube	10	Dia- 4cm, 6cm, 8cm, 10cm

15	RC Circuit board	10	I/P 15V, Voltmeter 0-20V, Ammeter 0-2000 mA, Resistors 4K7- 100K Ω, Capacitors 0.047-2200μF
16	Stop clock	20	+/- 1s
17	LCR circuit board	10	Ammeter 0-150μA, Inductors 2.5mH, 5mH,7.5mH, Capacitors 0.1μF, 0.022μF, 0.0033μF, Resistors 10Ω-10KΩ
18	Function generator	10	0.1Hz-1MHz
19	Melde's arrangement	10	Tuning fork frequency 80-90Hz, DC coil 4-6V, 2-3 A
20	Weight box	10	1mg-100g
21	Meter scale	10	1m
22	Energy gap kit	10	Heating element - 35W, E_g = 0.2-0.4eV I/P 0-10V, Ammeter 0-200 μA

COMPUTER PROGRAMMING LABORATORY
(Common for CSE / ECE / EEE / IT)

Semester: I

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
1502	Foundation	-	-	3	2	30	70	100
Total Contact Hours: Nil	Total Tutorials: Nil	Total Practical Classes: 36				Total Hours: 36		

OBJECTIVES:

The course should enable the students to:

I. Formulate problems and implement algorithms using C programming language.
II. Develop programs using decision structures, loops and functions.
III. Learn memory allocation techniques using pointers.
IV. Use structured programming approach for solving of computing problems in real world.

LIST OF EXPERIMENTS

Week-1 OPERATORS AND EVALUATION OF EXPRESSIONS

a. Write a C program to check whether a number is even or odd using ternary operator.
b. Write a C program to perform the addition of two numbers without using + operator.
c. Write a C program to evaluate the arithmetic expression ((a + b / c * d - e) * (f - g)). Read the values a, b, c, d, e, f, g from the standard input device.
d. Write a C program to find the sum of individual digits of a 3 digit number.
e. Write a C program to read the values of x and y and print the results of the following expressions in one line:
   i. (x + y) / (x - y)
   ii. (x + y)(x - y)

Week-2 CONTROL STRUCTURES

a. Write a C program to find the sum of individual digits of a positive integer.
b. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
d. A character is entered through keyboard. Write a C program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol using if-else and switch case. The following table shows the range of ASCII values for various characters.

Characters	ASCII values
A – Z	65 – 90
a – z	97 – 122
0 – 9	48 – 57
Special symbols	0 – 47, 58 – 64, 91 – 96, 123 – 127

e. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Write a C program to determine how much profit or

loss incurred in percentage.

Week-3 CONTROL STRUCTURES

a. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use switch statement).
b. Write a C program to calculate the following sum:

$$sum = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$

c. Write a C program to find the roots of a quadratic equation.
d. Write a C program to check whether a given 3 digit number is Armstrong number or not.
e. Write a C program to print the numbers in triangular form

```
1
1  2
1  2  3
1  2  3  4
```

Week-4 ARRAYS

a. Write a C program to find the second largest integer in a list of integers.
b. Write a C program to perform the following:
   i. Addition of two matrices
   ii. Multiplication of two matrices
c. Write a C program to count and display positive, negative, odd and even numbers in an array.
d. Write a C program to merge two sorted arrays into another array in a sorted order.
e. Write a C program to find the frequency of a particular number in a list of integers.

Week-5 STRINGS

a. Write a C program that uses functions to perform the following operations:
   i. To insert a sub string into a given main string from a given position.
   ii. To delete n characters from a given position in a given string.
b. Write a C program to determine if the given string is a palindrome or not.
c. Write a C program to find a string within a sentence and replace it with another string.
d. Write a C program that reads a line of text and counts all occurrence of a particular word.
e. Write a C program that displays the position or index in the string S where the string T begins, or 1 if S doesn't contain T.

Week-6 FUNCTIONS

a. Write C programs that use both recursive and non-recursive functions
   i. To find the factorial of a given integer.
   ii. To find the greatest common divisor of two given integers.
b. Write C programs that use both recursive and non-recursive functions
   i. To print Fibonacci series.
   ii. To solve towers of Hanoi problem.
c. Write a C program to print the transpose of a given matrix using function.
d. Write a C program that uses a function to reverse a given string.

Week-7 POINTERS

a. Write a C program to concatenate two strings using pointers.
b. Write a C program to find the length of string using pointers.
c. Write a C program to compare two strings using pointers.
d. Write a C program to copy a string from source to destination using pointers.
e. Write a C program to reverse a string using pointers.

Week-8	STRUCTURES AND UNIONS

a. Write a C program that uses functions to perform the following operations:
   i. Reading a complex number
   ii. Writing a complex number
   iii. Addition and subtraction of two complex numbers
   iv. Multiplication of two complex numbers. Note: represent complex number using a structure.
b. Write a C program to compute the monthly pay of 100 employees using each employee's name, basic pay. The DA is computed as 52% of the basic pay. Gross-salary (basic pay + DA). Print the employees name and gross salary.
c. Create a Book structure containing book_id, title, author name and price. Write a C program to pass a structure as a function argument and print the book details.
d. Create a union containing 6 strings: name, home_address, hostel_address, city, state and zip. Write a C program to display your present address.
e. Write a C program to define a structure named DOB, which contains name, day, month and year. Using the concept of nested structures display your name and date of birth.

Week-9	ADDITIONAL PROGRAMS

a. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$. For example: if n is 3 and x is 5, then the program computes 1+5+25+125. Print x, n, the sum. Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.
b. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
c. Write a C program to convert a Roman numeral to its decimal equivalent. E.g. Roman number CD is equivalent to 400.

Week-10	PREPROCESSOR DIRECTIVES

a. Define a macro with one parameter to compute the volume of a sphere. Write a C program using this macro to compute the volume for spheres of radius 5, 10 and 15 meters.
b. Define a macro that receives an array and the number of elements in the array as arguments. Write a C program for using this macro to print the elements of the array.
c. Write symbolic constants for the binary arithmetic operators +, -, *, and /. Write a C program to illustrate the use of these symbolic constants.

Week-11	FILES

a. Write a C program to display the contents of a file.
b. Write a C program to copy the contents of one file to another.
c. Write a C program to reverse the first n characters in a file, where n is given by the user.
d. Two files DATA1 and DATA2 contain sorted lists of integers. Write a C program to merge the contents of two files into a third file DATA i.e., the contents of the first file followed by those of the second are put in the third file.
e. Write a C program to count the no. of characters present in the file.

Week-12	COMMAND LINE ARGUMENTS

a. Write a C program to read arguments at the command line and display it.
b. Write a C program to read two numbers at the command line and perform arithmetic operations on it.
c. Write a C program to read a file name at the command line and display its contents.

Reference Books:

1. Yashavant Kanetkar, "Let Us C", BPB Publications, New Delhi, 13th Edition, 2012.
2. Oualline Steve, "Practical C Programming", O'Reilly Media, 3rd Edition, 1997.
3. King K N, "C Programming: A Modern Approach", Atlantic Publishers, 2nd Edition, 2015.
4. Kochan Stephen G, "Programming in C – A Complete Introduction to the C Programming Language", Sam's Publishers, 3rd Edition, 2004.
5. Linden Peter V, "Expert C Programming: Deep C Secrets", Pearson India, 1st Edition, 1994.

