Bapatla Engineering College

(*Autonomous*)

BAPATLA

B.Tech

Electronics and instrumentation Engineering

Curriculum Effective from A.Y. 2020-21(R20 Regulations)

Department Of Electronics An Instrumentation Engineering

SCHEMES

Bapatla Engineering College:: Bapatla

(Autonomous underAcharyaNagarjuna University)

(Sponsored by Bapatla Education Society)

BAPATLA - 522102 Guntur District, A.P.,India

www.becbapatla.ac.in

B.Tech Regular Four Year Degree Programme
(For the batches admitted from the Academic Year 2020 - 21)

Preliminary Definitions and Nomenclature 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 (Acharya Nagarjuna University, Guntur).

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

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 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 and one even.

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

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.

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

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

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

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.

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

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

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

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

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 examinations 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 Bapatla Engineering College, Bapatla, unless indicated otherwise by the context.

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

Minor: Minors are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech degree.

Pre-requisite: A specific course or subject, the knowledge of which is required to complete before student register another course at the next grade level.

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, UG degree program: Bachelor of Technology (B.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.

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

Regulations: The regulations, common to all B.Tech programs offered by Institute, are designated as "BEC Regulations – R20" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 16 to 18 weeks of academic work equivalent to normally 90 working days. Odd semester commences usually in July and even semester in December of every year.

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

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 behavioural.

University: Means Acharya Nagarjuna University, Guntur.

Bapatla Engineering College::BAPATLA
(Autonomous)
Academic Regulations
Regulations for Four Year Bachelor of Technology (B.Tech) Degree programme for the Batches admitted from the academic year 2020-21

1. Award of B.Tech. Degree

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

i. Pursues a course of study for not less than four academic years and in not more than eight academic years. However, for the students availing Gap year facility, this period shall be extended by two years at the most and these two years would not be counted in the maximum time permitted for graduation. A lateral entry student pursues a course of study for not less than three academic years and in not more than six academic years

ii. Registers for 160 credits and secures all 160 credits. However, a lateral entry student registers for 121 credits and secures all the 121 credits from III semester to VIII semester of Regular B. Tech. program.

iii. The student will be eligible to get Under graduate degree with honours or additional minor engineering if he/she completes an additional 20 credits

iv. A student will be permitted to register either for Honours degree or additional minor engineering but not both.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. A lateral entry student should complete the course within six academic years from the year of their admission, failing which his/her admission in B.Tech course stands cancelled

3. Courses of study

The following courses of study are offered at present as specializations for the B. Tech. course

S.No.	Title of the UG Programme	Abbreviation
1.	Civil Engineering	CE
2.	Computer Science & Engineering	CS
3.	Electrical & Electronics Engineering	EE
4.	Electronics & Communication Engineering	EC
5.	Electronics & Instrumentation Engineering	EI
6.	Information Technology	IT
7.	Mechanical Engineering	ME
8.	Cyber Security	CB
9.	Data Science	DS

4. Credits:

i. *Credit:* A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture) or two hours of practical work/field work per week.
ii. *Academic Year:* Two consecutive (one odd + one even) semesters constitute one academic year.
iii. *Choice Based Credit System (CBCS):* The CBCS provides choice for students to select from the prescribed courses.
iv. Each course is assigned certain number of credits based on following

	Semester	
	Periods / Week	Credits
Theory	03	03
Tutorial	01	01
Practical	03	1.5
Internship (At the end of IV & VI evaluated in V & VII resp.)	-	1.5/3.0
Project work	-	12

5. Course Structure

Every course of the B.Tech program will be placed in one of the 8 categories with minimum credits as listed below.

S.No.	Category	Category Description	Abbreviated Category	Credits
1	Humanities and social science	Humanities and social science including Management courses	HS	10.5
2	Basic Sciences	Basic Science courses	BS	21
3	Engineering Science courses	Engineering Science Courses including workshop, drawing, basics of electrical / mechanical / computer etc.	ES	24
4	Professional core	Professional core Courses	PC	51
5	Open Electives	Open Elective Courses- from other technical/ emerging and job oriented	OE	12
6	Professional Courses	Professional Elective Courses relevant to chosen specialization/ branch	PE	18
7	Project Work	Project Work, Seminar, Internship in industry elsewhere	PW	16.5
8	Mandatory courses	Environmental Studies, Induction training, Universal human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge (Non-Credit)	MC	0
9	Skill Oriented Courses	Skill Oriented Courses relevant to domain, interdisciplinary, communication skill, industry	SC	10
		Total Credits		160

6. Weightage for course evaluation

6.1 Course Pattern

- The entire course of study is for four academic years. Semester pattern shall be followed in all years.
- A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.
- When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

6.2 Evaluation Process

The performance of the students in each semester shall be assessed course wise. All assessments will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded.

The performance of a student in each course is assessed with alternate assessment methods, term examinations on a continuous basis during the semester called Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE) conducted at the end of the semester. For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester, except where stated otherwise in the detailed Scheme of Instruction.

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition, Internships carried out after IV Semester & VI Semester shall be evaluated for 100 marks each and the Internship along with Project Work carried out in VIII Semester shall be evaluated for 150 marks. For theory subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination. For practical subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination. For project work, the distribution shall be 50 marks for Internal Evaluation and 100 marks for the End-Examination / Viva-Voce. The distribution of marks between Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to be conducted at the end of the semester will be as follows:

Nature of the Course	CIE	SEE
Theory subjects	30	70
Drawing	30	70
Practical	30	70
Term Paper	30	70
Project work	50	100

6.3 Continuous Internal Evaluation (CIE) in Theory and Drawing subjects:

6.3.1 In each Semester there shall be two Term examinations and some ***Alternate Assessment Tools (AAT)*** like Home Assignment, Class Test, Problem Solving, Group Discussion, Quiz, Seminar and Field Study in every theory course. The Alternate Assessment Tools with detailed modality of evaluation for each course shall be finalized by the teacher concerned before beginning of the course. It will be reviewed and approved by the Department Committee.