Web References:

1. www.sanfoundry.com/c-programming-examples
2. www.geeksforgeeks.org/c
3. www.cprogramming.com/tutorial/c
4. www.cs.princeton.edu

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

HARDWARE:

30 numbers of Intel Desktop Computers with 2 GB RAM
Dot matrix Printers: 02

SOFTWARE:

System Software: Linux / Microsoft Windows 7
Programming Languages: Borland C++ 5.02

COMPUTER PROGRAMMING LABORATORY
(Common for CSE / ECE / EEE / IT)

Semester: I

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A1303	Foundation	-	-	3	2	30	70	100
Total Contact Hours: Nil	Total Tutorials: Nil	Total Practical Classes: 45				Total Hours: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the basic principles of engineering drawing.
II. Understand the construction of scales.
III. Apply the knowledge of interpretation of dimensions of different quadrant projections.
IV. Convert the pictorial views into orthographic views and vice versa.
V. Create intricate details of components through sections and to develop its surfaces.

LIST OF EXPERIMENTS

UNIT-I	**INTRODUCTION TO ENGINEERING DRAWING**	**Hours: 09**

Introduction to engineering drawing: Introduction to engineering drawing**,** drawing instruments and accessories, types of lines, lettering practice and rules of dimensioning, geometrical constructions, basic geometrical shapes; Introduction to AutoCAD familiarization of graphical user interface, toggle functional keys and tool bars; Drawing of closed form entities like line, circle, ellipse, polygon; Lettering and standard drawing templates.

UNIT-II	**DRAFTING AND MODELING SYSTEMS**	**Hours: 09**

Drafting and modeling systems: Geometric commands, layers, display control command, editing, dimensioning and solid modeling.

UNIT-III	**ORTHOGRAPHIC PROJECTION**	**Hours: 09**

Orthographic projection: Principles of orthographic projections, conventions, first and third angle projections.
Projection of points, straight lines, planes and regular solid, prisms, cylinders, pyramids and cones.

UNIT-IV	**ISOMETRIC PROJECTIONS**	**Hours: 09**

Isometric projections: Principle of isometric projection, isometric scale, isometric projections and isometric views, isometric projections of solids.

UNIT-V	**TRANSFORMATION OF PROJECTIONS**	**Hours: 09**

Transformation of projections: Conversion of isometric views to orthographic views and conversion of orthographic views to isometric views.

Text Books:

1 N. D. Bhatt, "Engineering Drawing", Charotar Publications, 49th Edition, 2012.
2 C. M. Agrawal, Basant Agrawal, "Engineering Drawing'', Tata Mc Graw Hill, 2nd Edition, 2013.

Reference Books:

1. K. Venugopal, "Engineering Drawing and Graphics", New Age Publications, 2nd Edition, 2010.

2. Dhananjay. A. Johle, "Engineering Drawing", Tata Mc Graw Hill, 1st Edition, 2008.
3. S. Trymbaka Murthy, "Computer Aided Engineering Drawing", I.K. International Publishers, 3rd Edition, 2011.
4. A. K. Sarkar, A. P. Rastogi, "Engineering graphics with Auto CAD", PHI Learning, 1st Edition, 2010.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. http://www.autocadtutorials.net/
3. https://grabcad.com/questions/tutorial-16-for-beginner-engineering-drawing-1

E-Text Books:

1.https://books.google.co.in/books?id=VRN7e09Rq0C&pg=PA9&source=gbs_toc_r&cad=4#v=onepage&q&f=false

MOOC Course

1. http://freevideolectures.com/Course/3420/Engineering-Drawing/
2. http://nptel.ac.in/courses/105104148/

COMPUTATIONAL MATHEMATICS LABORATORY
(Common for CSE / ECE / EEE / IT)

Semester: I

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A1809	Foundation	-	-	2	1	30	70	100
Total Contact Hours: Nil	Total Tutorials: Nil	Total Practical Classes: 15				Total Hours: 30		

OBJECTIVES:

The course should enable the students to:

I. Train the students how to approach for solving engineering problems.

II. Understand the concepts of algebra, calculus and numerical solutions using MATLAB software.

III. Enrich the knowledge in MATLAB and can apply for project works.

LIST OF EXPERIMENTS

Week-l BASIC FEATURES

a. Features and uses.
b. Local environment setup.

Week-2 ALGEBRA

a. Solving basic algebraic equations.
b. Solving system of equations.
c. Two dimensional plots.

Week-3 CALCULUS

a. Calculating limits.
b. Solving differential equations.
c. Finding definite integral.

Week-4 MATRICES

a. Addition, subtraction and multiplication of matrices.
b. Transpose of a matrix.
c. Inverse of a matrix.

Week-5 SYSTEM OF LINEAR EQUATIONS

a. Rank of a matrix.
b. Gauss Jordan method.
c. LU decomposition method.

Week-6 LINEAR TRANSFORMATION

a. Characteristic equation.
b. Eigen values.
c. Eigen vectors.

Week-7 DIFFERENTIATION AND INTEGRATION

a. Higher order differential equations.
b. Double integrals.
c. Triple integrals.

Week-8	INTERPOLATION AND CURVE FITTING
a. Lagrange polynomial. b. Straight line fit. c. Polynomial curve fit.	
Week-9	**ROOT FINDING**
a. Bisection method. b. Regula false method. c. Newton Raphson method.	
Week-10	**NUMERICAL DIFFERENTION AND INTEGRATION**
a. Trapezoidal, Simson's method. b. Euler method. c. Runge Kutta method.	
Week-11	**3D PLOTTING**
a. Line plotting. b. Surface plotting. c. Volume plotting.	
Week-12	**VECTOR CALCULUS**
a. Gradient. b. Divergent. c. Curl.	

Reference Books:

1. Cleve Moler, "Numerical Computing with MATLAB", SIAM, Philadelphia, 2nd Edition, 2008.
2. Dean G. Duffy, "Advanced Engineering Mathematics with MATLAB", CRC Press, Taylor & Francis Group, 6th Edition, 2015.

Web Reference:

1. http://www.iare.ac.in

LIST OF EQUIPMENTS REQUIRED FOR A BATCH OF 30 STUDENTS

HARDWARE: 30 numbers of Intel Desktop Computers with 2 GB RAM
SOFTWARE: Microsoft Windows 7 and MATLAB – V 8.5, which is also R2015a.

ENGLISH FOR COMMUNICATION
(Common for CSE / ECE / EEE / IT)

Semester: II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A2801	Foundation	3	-	-	3	30	70	100
Total Contact Hours: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Hours: 45		

OBJECTIVES:

The course should enable the students to:

I. Endow the communication in an intelligible English accent and pronunciation.
II. Promulgate the use of the four language skills i.e., Listening, Speaking, Reading and Writing.
III. Widen the art of writing simple English with correct spelling, grammar and punctuation.

UNIT-I	LISTENING SKILL	Hours: 08

Significance, essentials, barriers and effectiveness of listening; Listening to dialogues, conversation, discussions, monologues, soliloquies; Listening to prose and poetry reading; Listening to sounds, silent letters, stressed syllables in English; Listening for the gist of the text, for identifying the topic, general meaning and specific information; Listening for multiple choice questions, positive and negative comments for interpretation.

UNIT-II	SPEAKING SKILL	Hours: 10

Significance, essentials, barriers and effectiveness of speaking; Simple oral or casual interaction, dialogue, conversation; Debates: Differences between disagreeing and being disagreeable; Brief presentations; Role plays; Interviews: Preparing HR questions with possible answers; Generating talks based on visual or written prompts; Addressing a small group or a large formal gathering; Speaking about present, past experiences and future plans; Arguing outs a topic without verbal fights; Paper presentation.

UNIT-III	READING SKILL	Hours: 10

Techniques of reading: Skimming, scanning, intensive and extensive reading; Reading comprehension: Exercises for multiple choice questions and contextual meaning.

Vocabulary enrichment and grammar exercises based on selective readings: Anecdotes, short stories, poems, prose passages for intellectual and emotional comments; Reading for the gist of a text, for specific information, for information transfer and interpretation.

UNIT-IV	WRITING SKILL	Hours: 09

Significance, essentials and effectiveness of writing; Writing emails, agendas, brochures, instructions, recommendations, functional checklists, minutes of a meeting; Writing paragraphs: Comparing, contrasting, presentations with an introduction, body and conclusion; Writing formal and informal letters: Letter of invitation, accepting, declining, requesting, cover letter enclosing a CV or Resume; Report writing.

UNIT-V	VOCABULARY AND GRAMMAR	Hours: 08

Punctuation, parts of speech, articles, concords, tenses, verbs; Forms of verbs: Regular and irregular, direct and indirect speech, change of voice; Synonyms, antonyms, one word substitutes, idioms and phrases, prefixes, suffixes, technical vocabulary.

Text Books :

1. Devaki Reddy, Shreesh Chaudhary, “Technical English", Macmillan, 1st Edition, 2009.
2. Rutherford, Andrea J, "Basic Communication Skills for Technology", Pearson Education, 2nd Edition, 2010.

Reference Books:

1. Norman Whitby, “Business Benchmark: Pre-Intermediate to Intermediate – BEC Preliminary”, Cambridge University Press, 2nd Edition, 2008.
2. Meenakshi Raman, Sangeetha Sharma, “Technical Communication Principles Practices”, Oxford University Press, New Delhi, 3rd Edition , 2015.
3. V Sasikumar, P V Dhamija, “Spoken English”, Tata Mc Graw Hill, New Delhi, 2nd Edition, 2007.

Web References:

1. www.edufind.com
2. www.myenglishpages.com
3. http://grammar.ccc.comment.edu
4. http://owl.english.prudue.edu

E-Text Books:

1. http://bookboon.com/en/communication-ebooks-zip
2. http://www.bloomsbury-international.com/images/ezone/ebook/writing-skills-pdf.pdf
3. https://americanenglish.state.gov/files/ae/resource_files/developing_writing.pdf
4. http://learningenglishvocabularygrammar.com/files/idiomsandphraseswithmeaningsandexamplespdf.pdf
5. http://www.robinwood.com/Democracy/GeneralEssays/CriticalThinking.pdf

TRANSFORMATION TECHNIQUES
(EEE)

Semester: II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A2803	Core	3	1	-	3	30	70	100

Total Contact Hours: 45	Total Tutorials: 15	Total Practical Classes: Nil	Total Hours: 60

OBJECTIVES:

The course should enable the students to:

I. Express non periodic function to periodic function using Fourier series and Fourier transforms.
II. Apply Laplace transforms and Z-transforms to solve differential equations.
III. Formulate and solve partial differential equations.

UNIT-I	FOURIER SERIES	Hours: 09

Definition of periodic function, determination of Fourier coefficients; Fourier expansion of periodic function in a given interval of length 2π; Fourier series of even and odd functions; Fourier series in an arbitrary interval; Half- range Fourier sine and cosine expansions.

UNIT-II	FOURIER TRANSFORMS	Hours: 09

Fourier integral theorem, Fourier sine and cosine integrals; Fourier transforms; Fourier sine and cosine transform, properties, inverse transforms, finite Fourier transforms.

UNIT-III	LAPLACE TRANSFORMS	Hours: 09

Definition of Laplace transform, linearity property, piecewise continuous function, existence of Laplace transform, function of exponential order, first and second shifting theorems, change of scale property, Laplace transforms of derivatives and integrals, multiplied by t, divided by t, Laplace transform of periodic functions.

Inverse Laplace transform: Definition of Inverse Laplace transform, linearity property, first and second shifting theorems, change of scale property, multiplied by s, divided by s; Convolution theorem and applications.

UNIT-IV	Z –TRANSFORMS	Hours: 09

Z-transforms: Elementary properties, inverse Z-transform, convolution theorem, formation of difference equations.

UNIT-V	PARTIAL DIFFERENTIAL EQUATIONS	Hours: 09

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equation, Lagrange equation and nonlinear standard type equations, method of separation of variables.

Text Books:

1. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 10th Edition, 2010.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2013.

Reference Books:

1. S. S. Sastry, “Introduction methods of numerical analysis”, Prentice-Hall of India Private Limited, 5th Edition, 2005
2. G. Shanker Rao, “Mathematical Methods”, I. K. International Publications, 1st Edition, 2011.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://ocw.mit.edu/resources/#Mathematics
3. http://www.sosmath.com/
4. http://mathworld.wolfram.com/

E-Text Books:

1. http://keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html
2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks

ENVIRONMENTAL SCIENCE AND ENGINEERING
(Common for all Branches)

Semester: II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A2807	Foundation	3	-	-	3	30	70	100
Total Contact Hours: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Hours: 45		

OBJECTIVES:

The course should enable the students to:

I. Analyze the interrelationship between living organism and environment.
II. Understand the importance of environment by assessing its impact on the human world.
III. Enrich the knowledge on themes of biodiversity, natural resources, pollution control and waste management.

UNIT-I	ENVIRONMENT AND ECOSYSTEMS	Hours: 08

Environment: Definition, scope and importance of environment, need for public awareness; Ecosystem: Definition, scope and importance of ecosystem, classification, structure and function of an ecosystem, food chains, food web and ecological pyramids, flow of energy; Biogeochemical cycles; Biomagnifications.

UNIT-II	NATURAL RESOURCES	Hours: 08

Natural resources: Classification of resources, living and nonliving resources; Water resources: Use and over utilization of surface and ground water, floods and droughts, dams, benefits and problems; Mineral resources: Use and exploitation; Land resources; Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT-III	BIODIVERSITY AND BIOTIC RESOURCES	Hours: 10

Biodiversity and biotic resources: Introduction, definition, genetic, species and ecosystem diversity; Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and optional values; India as a mega diversity nation; Hot spots of biodiversity.

Threats to biodiversity: Habitat loss, poaching of wildlife, human-wildlife conflicts; Conservation of biodiversity: In situ and ex situ conservation; National biodiversity act.