The Term Examination is conducted in the regular mode according to a schedule which will be common for a particular year of study. The maximum weightage for Term Examinations, AATs and the calculation of marks for CIE in a theory course is given in the following table.

Particulars	Term Exams (Max. 20 marks)	AAT (Max. 10 marks)
Better Performed exam	75% of marks obtained	Continuous assessment by teacher as per the predetermined course delivery & assessment plan. (Minimum two & maximum four assessments). AAT marks shall be considered based on average of all tests conducted.
Other exam	25% of marks obtained	

A minimum of 12 (40%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in that course and eligible to write the SEE of that course.

6.3.2 Semester End Examination (SEE) in Theory, Design and/or Drawing course:

a) For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester for 70 marks, except where stated otherwise in the detailed Scheme of Instruction. Question paper setting shall be set by the teacher or teachers together in a multi section courses and to be verified as described in policy document.

b) A minimum of 25 (Approx. 35%) marks are to be secured exclusively in the Semester End Examination (SEE) of theory, design and/or drawing course. However a minimum 40 marks are to be secured in CIE & SEE together for the award of the grade and securing the credits in that course.

6.3.3 Continuous Internal Evaluation (CIE) in laboratory courses:

The evaluation for Laboratory course is based on CIE and SEE. The CIE for 30 marks comprises of 15 marks for day to day laboratory work, 5 marks for record submission and 10 marks for a laboratory examination at the end of the semester. In any semester, a minimum of 90 percent of prescribed number of experiments / exercises specified in the syllabi for laboratory course shall be taken up by the students. They shall complete these experiments / exercises in all respects and get the record certified by the internal lab teacher concerned and the Head of the Department concerned to be eligible to appear for the Final Examination in that laboratory course.

A minimum of 12 (40%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in that lab course and eligible to write the SEE of that lab course.

6.3.4 Semester End Examination (SEE) in laboratory courses:

a) For each laboratory course, the Semester End Examination (SEE) shall be conducted by one internal and one external examiner appointed by the Principal and the duration of the exam shall be for three hours. The SEE is for 70 marks which include 15 marks for write up, 35 marks for lab experiment/exercise, 15 marks for Viva-voce and 5 marks for general impression.

b) A minimum of 25 (Approx. 35%) marks are to be secured exclusively in the Semester End Examination (SEE) of laboratory course. However a minimum 40 marks are to be secured in CIE & SEE together for the award of the grade and securing the credits in that course.

6.3.5 Evaluation of Summer Internship and Industrial/Research Internship:

a) **Summer Internship at the end of IV semester and Industrial/Research Internship** at the end of VI carried out in industry are to be evaluated in V & VII semesters respectively based report and certificate provided by the industry. The report and certificate will be evaluated by the department committee for 100 marks. 50 marks shall be for the report and certificate and 50 marks based on seminars/presentation to the department committee by the student.

b) A minimum of 40 (40%) marks are to be secured exclusively to be declared as passed and securing the credits in the internships.

6.3.6 Evaluation of the Project

a) In case of the Project work, the evaluation shall be based on CIE and SEE. The CIE for 50 marks consists of a minimum of two Seminars / presentations for 20 marks and the Project Report submitted at the end of the semester which is evaluated for 30 marks.

b) A minimum of 20 (40%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in the Project Work and eligible to write the SEE in the Project Work.

c) SEE shall be evaluated in the form of a Viva- voce and the demonstration of the thesis work for 100 marks. Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner to be appointed by the Principal.

d) A minimum of 40 (40%) marks shall be obtained in SEE exclusively in order to be declared as passed in the Project and for the award of the grade.

NOTE : A student who is absent for any Test / Exam / Seminar / Presentation as a part of Continuous Internal Evaluation (CIE), for any reason whatsoever, shall be deemed to have scored zero marks in the respective component and no provision for make-up shall be provided.

6.4 There shall be mandatory courses with zero credits. There shall be no external examination. However, attendance in the mandatory course shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates every six months/semester at a mutually convenient date of college/student satisfying the conditions mentioned in item 1 & 2 of the regulations.

6.5 For the subject having design and/or drawing, such as Engineering Drawing, the distribution shall be 30 marks for internal evaluation and 70 marks for end examination.

Day-to-day work shall be evaluated for 10 marks by the concerned subject faculty based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 30 marks with consideration of 75% weightage to the better mid exam and 25% to the other for the finalization of Internal marks. The subjective paper shall contain 5 questions of equal weightage of 10 marks and the marks obtained for 3 questions shall be condensed to 20 marks, any fraction (0.5 & above) shall be rounded off to the next higher mark. The sum of day-to-day evaluation and the internal test marks will be the final sessional marks for the subject.

In the end examination pattern for Engineering Drawing there shall be 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing is mentioned along with the syllabus.

6.6 Course Repetition (Repeater course)

The students not qualified to write SEE in a course may register for the repeater courses through course repetition and summer semester. The students have to apply to the Principal through the respective HOD by paying prescribed fees.

Course repetition: A student can take up a maximum of two theory courses in a semester immediately after the semester end examinations of that particular semester in accordance with the guidelines recommended by the Academic Council. The students who are not taking regular semester courses may additionally register for one more theory course.

Summer semester: Further the students can register maximum three (theory + lab courses together) courses in the summer semester. Summer semester courses shall be of both even & odd semesters. Summer semester shall be conducted immediately after completion of even semester end examinations.

The HODs concerned have to allot a teacher related to that course to conduct class work. The minimum number of periods to be conducted should not be less than 75% of the total prescribed periods for that course. The classes will be conducted in the vacation period or in the weekends or in the afternoons as decided by the HOD concerned. Teacher has to evaluate the student for his performance in CIE as per the autonomous norms and the qualified students should appear for a semester end examination. The pass criteria in both CIE & SEE should be as per autonomous norms.

The documents for monitoring the candidates registered for course repetition are available with the Heads of the Departments and Exam Section.

6.8 There shall be five Professional Elective Courses from V Semester to VII and for each elective there shall be choices such that the student shall choose a course from the list of choice courses offered by the department for that particular elective.

6.9 There shall be four Open Electives/ Job Oriented Courses common to all disciplines from V Semester to VII, where in the students shall choose the electives offered by various departments including his/her own department in such a manner that he/she has not studied the same course in any form during the Programme.

The students shall be permitted to pursue up to a maximum of two elective courses under MOOCs (Massive Open Online Courses) offered by NPTEL notified by the Department during the semester. Each of the Courses must be of minimum 12 weeks in duration. The student has to acquire a certificate for the concerned course from the NPTEL during the semester only in order to earn 3 Credits.

6.10 There shall be a mandatory **induction program** for three weeks before the commencement of first semester.

6.11 **Minor in a discipline** (Minor degree/programme) concept is introduced in the curriculum for all conventional B. Tech programmes in which it offers a major. The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. programme.

a. Students who have a CGPA of 8.0 or above (up to II semester) and without any backlog subjects will be permitted to register for Minor discipline programme. A SGPA and CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Minor discipline registration active else Minor discipline registration will be cancelled.
b. Students aspiring for a Minor must register at the beginning of IV Semester and must opt for a Minor in a discipline other than the discipline he/she has registered in.
c. In order to earn a Minor in a discipline a student has to earn 20 extra credits by studying four theory subjects each for 4 credits and two MOOCs offered by NPTEL (notified by the Department corresponding to the Minor Programme) each for 2 credits and with a minimum duration of 8 weeks.
d. The student has to acquire a certificate for the concerned course from the NPTEL in order to earn 2 Credits.
e. Students are not allowed to register and pursue more than two courses in any semester. Students may complete the Minor before VIII semester.
f. Each department shall enlist a set of subjects from its curriculum which are core for the discipline without any prerequisites. The Evaluation pattern of theory subjects will be similar to the regular programme evaluation.
g. Students are not allowed to pursue minor discipline programme subjects under Self-study. Classes for the courses of the minor shall be conducted beyond the regular hours.

Student may enlist their choices of Minor discipline programmes in order of preference, to which they wish to join. It will not be permissible to alter the choices

after the application has been submitted. However, students are allowed to opt for only one Minor discipline programme in the order of preference given by the student.

h. Minimum strength for offering Minor in a discipline is considered One-Fifth (i.e., 20% of the class) of the class size and Maximum size is Four-Fifth of Class size (i.e., 80% of the class).

i. Completion of a Minor discipline programme requires no addition of time to the regular Four year Bachelors' programme. That is, Minor discipline programme should be completed by the end of final year B. Tech. program along with the major discipline.

j. The Concerned Head of the department will arrange separate course/class work and time table of the various Minor programmes. Attendance regulations for these Minor discipline programmes will be as per regular courses.

k. A Student registered for Minor in a discipline shall pass in all subjects that constitute the requirement for the Minor discipline programme. No class/division (i.e., second class, first class and distinction etc.) shall be awarded for Minor discipline programme.

l. In case a student drops or fails to meet the CGPA requirement for Degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for Degree with Minor and the student will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioned the additional courses completed by them.

m. This Minor in a discipline will be mentioned in the degree certificate as Bachelor of Technology in XXX with Minor in YYY. For example, Bachelor of Technology in **Computer Science & Engineering** with Minor in **Electronics & Communication Engineering**. The fact will also be reflected in the transcripts, along with the list of courses for Minor programme with CGPA mentioned separately.

6.12 Honors degree in a discipline:

a. This concept is introduced in the curriculum for all conventional B. Tech. programmes. The main objective of Honors degree in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. programme.

b. A student shall be permitted to register for Honors program at the beginning of IV Semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of second semester without any backlogs. SGPA and CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog subjects in order to keep the Honors discipline registration active else Honors discipline registration will stand cancelled.

c. In order to earn the Honors degree in his/her discipline, a student has to earn 20 extra credits by studying four advanced specified courses for 16 credits and acquiring the remaining 4 credits through two MOOCs offered by NPTEL which are domain specific in the branch of Engineering concerned, each for 2 credits and with a minimum duration of 8 weeks.

d. The student has to acquire a certificate for the concerned course from the NPTEL in order to earn 3 Credits.

e. The Evaluation pattern of theory subjects shall be similar to the regular programme evaluation.

f. If a student drops or is terminated from the Honors program, the additional credits earned till that time cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following:

   i. All the courses done under the dropped Honors will be shown in the transcript. (or)

   ii. None of the courses done under the dropped Honors will be shown in the transcript.

g. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and the student will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

h. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

6.13 National Service Scheme (NSS)/Yoga is compulsory for all the Undergraduate students. The student participation shall be for a minimum period of 45 hours during the first year. Grades will be awarded as Very good, Good, Satisfactory in the mark sheet on the basis of participation, attendance, performance and behaviour. If a student gets Unsatisfactory grade, he/she has to repeat the above activity in the subsequent years along with the next year students.