UNIT-IV	ENVIRONMENTAL POLLUTION, POLLUTION CONTROL TECHNOLOGIES AND GLOBAL ENVIRONMENTAL PROBLEMS	Hours: 10

Environmental pollution: Definition, causes and effects of air pollution, water pollution, soil pollution, noise pollution; Solid waste: Municipal solid waste management, composition and characteristics of e-waste and its management; Pollution control technologies: Waste water treatment methods, primary, secondary and tertiary; Concepts of bioremediation; Global environmental problems and global efforts: Climate change, ozone depletion, ozone depleting substances, deforestation and desertification; International conventions / protocols: Earth summit, Kyoto protocol and Montreal protocol.

UNIT-V	ENVIRONMENTAL LEGISLATIONS AND SUSTAINABLE DEVELOPMENT	Hours: 09

Environmental legislations: Environmental protection act, air act1981, water act, forest act, wild life act, municipal solid waste management and handling rules, biomedical waste management and handling rules,

hazardous waste management and handling rules; Towards sustainable future: Concept of sustainable development, population and its explosion, crazy consumerism, environmental education, urban sprawl, concept of green building.

Text Books:

1. Benny Joseph, "Environmental Studies", Tata Mc Graw Hill Publishing Co. Ltd, New Delhi, 1st Edition, 2006.
2. Erach Bharucha, "Textbook of Environmental Studies for Under Graduate Courses", Orient Black Swan, 2nd Edition, 2013.

Reference Books:

1. G. Tyler Miller, Scott Spoolman, " Environmental Science", Cengage Learning, 14th Edition, 2012.
2. Anubha Kaushik, "Perspectives in Environmental Science", New Age International, New Delhi, 4th Edition, 2006.
3. Gilbert M. Masters, Wendell P. Ela, "Introduction to Environmental Engineering and Science, Pearson, 3rd Edition, 2007.

Web References:

1. www.elsevier.com
2. libguides.lib.msu.edu
3. www.fao.org
4. www.nrc.gov
5. www.istl.org
6. ww.ser.org
7. www.epd.gov.
8. www.nptel.ac.in

E-Text Books:

1. www.ilocis.org
2. img.teebweb.org
3. ec.europa.eu
4. www.epa.ie
5. birdi.ctu.edu.vn

DATA STRUCTURES WITH C
(Common for CSE / ECE / EEE / IT)

Semester: II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A2502	Foundation	3	1	-	4	30	70	100
Total Contact Hours: 45	Total Tutorials: 15	Total Practical Classes: Nil				Total Hours: 60		

OBJECTIVES:

The course should enable the students to:

I. Learn the basic techniques of algorithm analysis.
II. Demonstrate several searching and sorting algorithms.
III. Implementation of linear data structure mechanisms.
IV. Demonstrate various tree and graph traversal algorithms.
V. Analyze and choose appropriate data structure to solve problems in real world.

UNIT-I	INTRODUCTION TO DATA STRUCTURES, SEARCHING AND SORTING	Hours: 12

Basic concepts: Introduction to data structures, classification of data structures, operations on data structures, abstract data type, algorithms, different approaches to design an algorithm, recursive algorithms, performance analysis of algorithms, asymptotic notations; Searching techniques: Linear search, binary search and Fibonacci search; Sorting techniques: Insertion sort, quick sort, merge sort, shell sort, radix sort and comparison of sorting algorithms.

UNIT-II	LINEAR DATA STRUCTURES	Hours: 10

Stacks: Primitive operations, implementation of stacks; Arrays and linked list representation, applications of stacks arithmetic expression conversion and evaluation; Queues: Primitive operations; Implementation of queues: Array and linked list representation, applications of linear queue, circular queue, doubly ended queue and priority queue.

UNIT-III	LINKED LISTS	Hours: 07

Linked lists: Basic concepts, types of linked lists.

Implementation: Singly linked list, circular linked list, doubly linked list, applications of linked lists.

UNIT-IV	NON LINEAR DATA STRUCTURES	Hours: 08

Trees: Basic concept, binary tree, binary tree representation, array and linked representations, binary tree traversal, binary search tree, tree variants, application of trees; Graphs: Basic concept, graph terminology, graph implementation, graph traversals, shortest path algorithm, minimum spanning trees, application of graphs.

UNIT-V	BINARY TREES AND HASHING	Hours: 08

Binary search trees: Binary search trees, properties and operations; Balanced search trees: AVL trees, red-black trees, splay trees; Introduction to M-Way search trees, B trees; Hashing and collision: Introduction, hash tables, hash functions, collisions, applications of hashing.

Text Books:

1. Mark A. Weiss, "Data Structures and Algorithm Analysis in C", Pearson, 2nd Edition, 1996.

2. Ellis Horowitz, Satraj Sahni, Susan Anderson Freed, "Fundamentals of Data Structures in C", Universities Press, 2nd Edition, 2008.

Reference Books:

1. Reema Thareja, "Data Structures using C", Oxford University Press, 2nd Edition, 2014.
2. S. Lipschutz, "Data Structures", Tata Mc Graw Hill Education, 1st Edition, 2008.
3. D. Samanta, "Classic Data Structures", PHI Learning, 2nd Edition, 2004.
4. Tanenbaum, Langsam, Augenstein, "Data Structures Using C", Pearson, 1st Edition, 2003.

Web References:

1. www.tutorialspoint.com/data_structures_algorithms
2. www.geeksforgeeks.org/data-structures/
3. www.studytonight.com/data-structures/
4. https://www.coursera.org/specializations/data-structures-algorithms

E-Text Books:

1. https://www.scribd.com/doc/268924096/c-Data-Structures-Balaguruswamy-eBook
2. https://www.safaribooksonline.com/library/view/data-structures-using/9789332524248/
3. http://www.amazon.com/Data-Structures-C-Noel-Kalicharan/dp/1438253273
4. https://www.scribd.com/doc/40147240/Data-Structures-Using-c-by-Aaron-m-Tenenbaum-946

ELECTRICAL CIRCUITS
(Common to EEE / ECE)

Semester: II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A2201	Foundation	3	1	-	4	30	70	100
Total Contact Hours: 45	Total Tutorials: 15	Total Practical Classes: Nil				Total Hours: 60		

OBJECTIVES:

The course should enable the students to:

I. Classify circuit parameters and apply Kirchhoff's laws for network reduction.
II. Apply mesh analysis and nodal analysis to solve electrical networks.
III. Illustrate single phase AC circuits and apply steady state analysis to time varying circuits.
IV. Apply network theorems to obtain the equivalent circuit of electrical networks.

UNIT-I	INTRODUCTION TO ELECTRICAL CIRCUITS	Hours: 09

Circuit Concept: R, L, C Parameters, voltage and current sources, independent and dependent sources, source transformation, voltage current relationship for passive elements (for different input signal Square, Ramp, Saw tooth and Triangular). Kirchhoff's laws, network reduction techniques series, parallel, series parallel.

UNIT-II	ANALYSIS OF ELECTRICAL CIRCUITS	Hours: 09

Mesh analysis: Mesh equations by inspection method, super mesh analysis; Nodal analysis: Nodal equations by inspection method, super node analysis, star to delta or delta to star transformation; Network topology: Definitions, graph, tree, basic tie set and basic cut set matrices for planar networks duality & dual networks.