6.14 Students shall undergo two summer internships each for a minimum of six weeks duration at the end of second and third years of the programme for 1.5 credits & 3 credits respectively. The organization in which the student wishes to carry out Internship need to be approved by Internal Department Committee comprising Head of Department and two senior faculty. The student shall submit a detailed technical report along with internship certificate from the Internship organization in order to obtain the prescribed credits. The student shall submit the Internship Project Report along with Certificate of Internship. The evaluation of the first and second summer internships shall be conducted at the end of the V Semester & VII semester respectively.

There shall be internal evaluation for 100 marks and there shall not be external evaluation. The Internal Evaluation shall be made by the departmental committee (Head of the Department and two senior faculty of the department) on the basis of the project report submitted by the student.

Completion of the internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship in the subsequent summer provided that the student doesn't pursue two summer internships in the same summer.

Community Service Project focussing on specific local issues, shall be an alternative to the six weeks of summer Internship, whenever there is any emergency and when students cannot pursue their summer internships. The Community Service Project shall be for 6 weeks in duration which includes preliminary survey for 1 week, community awareness

programs for one week, community immersion program in consonance with Government agencies for 3 weeks and a community exit report (a detailed report) for one week. The community service project shall be evaluated for 100 marks by the internal departmental committee comprising Head of the Department and two senior faculty of the department. **However, the first priority shall be given to the internship.**

6.15 There shall also be a mandatory full internship in the final semester (VIII Semester) of the Programme along with the project work. The organization in which the student wishes to carry out the Internship need to be approved by Internal Department Committee comprising Head of the Department and two senior faculty. The faculty of the respective department monitors the student internship program along with project work. At the end of the semester, the candidate shall submit a certificate of internship and a project report. The project report and presentation shall be internally evaluated for 50 marks by the departmental committee consisting of Head of the Department, Project supervisor and a senior faculty member. The Viva-Voce shall be conducted for 100 marks by a committee consisting of HOD, Project Supervisor and an External Examiner.

Completion of internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship along with project work for next six months.

6.16 There shall be five skill-oriented courses offered during III semester to VII semester. Out of the five skill courses, two shall be skill-oriented programs related to the domain and these two shall be completed in second year. Of the remaining three skill courses, one shall necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

The student can choose between a skill advanced course being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies which are duly approved by the Internal Department Committee. The credits assigned to the skill advanced course shall be awarded to the student upon producing the Course Completion Certificate from the agencies/professional bodies.

The Internal Department Committee comprising Head of Department and two senior faculty shall evaluate the grades/ marks awarded for a course by external agencies and convert to the equivalent marks/grades.

7. Attendance Requirements:

- A student shall be eligible to appear for semester end examinations (SEE), if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.
- Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

8. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.7

8.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project, if he/she secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together. In case of mandatory courses, internships, project work viva – voce, he/she should secure 40% of the total marks.

8.2 A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing 40% of the credits in the subjects that have been studied up to III Semester from the following examinations.

One regular and two supplementary examinations of I Semester.
One regular and one supplementary examination of II Semester.
One regular examination of III semester.

8.3 A student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of securing 40% of the credits in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

One regular and four supplementary examinations of I Semester.
One regular and three supplementary examinations of II Semester.
One regular and two supplementary examinations of III Semester.
One regular and one supplementary examinations of IV Semester.
One regular examination of V Semester.

And if a student is detained for want of credits for particular academic year by sections 8.2 and 8.3 above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V Semester or VII Semester as the case may be.

8.4 A student shall register and put up minimum attendance in all 160 credits and earn all the 160 credits. Marks obtained in all 160 credits shall be considered for the calculation of aggregate percentage of marks obtained. In case of lateral entry students, the number of credits is 121.

8.5 Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

9. Course Pattern:

(i) A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.

When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

(ii) **With–holding of Results**:

If any case of indiscipline or malpractice is pending against candidate, the result of the candidate shall be with held and he/she will not be allowed/promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

(iii) **Grading**

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

Table – Conversion into Grades and Grade Points assigned

Range in which the marks in the subject fall	Grade	Grade Points Assigned
≥ 90	S (Superior)	10
80-89	A (Excellent)	9
70-79	B (Very Good)	8
60-69	C (Good)	7
50-59	D (Average)	6
40-49	E (Below Average)	4
< 40	F (Fail)	0
Absent	Ab (Absent)	0

A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered. Same is the case with a student who obtains 'Ab' in end examination.

For **mandatory** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

10. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

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

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i \times GP_i}{\sum_{i=1}^{n} C_i}$$

where, C_i is the number of credits of the i^{th} subject and GP_i is the grade point scored by the student in the i^{th} course.

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

$$\text{CGPA} = \frac{\sum_{j=1}^{m} SGPA_j \times TC_j}{\sum_{j=1}^{m} TC_j}$$

where "$SGPA_j$" is the SGPA of the j^{th} semester and TC_j is the total number of credits in that semester.

(iii) Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

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

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

(vi) *Letter Grade:* It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D, E and F.

11. Award of Class:

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

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 4.0 < 5.5

12. Gap Year:

Gap year concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. An evaluation committee shall be constituted by the College to evaluate the proposal submitted by the student and the committee shall decide whether or not to permit the student(s) to avail the Gap Year.

13. Transitory Regulations:

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, and they will be in the academic regulations into which they get readmitted.

Candidates who were permitted with Gap Year shall be eligible for rejoining into the succeeding year of their B. Tech from the date of commencement of class work, and they will be in the academic regulations into which the candidate is presently re-joining.

14. Minimum Instruction Days:

The minimum instruction days including exams for each semester shall be 90 days.

15. Medium of Instruction

The Medium of Instruction is **English** for all courses, laboratories, internal and external examinations and project reports.

16. Rules of Discipline

(i) Use of mobile phones with camera, in the campus is strictly prohibited.

(ii) Students shall behave and conduct themselves in a dignified and courteous manner in the campus/Hostels.

(iii) Students shall not bring outsiders to the institution or hostels.

(iv) Students shall not steal, deface, damage or cause any loss to the institution property.

(v) Students shall not collect money either by request or coercion from others within the campus or hostels.

(vi) Students shall not resort to plagiarism of any nature/extent. Use of material, ideas, figures, code or data without appropriate acknowledgement or permission of the original source shall be treated as cases of plagiarism. Submission of material, verbatim or paraphrased, that is authored by another person or published earlier by oneself shall also be considered as cases of plagiarism.

(vii) Use of vehicles by the students inside the campus is prohibited.

(viii) Any conduct which leads to lowering of the esteem of the organization is prohibited.

(ix) Any material to be uploaded to social media sites need to be approved by Head of the Department concerned/Dean/Principal.

(x) Any student exhibiting prohibited behaviour shall be suspended from the institute. The period of suspension and punishment shall be clearly communicated to the student. The student shall lose the attendance for the suspended period

(xi) Dress Code

Boys : All the boy students should wear formal dresses. Wearing T-shirts and other informal dresses in the campus is strictly prohibited.

Girls : All the girls students shall wear saree/chudidhar with dupatta

17. Punishments for Malpractice cases – Guidelines

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

S.No.	Nature of Malpractice/Improper conduct	Punishment
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm	Expulsion from the examination hall and cancellation of the performance in that course only.

	computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the course of the examination).	
2	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
3	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
4	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any other student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the students involved. In case of an outsider, he will be handed over to the police and a case shall be registered against him.
5	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
6	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
7	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all

		examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeit of seat.
8	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case shall be registered against them.
9	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from classwork and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The student is also debarred and

		forfeits the seat.
11	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in S.No7 to S.No 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them.
12	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the police and a case shall be registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination including practicals and project work of that semester/year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
13	If any malpractice is detected which is not covered in the above S.No 1 to S.No 12 items, it shall be reported to the college academic council for further action and award suitable punishment.	
14	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable	

	punishment.

Bapatla Engineering College: Bapatla

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

First Year B. Tech (SEMESTER – I)

Code No.	Subject	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			NO. OF CREDITS	CATOGORY
		L	T	P	Total	CIE	SEE	Total Marks		
20EI101/ MA01	Linear Algebra and Ordinary Differential Equations	3	0	0	3	30	70	100	3	BS
20EI102/ PH01	Physics -1 waves and Modern Physics	3	0	0	3	30	70	100	3	BS
20EI103/ CY01	Engineering Chemistry	3	0	0	3	30	70	100	3	BS
20EI104/ EL01	Communicative English	3	0	0	3	30	70	100	3	HS
20 EIL101/ MEL01	Engineering Graphics	1	0	4	5	30	70	100	3	ES
20 EIL102/ PHL01	Physics Lab	0	0	3	3	30	70	100	1.5	BS
20EIL103/ ELL01	English communications and skills laboratory	0	0	3	3	30	70	100	1.5	HS
20EIL104/ MEL02	Workshop	0	0	3	3	30	70	100	1.5	ES
	TOTAL	13	0	13	26	240	560	800	19.5	

BS – Basic Sciences	CIE – Continuous Internal Evaluation	L - Lecture Hours
ES – Engineering Sciences	SEE – Semester End Examination	
HS – humanities & Social sciences		T - Tutorial
MC – Mandatory Courses		P - Practical

CATEGORY	CREDITS
BS – Basic Sciences	**10.5**
HS – Humanities	**4.5**
ES – Engineering Sciences	**4.5**
Total	**19.5**

Bapatla Engineering College: Bapatla

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

First Year B. Tech (SEMESTER – II)

Code No.	Subject	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			NO. OF CREDITS	CATOGORY
		L	T	P	Total	CIE	SEE	Total Marks		
20EI201/ MA02	Numerical Methods and Advanced Calculus	3	0	0	3	30	70	100	3	BS
20EI202/ PH03	Semiconductor Physics and Nano Materials	3	0	0	3	30	70	100	3	BS
20EI203	Instrumentation & Nanotechnology	3	0	0	3	30	70	100	3	ES
20EI204/ CS01	Problem Solving using programming	3	0	0	3	30	70	100	3	ES
20EI205/ EE02	Basic Electrical Engineering	3	0	0	3	30	70	100	3	ES
20EI206/ MC01	Environmental Studies	3	0	0	3	30	70	100	0	MC
20EIL201/ CYL01	Chemistry Lab	0	0	3	3	30	70	100	1.5	BS
20EIL202/ CSL01	Problem Solving using Programming Lab	0	0	3	3	30	70	100	1.5	ES
20EIL203/ EEL02	Basic Electrical Engineering Lab	0	0	3	3	30	70	100	1.5	ES
	TOTAL	23	0	9	27	270	630	900	19.5	

BS – BASIC SCIENCES	CIE – CONTINUOUS INTERNAL EVALUATION	L - LECTURE HOURS
HS – HUMANITIES	SEE – SEMESTER END EXAMINATION	T – TUTORIAL
ES – ENGINEERING SCIENCES		P – PRACTICAL

CATEGORY	CREDITS
BS – BASIC SCIENCES	10.5
HS – HUMANITIES	4.5
ES – ENGINEERING SCIENCES	4.5
TOTAL	19.5

Bapatla Engineering College: Bapatla

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

Second Year B. Tech (SEMESTER – III)