UNIT-III	SINGLE PHASE A.C. CIRCUITS	Hours: 10

Single phase AC circuits: RMS and average values and form factor for different periodic wave forms, steady state analysis of RL and RC (in Series, Parallel and Series Parallel Combinations) with Sinusoidal Excitation, Concept of reactance, impedance, susceptance and admittance, phase and phase difference, concept of power factor, real and reactive powers, complex and Polar forms of representation, Complex power.

Steady state analysis of RLC: (in series, parallel and series parallel combinations) with sinusoidal excitation. Concept of reactance, impedance, susceptance and admittance, phase and phase difference, concept of power factor, real and reactive powers, complex and polar forms of representation, complex power.

UNIT-IV	RESONANCE AND MAGNETIC CIRCUITS	Hours: 08

Resonance: Series, parallel circuits, concept of band width and Q factor; Magnetic circuits: Faraday's laws of electromagnetic induction, concept of self and mutual inductance, dot convention, coefficient of coupling, composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT-V	NETWORK THEOREMS (AC & DC)	Hours: 09

Theorems: Tellegen's, Superposition, Reciprocity, Thevinin's, Norton's, maximum power transfer, Milliman's and compensation theorems for DC & AC excitations, numerical problems.

Text Books:

1. A. Chakrabarthy, "Electric Circuits", Dhanipat Rai & Sons, 6th Edition, 2010.
2. A. Sudhakar, Shyammohan S Palli, "Circuits and Networks", Tata Mc Graw Hill, 4th Edition, 2010.
3. M. E. Van Valkenberg, "Network Analysis", PHI, 3 rd Edition, 2014.

Reference Books:

1. John Bird, "Electrical Circuit Theory and Technology", Newnes, 2nd Edition, 2003.
2. C. L. Wadhwa, "Electrical Circuit Analysis Inclucing Passive Network Synthesis", New Age International, 2nd Edition, 2009.
3. David A. Bell,"Electric circuits", Oxford University Press, 7th Edition, 2009.

Web References:

1. http://www.igniteengineers.com
2. http://www.ocw.nthu.edu.tw
3. http://www.uotechnology.edu.iq
4. http://www.iare.ac.in

E-Text Books :

1. http://www.bookboon.com/en/concepts-in-electric-circuits-ebook
2. http://www.www.jntubook.com
3. http://www.allaboutcircuits.com
4. http://www.archive.org

COMMUNICATION SKILLS LABORATORY
(Common for CSE / ECE / EEE / IT)

Semester: II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A2808	Foundation	-	-	2	1	30	70	100
Total Contact Hours: Nil	Total Tutorials: Nil	Total Practical Classes: 16				Total Hours: 32		

OBJECTIVES:

The course enables the students to:

I. Improve their ability to listen and comprehend a given text.
II. Upgrade the fluency and acquire a functional knowledge of English Language.
III. Enrich thought process by viewing a problem through multiple angles.

LIST OF EXPERIMENTS

Week-l	**LISTENING SKILL**

a. Listening to conversations and interviews of famous personalities in various fields, listening practice related to the TV talk shows, news.
b. Listening for specific information, listening for summarizing information.

Week-2	**LISTENING SKILL**

a. Listening to films of short duration and monologues for taking notes, listening to answer multiple choice questions.
b. Listening to telephonic conversations; Listening to native British and American speakers to analyze intercultural differences.

Week-3	**SPEAKING SKILL**

a. Functions of English Language; Introduction to phonetics, exercises on pronunciation, symbols of phonetics.
b. Speaking exercises involving the use of stress and intonation, improving pronunciation through tongue twisters.
c. Tips on how to develop fluency, body language and communication; Introducing oneself: Talking about yourself, others, leave taking.

Week-4	**SPEAKING SKILL**

a. Just a minute (JAM) sessions, public speaking, situational conversation/role-play.
b. Greetings for different occasions with feedback preferably through video recording; Speaking about present, past experiences and future plans; Acting as a compere and news reader.

Week-5	**READING SKILL**

a. Reading anecdotes to predict the content, reading for interpretation.
b. Suggested reading: Short stories and poem; Critical reading.

Week-6	**READING SKILL**

Reading for information transfer; Reading newspaper and magazine articles, memos, letters, notices and minutes for

critical commentary.	
Week-7	**READING SKILL**
Reading brochures, advertisements, pamphlets for improved presentation; Reading comprehension exercises with critical and analytical questions based on context.	
Week-8	**WRITING SKILL**
Writing messages, leaflets, notice; Writing tasks; Flashcard.	
Week-9	**WRITING SKILL**
a. Write a slogan related to the image. b. Write a short story of 6-10 lines based on the hints given.	
Week-10	**WRITING SKILL**
Writing a short story on their own; Writing a review on: Video clippings on inspirational speeches, short films, advertisements, recipe and recently watched film.	
Week-11	**THINKING SKILL**
Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms, proverbs.	
Week-12	**THINKING SKILL**
a. Inculcating interest in English using thinking blocks. b. Making pictures and improvising diagrams to form English words, phrases and proverbs.	
Reference Books:	
1. Raman, Meenakshi, Sangeetha Sharma, "Technical Communication", English for Engineers, 2nd Edition, New Delhi, Oxford University Press, 2010. 2. Rhirdion, Daniel, "Technical Communication", New Delhi, Cengage Learning, 1st Edition, 2009.	
Web References:	
1. http://learnenglish.britishcouncil.org 2. http://www.esl-lab.com/ 3. http://www.elllo.org/	
EQUIPMENT REQUIRED FOR A BATCH OF 60 STUDENTS [ORAL (30) AND MULTIMEDIA (30)]	
1. Career laboratory: 1 Room 2. Server computer for the laboratory with high configuration: 1 no 3. Intel Desktop Computers with 2 GB RAM: 30 no 4. Software: K Van Solution 5. LCD Projector: 1 no 6. Speakers with amplifiers, one wireless mic and one collar mic 7. Podium: 1 no 8. Chairs: 30 no 9. Discussion Tables: 2 no 10. White board: 1 no	

DATA STRUCTURES LABORATORY
(Common for CSE / ECE / EEE / IT)

Semester: II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A2503	Foundation	-	-	3	2	30	70	100
Total Contact Hours: Nil	Total Tutorials: Nil	Total Practical Classes: 36				Total Hours: 36		

OBJECTIVES:

The course should enable the students to:

I. Implement linear and non linear data structures.
II. Analyze various algorithms based on their time complexity.
III. Choose appropriate data structure and algorithm design method for a specific application.
IV. Identify suitable data structure to solve various computing problems.

LIST OF EXPERIMENTS

Week-1 SEARCHING TECHNIQUES

Write C programs for implementing the following searching techniques to search a particular data item from a given list of integers 25, 42, 55, 61, 78, 86, 95, 24, 16, 9, 71, 83.

a. Linear search.
b. Binary search.
c. Fibonacci search.

Week-2 SORTING TECHNIQUES

Write C programs for implementing the following sorting techniques to arrange a list of integers in ascending order.

a. Selection sort.
b. Quick sort.
c. Merge sort.

Week-3 IMPLEMENTATION OF STACK

Write C programs to design and implement stack and its operations using

a. Array
b. Singly linked list.

Week-4 IMPLEMENTATION OF LINEAR QUEUE

Write C programs to design and implement linear queue and its operations using

a. Array
b. Singly linked list.