Code No.	Subject	Scheme of Instruction Hours per week L	T	P	Total	Scheme of Examination (Maximum marks) CIE	SEE	Total Marks	NO. OF CREDITS	CATOGORY
20EI301/ MA03	Probability and Statistics	3	0	0	3	30	70	100	3	BS
20EI302	Electronic Devices and Circuits	3	0	0	3	30	70	100	3	PC
20EI303	Digital Electronics	3	0	0	3	30	70	100	3	PC
20EI304	Network Theory	3	0	0	3	30	70	100	3	PC
20EI305	Transducers	3	0	0	3	30	70	100	3	PC
20EIL301/ SO01	Skill Oriented Course * Data Structures using 'C'	1	0	2	3	30	70	100	2	SOC
20EIL302	Electronic Devices Lab	0	0	3	3	30	70	100	1.5	PC
20EIL303	Digital Electronics Lab	0	0	3	3	30	70	100	1.5	PC
20EIL 304	Transducers Lab	0	0	3	3	30	70	100	1.5	PC
20EI306/ MC01	Mandatory course / *Constitution of India	2	0	0	3	30	00	00	0	MC
	TOTAL	19	0	11	30	300	700	900	21.5	0

BS – Basic Sciences	CIE – Continuous Internal Evaluation	L - lecture hours
PC –Professional Core Courses	SEE – Semester End Examination	T - Tutorial
SC – Skill Oriented Courses		P - practical
MC – Mandatory Courses		

CATEGORY	CREDITS
BS – Basic Sciences	3
PC –Professional Core Courses	16.5
SOC – Skill Oriented Courses	2
MC – Mandatory Courses	0
TOTAL	21.5

Bapatla Engineering College: Bapatla

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

Second Year B. Tech (SEMESTER – IV)

Code No.	Subject	Scheme of Instruction (Hours per week) L	T	P	Total	Scheme of Examination (Maximum marks) CIE	SEE	Total Marks	NO. OF CREDITS	CATOGORY
20EI401/ MA04	Complex Analysis and Special functions	3	0	0	3	30	70	100	3	ES
20EI402	Signals and Systems	3	0	0	3	30	70	100	3	PC
20EI403	Electrical & Electronic Measurements	3	0	0	3	30	70	100	3	PC
20EI404	Analog Electronic Circuits	3	0	0	3	30	70	100	3	PC
20EI405/ EL02	Technical English	3	0	0	3	30	70	100	3	HS
20EIL401	Skill oriented course*	1	0	2	3	30	70	100	2	SOC
20EIL402	Analog Electronic Circuits Lab	0	0	3	3	30	70	100	1.5	PC
20EIL403	Measurements Lab	0	0	3	3	30	70	100	1.5	PC
20EIL404	Signals and systems lab	0	0	3	3	30	70	100	1.5	PC
	TOTAL	16	0	11	27	270	630	900	19.5	
Internship 2 months (Mandatory) during summer vacation										
20EIH11-14 –Honours 20EIM11-14 -Minor course		3	1	0	4	30	70	100	4	HC MC

BS – Basic Sciences	CIE – Continuous Internal Evaluation	L - Lecture Hours
ES – Engineering Sciences	SEE – Semester End Examination	T – Tutorial
PC –Professional Core Courses		P – Practical
SOC – Skill Oriented Courses		

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CATEGORY		CREDITS
1	ES – Engineering Sciences	3
2	PC –Professional Core Courses	13.5
3	SC – Skill Oriented Courses	2
4	HS- Humanities	3
	Total	**21.5**
6	Honours /minor	4
	Total	**25.5**

Bapatla Engineering College: Bapatla

(Autonomous)

BAPATLA ENGINEERING COLLEGE: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

Third Year B. Tech (SEMESTER – V)

Code No.	Subject	Scheme of Instruction (HOURS per week)				Scheme of Examination (Maximum marks)			NO. OF CREDITS	CATEGORY
		L	T	P	Total	CIE	SEE	Total Marks		
20EI501	Control Systems	2	1	0	3	30	70	100	3	PC
20EI502	Linear Integrated Circuits & Applications.	3	0	0	3	30	70	100	3	PC
20EI503	Microcontrollers	3	0	0	3	30	70	100	3	PC
20EI504/ JO 01-09	Job oriented courses	2	0	2	4	30	70	100	3	JO
20EID 11- 13	Professional Elective - 1	3	0	0	3	30	70	100	3	PE
20EIL501/ SA01	Skill Advanced Course (PLC)	1	0	2	3	30	70	100	2	SAC
20EIL502	Control Systems Lab	0	0	3	3	30	70	100	1.5	PC
20EIL503	Microcontrollers Lab	0	0	3	3	30	70	100	1.5	PC
20EI506/ MC02	Mandatory course : Professional Ethics and Human Values	2	0	0	2	30	--	30	0	MC
Summer internship for 2 months (mandatory) after second year to be evaluated during the Vth Semester									1.5	IN
	TOTAL	16	1	10	27	270	560	830	21.5	
20EIH21-24 – HONORS 20EIM21-24 - MINOR COURSES		4	0	0	4	30	70	100	4	

Bapatla Engineering College: Bapatla

(Autonomous)

BS – Basic Sciences	CIE – Continuous Internal Evaluation	L - Lecture Hours
PC –Professional Core Courses	SEE – Semester End Examination	T - Tutorial
ES – Engineering Sciences		P - Practical
SC – Skill Oriented Courses		
MC – Mandatory Courses		

COURSES & CREDIT DISTRIBUTION :

S.No.	Type of Course	No. of Courses		Credits		Total
		Theory	Lab	Theory	Lab	
1	PC –Professional Core Courses	3	2	9	3	12
2	JO -Job oriented courses	1	-	3	-	3
3	PE - Professional Elective Course	1	-	3	-	3
4	SAC – Skill Advanced Courses		1		2	2
5	MC – Mandatory Courses	1	-	-	-	-
6	Internship					1.5
	Total	7	3			21.5
7.	Honours /minor	1		4	-	4
	Total	8	3	19	5	25.5