Week-5 APPLICATIONS OF STACK

Write a C programs to perform the following using a stack

a. Conversions from infix expression to its equivalent postfix expression.
b. Evaluate the following postfix expression 23* 4 5/-.

Week-6 IMPLEMENTATION OF DEQUE

Write C programs to implement a double ended queue ADT using

a. Array

b. Double linked list.

Week-7	IMPLEMENTATION OF SINGLE AND CIRCULAR SINGLE LINKED LIST

Write C programs to design and implement the basic operations of the following:
a. Single linked list.
b. Circular single linked list.

Week-8	IMPLEMENTATION OF DOUBLE LINKED LIST

Write C programs to design and implement the basic operations of doubly linked list.

Week-9	GRAPH TRAVERSAL TECHNIQUES

Write C programs to implement the following graph traversal algorithms:
a. Depth first search.
b. Breadth first search.

Week-10	IMPLEMENTATION OF BINARY SEARCH TREE

Write a C program that uses functions to perform the following:
a. Create a binary search tree of characters.
b. Traverse the above binary search tree recursively in post-order.
c. Count the number of nodes in the binary search tree.

Week-11	B –TREE

Write a C program to perform the following operation:
a. Insertion into a B-tree.
b. Heap sort.

Week-12	HASHING

Write a C program to implement all the functions of a dictionary ADT using hashing.

Reference Books:

1. Kernighan Brian W, Dennis M. Ritchie, "The C Programming Language", Prentice Hall of India, Re-Print, 2008.
2. Balagurusamy E, "Programming in ANSI C", Tata Mc Graw Hill, 6th Edition, 2008.
3. Gottfried Byron, "Schaum's Outline of Programming with C", Tata Mc Graw Hill, 1st Edition, 2010.
4. Lipschutz Seymour, " Data Structures Schaum's Outlines Series", Tata Mc Graw Hill, 3rd Edition, 2014
5. Horowitz Ellis, Satraj Sahni, Susan Anderson, Freed, "Fundamentals of Data Structures in C", W. H. Freeman Company, 2nd Edition, 2011.

Web References:

1. www.tutorialspoint.com/data_structures_algorithms
2. www.geeksforgeeks.org/data-structures/
3. www.studytonight.com/data-structures/
4. www.coursera.org/specializations/data-structures-algorithms

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

HARDWARE:
30 numbers of Intel Desktop Computers with 2 GB RAM
Dot Matrix Printers: 02

SOFTWARE:
System Software: Linux / Microsoft Windows 7.
Programming Languages: Borland C++ 5.02.

ELECTRICAL CIRCUITS LABORATORY
(Common for ECE / EEE)

Semester: II

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A2202	Foundation	-	-	3	2	30	70	100
Total Contact Hours: Nil	Total Tutorials: Nil			Total Practical Classes: 42		Total Hours: 42		

OBJECTIVES:

The course should enable the students to:

I. Implement different circuits and verify circuit concepts.
II. Study the concepts of mesh and nodal analysis in electrical circuits.
III. Design electric circuits to verify network theorems.
IV. Gain knowledge about resonance and magnetic circuits.

LIST OF EXPERIMENTS

Week-1	**KIRCHOFF'S LAWS**
Verification of Kirchhoff's current law and voltage law using hardware and digital simulation.	
Week-2	**MESH ANALYSIS**
Verification of Mesh Analysis using hardware and digital simulation.	
Week-3	**NODAL ANALYSIS**
Verification of Nodal Analysis using hardware and digital simulation.	
Week-4	**SINGLE PHASE AC CIRCUITS**
Determination of average value, RMS value, form factor, peak factor of sinusoidal wave, square wave using hardware and digital simulation.	
Week-5	**SUPERPOSITION THEOREM**
Verification of superposition theorem using hardware and digital simulation.	
Week-6	**RECIPROCITY THEOREM**
Verification of Reciprocity theorem using hardware and digital simulation.	
Week-7	**MAXIMUM POWER TRANSFER THEOREM**
Verification of maximum power transfer theorem using hardware and digital simulation.	
Week-8	**THEVENINS THEOREM**
Verification of Thevenin's theorem using hardware and digital simulation.	
Week-9	**NORTON'S THEOREM**
Verification of Norton's theorem using hardware and digital simulation.	
Week-10	**COMPENSATION THEOREM**
Verification of Compensation theorem using hardware and digital simulation.	
Week-11	**MILLIMAN'S THEOREM**

Verification of Milliman's theorem using hardware and digital simulation.

Week-12 **SERIES RESONANCE**

Verification of series resonance using hardware and digital simulation.

Week-13 **PARALLEL RESONANCE**

Verification of parallel resonance using hardware and digital simulation.

Week-14 **SELF INDUCTANCE AND MUTUAL INDUCTANCE**

Determination of self inductance and mutual inductance by using hardware.

Reference Books:

1. Department Lab Manual
2. A. Chakrabarti, "Circuit Theory", Dhanpat Rai Publications, 6th Edition, 2006.
3. William Hayt, Jack E. Kemmerly S.M. Durbin, "Engineering Circuit Analysis", Tata Mc Graw Hill, 7th Edition, 2010.
4. K. S. Suresh Kumar, "Electric Circuit Analysis", Pearson Education, 1st Edition, 2013.

Web References:

1. http://www.ee.iitkgp.ac.in
2. http://www.citchennai.edu.in
3. http://www.iare.ac.in

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS

S. No	Name of the Equipment	Range
1	Regulated Power Supply	0-30V DC
2	CRO	0-20 MHz
3	Digital voltmeter	0-20 V
4	Digital ammeter	0-200 mA
5	Resistors	47Ω, 82 Ω, 100 Ω, 150 Ω, 220 Ω, 470 Ω, 560 Ω, 1k Ω, 2.2k Ω, 3.3k Ω.5k Ω,10k Ω
6	Inductors	0.01mH, 0.1mH,10mH, 50mH
7	Capacitors	0.01µF, 0.1µF, 0.47µF, 470µF, 33µF
8	1-ϕ Transformer	3KVA, 115/230V
9	1-ϕ Auto Transformer	230/(0-270V), 10A
10	Ammeter	0-2.5/5A MI
11	Ammeter	0-10/20 A MI
12	Voltmeter	0-150/300V MI
13	Voltmeter	0-300/600V MI
14	Wattmeter	5/10A,75/150/300V LPF
15	Wattmeter	10/20A,150/300/600V UPF
16	Multimeter	10 Nos
17	Bread boards	30 Nos
18	Probes / Connecting wires	400 Nos
19	**HARDWARE:** 30 numbers of Intel Desktop Computers with 2 GB RAM	
20	**SOFTWARE:** Microsoft Windows 7 and MATLAB – V 8.5, which is also R2015a	

ENGINEERING PRACTICE LABORATORY
(Common for CSE / ECE / EEE / IT)

Semester: II

Course Code	Category	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A2505	Foundation	-	-	2	1	30	70	100
Total Contact Hours: Nil	Total Tutorials: Nil	Total Practical Classes: 48				Total Hours: 48		

OBJECTIVES:

The course should enable the students to:

I. Practice on operating system installation and configuration settings.
II. Design blogs and view the Skype installation.
III. Prepare productivity tools like word processors, spreadsheets, presentations.
IV. Develop models using fitting, carpentry, foundry, Black-Smithy and Tin-Smithy trades.
V. Demonstrate the process of house wiring for connecting and controlling home appliances.
VI. Illustrate metal joining arc welding process, plumbing, and power tools.