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

Third Year B. Tech (SEMESTER – VI)

Code No.	Subject	Scheme of Instruction (HOURS per week)				Scheme of Examination (Maximum marks)			No. of Credits	CATOGORY
		L	T	P	Total	CIE	SEE	Total Marks		
20EI601	Process Control	3	0	0	3	30	70	100	3	PC
20EI602	Digital Signal Processing	3	0	0	3	30	70	100	3	PC
20EI603	BIO Medical Instrumentation	3	0	0	3	30	70	100	3	PC
20EID 21-23	Professional Elective -2	3	0	0	3	30	70	100	3	PE
20EI605/ JO 01-09	Job Oriented Elective	2	0	2	3	30	70	100	3	JO
20EIL601 /EL04,	Soft skills Course /LAB	1	0	2	3	30	70	100	2	SAC
20EIL601	Process Control Lab	0	0	3	3	30	70	100	1.5	PC
20EIL602	Digital Signal Processing Lab	0	0	3	3	30	70	100	1.5	PC
20EIL603	Biomedical Instrumentation Lab	0	0	3	3	30	70	100	1.5	JO
20EIM	Mandatory Course as per AICTE	2	0	0	0	30		30	0	MC
									1.5	IN
	TOTAL	17	1	8	24	270	560	830	21.5	
Industrial / Research Internship (Mandatory) 2 months during summer vacation										
20EIH31-34 HONORS/MINOR COURSES		4	0	0					4	HC MC

BS – Basic Sciences	CIE – Continuous Internal Evaluation	L - Lecture Hours
PC –Professional Core Courses	SEE – Semester End Examination	T - Tutorial
ES – Engineering Sciences		P - Practical
SC – Skill Oriented Courses		
MC – Mandatory Courses		

Bapatla Engineering College: Bapatla

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COURSES & CREDIT DISTRIBUTION :

S.No.	Type of Course	No. of Courses		Credits		Total
		Theory	Lab	Theory	Lab	
1	PC –Professional Core Courses	3	3	9	4.5	13.5
2	JO -Job oriented courses	1	-	3	-	3
3	PE - Professional Elective Course	1	-	3	-	3
4	SAC – Skill Advanced Courses		1		2	2
5	MC – Mandatory Courses	1	-	-	-	-
	Total	7	3			**21.5**
7.	Honours /minor	1		4	-	4
	Total	8	3	19	5	**25.5**

Bapatla Engineering College: Bapatla

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

Fourth Year B. Tech (SEMESTER – VII)

Code No.	Subject	Scheme of Instruction (hours per week)				Scheme of Examination (Maximum marks)			NO. OF CREDITS	COURSE TYPE
		L	T	P	Total	CIE	SEE	Total Marks		
20EID 31-33	Professional Elective Course	3	0	0	3	30	70	100	3	PE
20EID 41-43	Professional Elective Course	3	0	0	3	30	70	100	3	PE
20EID 51-53	Professional Elective Course	3	0	0	3	30	70	100	3	PE
20EIJ0 1-09	Open Elective/ Job oriented Course	2	0	2	4	30	70	100	3	JO
20EIJ0 1-09	Open Elective/ Job oriented Course.	2	0	2	4	30	70	100	3	JO
20EIH 01-09	*Humanities and Social Science Elective*	3	0	0	3	30	70	100	3	HS
20EISA 01-09	Skill Advanced/ soft skill Course	1	0	2	3	30	70	100	2	SAC
Industrial research/ INTERNSHIP 2 months (Mandatory) after third year (to be evaluated during the VII semester)									3	
	TOTAL	19	0	2	35	210	490	700	23	
20EIH41-44-Honours/ Minor course		3	1			30	70	100	4	HC

Bapatla Engineering College: Bapatla

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BS – Basic Sciences	CIE – Continuous Internal Evaluation	L - Lecture Hours
PC –Professional Core Courses	SEE – Semester End Examination	T - Tutorial
ES – Engineering Sciences		P - Practical
SC – Skill Oriented Courses		
MC – Mandatory Courses		

S.No.	CATEGORY	Credits
1	PC –Professional Core Courses	
2	JO -Job oriented courses	6
3	PE - Professional Elective Course	9
4	MC – Mandatory Courses	
5	Humanities and Social Science	3
6	SC – Skill Advanced Courses	2
7	Internship	3
	Total	**23**
8	Honours /minor	4
	Total	**27**

Bapatla Engineering College: Bapatla

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

Second Year B. Tech (SEMESTER – VIII)

Code No.	Subject	Scheme of Instruction (HOURS per week) L	T	P	Total	Scheme of Examination (Maximum marks) CIE	SEE	Total Marks	No. of Credits	CATOGORY
20EIPR801	Major Project Work			12	12	50	100	150	12	PRJ
INTERNSHIP (6 MONTHS)										
								TOTAL CREDITS	12	

Bapatla Engineering College: Bapatla

(Autonomous)

PROFESSIONAL ELECTIVES

ELECTIVE -1	ELECTIVE - 2
1 Analog and Digital Communications	1. Industrial Instrumentation
2 Digital control systems	2. Power Plant Instrumentation
3 Operating Systems	3. Robotics and Automation

ELECTIVE - 3	ELECTIVE - 4
1 Analytical Instrumentation	1. Optoelectronics and laser instrumentation
2 Adaptive control systems	2. Sensor Networks.
3 Artificial intelligence	3. Instrumentation for Aerospace and Navigation