LIST OF EXPERIMENTS

Week-1	**NETWORK CONNECTIONS**
IP configurations, connecting devices in LAN through bridge, hub, switch; Wi-Fi, Li-Fi and Bluetooth settings; Crimping: Crossover, strait over.	
Week-2	**BLOG CREATION**
Creating blogs, import the data into blogs, blog templates, blog design.	
Week-3	**SKYPE INSTALLATION**
Skype installation and usages of Skype.	
Week-4	**CYBER HYGIENE**
Install antivirus software; Configure their personal firewall and windows update on their computer.	
Week-5	**MS WORD**
Prepare the project document - 1.	
Week-6	
Prepare the resume.	
Week-7	**MS EXCEL**
Spreadsheet basics, modifying worksheets, formatting cells, formulas and functions, sorting and filtering, charts.	
Week-8	**MS POWER POINT**
Power point screen, working with slides, add content, work with text, working with tables, graphics, slide animation, reordering slides, adding sound to a presentation.	
Week-9	**LATEX**
Prepare the project document – 1.	
Week-10	**LATEX**
Prepare the project document – 2.	

Week-11	LATEX
Prepare the resume.	
Week-12	**HOUSE WIRING**
Power point, light fitting and switches, television, home theater.	
Week-13	**CARPENTRY**
Study of tools and joints; Practice in planning, chiseling, marking and sawing; Joints: Cross joint, T joint, Dove tail joint.	
Week-14	**SOLDERING**
Electronic components (PCB'S), resistance soldering, desoldering, and soldering effects.	
Week-15	**FITTING**
Study of tools, practice in filing, cutting, drilling and tapping; Male and female joints, stepped joints**.**	
Week-16	**ELECTRICAL WINDING**
Lap winding, wave winding and design of transformer.	

Reference Books:

1. Peter Norton, "Introduction to Computers", Tata Mc Graw Hill Publishers, 6th Edition, 2010.
2. Scott Muller, Que, "Upgrading and Repairing", Pearson Education, PC's 18th Edition, 2009.
3. H. S. Bawa, "Workshop Practice", Tata Mc Graw Hill Publishing Company Limited, New Delhi, 2nd Edition, 2007.

Web References:

1. www.cl.cam.ac.uk/teaching/1011/CompFunds
2. www.bibcol.com
3. www.tutorialspoint.com/computer_fundamentals
4. www.craftsmanspace.com

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS

HARDWARE:
30 numbers of Intel Desktop Computers with 2 GB RAM
Dot Matrix Printers: 02

SOFTWARE:
System Software: Linux / Windows 7.
Application Software's: MS Office and TeXworks 0.6.1on LaTeX 2e (Open Source)

OTHER COMPONENTS REQUIRED:

Name of the component	Range/Specifications
Resistors	100 Ω, 2.2KΩ.
Capacitors	0.1μF.
Mild Steel	50x50x8 mm.
Bulb	40 Watts.
Wooden Piece	300x300x30 mm.
Armature winding M/c	0-440V, 20 A.
Coil Winding machine	0-440V, 20 A.
Copper winding wire enameled	35SWG 15 kg.
Core stamping	Made of silicon steel (E & I shape).

VISION AND MISSION OF THE INSTITUTE

VISION

To bring forth professionally competent and socially sensitive engineers, capable of working across cultures meeting the global standards ethically.

MISSION

To provide students with an extensive and exceptional education that prepares them to excel in their profession, guided by dynamic intellectual community and be able to face the technically complex world with creative leadership qualities.

Further, be instrumental in emanating new knowledge through innovative research that emboldens entrepreneurship and economic development for the benefit of wide spread community.

B.TECH - PROGRAM OUTCOMES (POS)

PO-1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems (**Engineering Knowledge**).

PO-2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences **(Problem Analysis).**

PO-3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations **(Design/Development of Solutions).**

PO-4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions **(Conduct Investigations of Complex Problems).**

PO-5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations **(Modern Tool Usage).**

PO-6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice **(The Engineer and Society).**

PO-7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development **(Environment and Sustainability).**

PO-8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice **(Ethics).**

PO-9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings **(Individual and Team Work).**

PO-10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions **(Communication).**

PO-11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change **(Life-long learning).**

OBJECTIVES OF THE DEPARTMENT

Programme Educational Objectives (PEO's)

A graduate of the Electrical and Electronics Engineering Program should:

PEO – I: To experience success in electrical and electronics engineering areas or other diverse fields that requires analytical and professional skills.

PEO – II: To stimulate students to contribute to their fields or professions and to excel them in professional ethics and leadership qualities.

PEO – III: To inculcate in students, professional attitude, effective communication skills and capability to succeed in multi-disciplinary and diverse fields.

PEO – IV: To promote students to continue to pursue professional development, including continuing or advanced education relevant to their career growth and to create enthusiasm for life-long learning.

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO – I: Able to utilize the knowledge of high voltage engineering in collaboration with power systems in innovative, dynamic and challenging environment, for the research based teamwork.

PSO – II: Can explore the scientific theories, ideas, methodologies and the new cutting edge Technologies in renewable energy engineering, and use this erudition in their professional envelopment and gain sufficient competence to solve the current and future energy problems universally.

PSO – III: The understanding of technologies like PLC, PMC, process controllers, transducers and HMI one can analyze, design electrical and electronics principles to install, test , maintain power system and applications.

FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT AUTONOMY

1. Who grants Autonomy? UGC, Govt., AICTE or University

In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy but only after concurrence from the respective state Government as well as UGC. The State Government has its own powers to grant autonomy directly to Govt. and Govt. aided Colleges.

2 Shall IARE award its own Degrees?

No. Degree will be awarded by Jawaharlal Nehru Technological University, Hyderabad with a mention of the name IARE on the Degree Certificate.

3 What is the difference between a Deemed University and an Autonomy College?

A Deemed University is fully autonomous to the extent of awarding its own Degree. A Deemed University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4 How will the Foreign Universities or other stake – holders know that we are an Autonomous College?

Autonomous status, once declared, shall be accepted by all the stake holders. The Govt. of Telangana mentions autonomous status during the First Year admission procedure. Foreign Universities and Indian Industries will know our status through our website.

5 What is the change of Status for Students and Teachers if we become Autonomous?

An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic performances, our capability of self- governance and the kind of quality education we offer.

6 Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?

There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee, which will keep a watch on the academics and keep its reports and recommendations every year. In addition the highest academic council also supervises the academic matters. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7 Will the students of IARE as an Autonomous College qualify for University Medals and Prizes for academic excellence?

No. IARE has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural on co-curricular organized by the University the students shall qualify.

8 Can IARE have its own Convocation?

No. Since the University awards the Degree the Convocation will be that of the University, but there will be Graduation Day at IARE.

9 Can IARE give a provisional degree certificate?

Since the examinations are conducted by IARE and the results are also declared by IARE, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

10 Will Academic Autonomy make a positive impact on the Placements or Employability?

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11 What is the proportion of Internal and External Assessment as an Autonomous College?

Presently, it is 70 % external and 30% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

12 Is it possible to have complete Internal Assessment for Theory or Practicals?

Yes indeed. We define our own system. We have the freedom to keep the proportion of external and internal assessment component to choose.

13 Why Credit based Grade System?

The credit based grade system is an accepted standard of academic performance the world over in all Universities. The acceptability of our graduates in the world market shall improve.

14 What exactly is a Credit based Grade System?

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like A, B,C,D, etc. are assigned for a Range of Marks. (e.g. 91% and above is A+, 80 to 90 % could be A etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

15 What are the norms for the number of Credits per Semester and total number of Credits for UG/PG programme?

These norms are usually defined by UGC or AICTE. Usually around 25 Credits per semester is the accepted norm.

16 What is a Semester Grade Point Average (SGPA)?

The performance of a student in a semester is indicated by a number called SGPA. The SGPA is the weighted average of the grade points obtained in all the courses registered by the student during the semester.

$$SGPA = \sum_{i=1}^{n} (C_i G_i) / \sum_{i=1}^{n} C_i$$

Where, C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course and i represent the number of courses in which a student registered in the concerned semester. SGPA is rounded to two decimal places.

17 What is a Cumulative Grade Point Average (CGPA)?

An up-to-date assessment of overall performance of a student from the time of his first registration is obtained by calculating a number called CGPA, which is weighted average of the grade points obtained in all the courses registered by the students since he entered the Institute.

$$CGPA = \sum_{j=1}^{m} \left(C_j S_j \right) / \sum_{j=1}^{m} C_j$$

Where, S_j is the SGPA of the j^{th} semester and C_j is the total number of credits upto the semester and m represent the number of semesters completed in which a student registered upto the semester. CGPA is rounded to two decimal places.

18 Is there any Software available for calculating Grade point averages and converting the same into Grades?

Yes, The institute has its own MIS software for calculation of SGPA, CGPA, etc.

19 Will the teacher be required to do the job of calculating SGPAs etc. and convert the same into Grades?

No. The teacher has to give marks obtained out of whatever maximum marks as it is. Rest is all done by the computer.

20 Will there be any Revaluation or Re-Examination System?

No. There will double valuation of answer scripts. There will be a make up Examination after a reasonable preparation time after the End Semester Examination for specific cases mentioned in the Rules and Regulations. In addition to this, there shall be a 'summer term' (compressed term) followed by the End Semester Exam, to save the precious time of students.

21 How fast Syllabi can be and should be changed?

Autonomy allows us the freedom to change the syllabi as often as we need.

22 Will the Degree be awarded on the basis of only final year performance?

No. The CGPA will reflect the average performance of all the semester taken together.

23 What are Statutory Academic Bodies?

Governing Body, Academic Council, Examination Committee and Board of Studies are the different statutory bodies. The participation of external members in every body is compulsory. The institute has nominated professors from IIT, NIT, University (the officers of the rank of Pro-vice Chancellor, Deans and Controller of Examinations) and also the reputed industrialist and industry experts on these bodies.

24 Who takes Decisions on Academic matters?

The Governing Body of institute is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like Boards of Studies. Decisions taken at the Boared of Studies level are to be ratified at the Academic Council and Governing Body.

25 What is the role of Examination committee?

The Examinations Committee is responsible for the smooth conduct of internal, End Semester and make up Examinations. All matters involving the conduct of examinations spot valuations, tabulations preparation of Grade Cards etc fall within the duties of the Examination Committee.

26 Is there any mechanism for Grievance Redressal?

The institute has grievance redressal committee, headed by Dean - Student affairs and Dean - IQAC.

27 How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulation

28 Who declares the result?

The result declaration process is also defined. After tabulation work wherein the SGPA, CGPA and final Grades are ready, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the Examinations and Result Committee for its approval. The result is then declared on the institute notice boards as well put on the web site and Students Corner. It is eventually sent to the University.

29 Who will keep the Student Academic Records, University or IARE?

It is the responsibility of the Dean, Academics of the Autonomous College to keep and preserve all the records.

30 What is our relationship with the JNT University?

We remain an affiliated college of the JNT University. The University has the right to nominate its members on the academic bodies of the college.

31 Shall we require University approval if we want to start any New Courses?

Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

32 Shall we get autonomy for PG and Doctoral Programmes also?

Yes, Presently our PG programmes also enjoying autonomous status.

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

UNDERTAKING BY STUDENT / PARENT

"To make the students attend the classes regularly from the first day of starting of classes and be aware of the College regulations, the following Undertaking Form is introduced which should be signed by both student and parent. The same should be submitted to the Dean, Academic".

I, Mr./Ms. ---------- joining I Semester / III Semester for the academic year 2016-2017 / 2017-2018 in Institute of Aeronautical Engineering, Hyderabad, do hereby undertake and abide by the following terms, and I will bring the ACKNOWLEDGEMENT duly signed by me and my parent and submit it to the Dean, Academic.

1. I will attend all the classes as per the timetable from the starting day of the semester specified in the institute Academic Calendar. In case, I do not turn up even after two weeks of starting of classes, I shall be ineligible to continue for the current academic year.
2. I will be regular and punctual to all the classes (theory/practical/drawing) and secure attendance of not less than 80% in every course as stipulated by Institute. I am fully aware that an attendance of less than 70% in more than three courses will make me lose one year.
3. I will compulsorily follow the dress code prescribed by the college.
4. I will conduct myself in a highly disciplined and decent manner both inside the classroom and on campus, failing which suitable action may be taken against me as per the rules and regulations of the institute.
5. I will concentrate on my studies without wasting time in the Campus/Hostel/Residence and attend all the tests to secure more than the minimum prescribed Class/Sessional Marks in each course. I will submit the assignments given in time to improve my performance.
6. I will not use Mobile Phone in the institute premises and also, I will not involve in any form of ragging inside or outside the campus. I am fully aware that using mobile phone to the institute premises is not permissible and involving in Ragging is an offence and punishable as per JNTUH/UGC rules and the law.
7. I declare that I shall not indulge in ragging, eve-teasing, smoking, consuming alcohol drug abuse or any other anti-social activity in the college premises, hostel, on educational tours, industrial visits or elsewhere.
8. I will pay tuition fees, examination fees and any other dues within the stipulated time as required by the Institution / authorities, failing which I will not be permitted to attend the classes.
9. I will not cause or involve in any sort of violence or disturbance both within and outside the college campus.
10. If I absent myself continuously for 3 days, my parents will have to meet the HOD concerned/ Principal.
11. I hereby acknowledge that I have received a copy of IARE - R16 Academic Rules and Regulations, Syllabus copy and hence, I shall abide by all the rules specified in it.

ACKNOWLEDGEMENT

I have carefully gone through the terms of the undertaking mentioned above and I understand that following these are for my/his/her own benefit and improvement. I also understand that if I/he/she fail to comply with these terms, shall be liable for suitable action as per Institute/JNTUH/AICTE/UGC rules and the law. I undertake that I/he/she will strictly follow the above terms.

Signature of Student with Date

Signature of Parent with Date
Name & Address with Phone Number