ELECTIVE - 5

1 Data Communications

2 Digital Image Processing(7)

3 Telemetry and SCADA

JOB ORIENTED ELECTIVES

1 Embedded Systems

2 Programmable logic Controllers

3 Object oriented programming with JAVA.

4 Virtual instrumentation

5 Python Programming

6 Internet of Things

7 Automation Technologies

8 Data structures and analysis of algorithms.

9 VLSI design

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LIST OF SUBJECTS HONOURS SPECIALIZATIONS

Pool- 1

1 Intelligent sensors and instrumentation
2 Advanced computer architectures
3 Wavelet theory and applications

Pool-2

1 Real-time operating systems
2 Advanced embedded systems
3 Advanced digital signal processing

Pool-3

1 Distributed control systems
2 Speech signal processing
3 Bio signal processing

Pool-4

1 Instrumentation in petro chemical industries
2 Wireless Sensor Networks.
3 Optimization in Engineering Design

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MINOR PROGRAM

General Minor Courses

Note:-

--> The student can opt any 4 subjects from the given list of the departments .

-->compulsory MOOC/ NPTEL courses for 4 credits (2 courses , 2 credits each) must be completed.

--> A total of 20 credits must be completed in order to get the minor Degree in the other branch specialization .

pre requisites :

-->as mentioned in the APSCHE guidelines.

LIST OF SUBJECTS For Minor SPECIALIZATIONS

Code No.	Subject	Scheme of Instruction (HOURS per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
20EIM01	Transducers	3	1	0	4	30	70	100	4
20EIM02	Electrical and electronic measurements	3	1	0	4	30	70	100	4
20EIM03	Industrial instrumentation	3	1	0	4	30	70	100	4
20EIM04	Programmable logic controllers	3	1	0	4	30	70	100	4
20EIM05	Analytical instrumentation	3	1	0	4	30	70	100	4
20EIM06	Bio medical instrumentation	3	1	0	4	30	70	100	4

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CREDIT DISTRRIBUTION FOR SEMESTER WISE

S.No.	YEAR	SEMESTER	NUMBER OF CREDITS
1	FIRST	1	19.5
		2	19.5
2	SECOND	3	21.5
		4	21.5
3	THIRD	5	21.5
		6	21.5
4	FOURTH	7	23.0
		8	12.0
		TOTAL	160

FOR HONOURS & MINOR COURSE

S.No.	YEAR	SEMESTER	NUMBER OF CREDITS
1	FIRST	1	19.5
		2	19.5
2	SECOND	3	21.5
		4	25.5
3	THIRD	5	25.5
		6	25.5
4	FOURTH	7	27.0
		8	12.0
	ONLINE COURSES		4
		TOTAL	180

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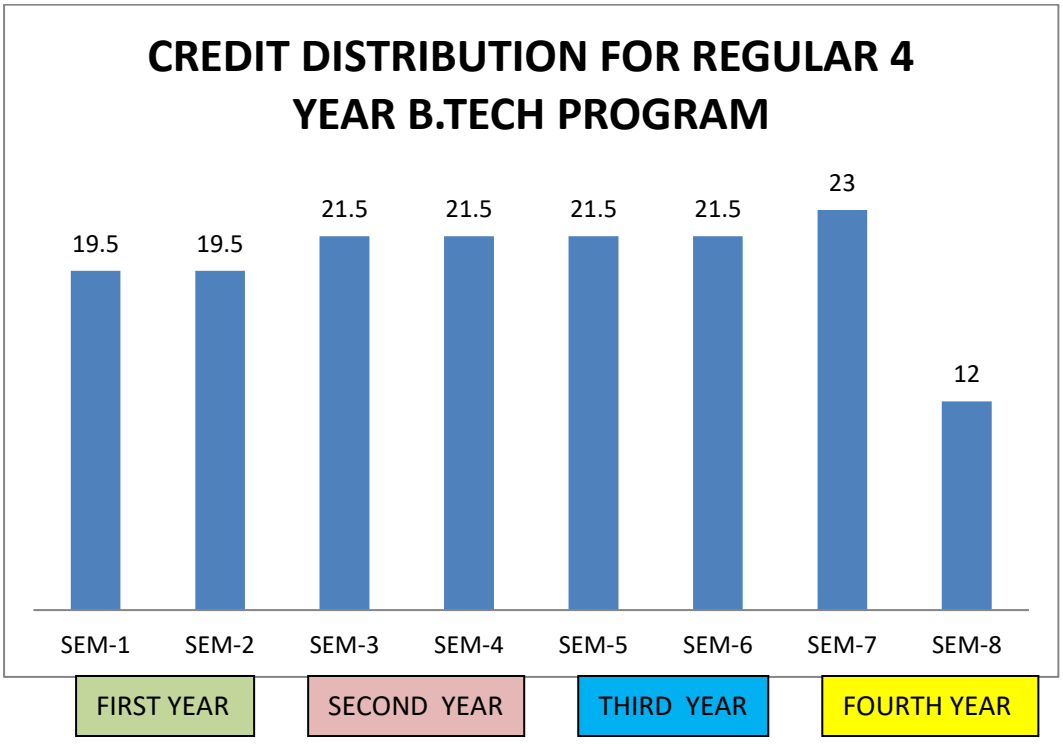
CREDIT DISTRRIBUTION SEMESTER WISE

FOR REGULAR 4 YEAR BTECH			
.No.	YEAR	SEMESTER	NUMBER OF CREDITS
1	FIRST	1	19.5
		2	19.5
2	SECOND	3	21.5
		4	21.5
3	THIRD	5	21.5
		6	21.5
4	FOURTH	7	23.0
		8	12.0
		TOTAL	160



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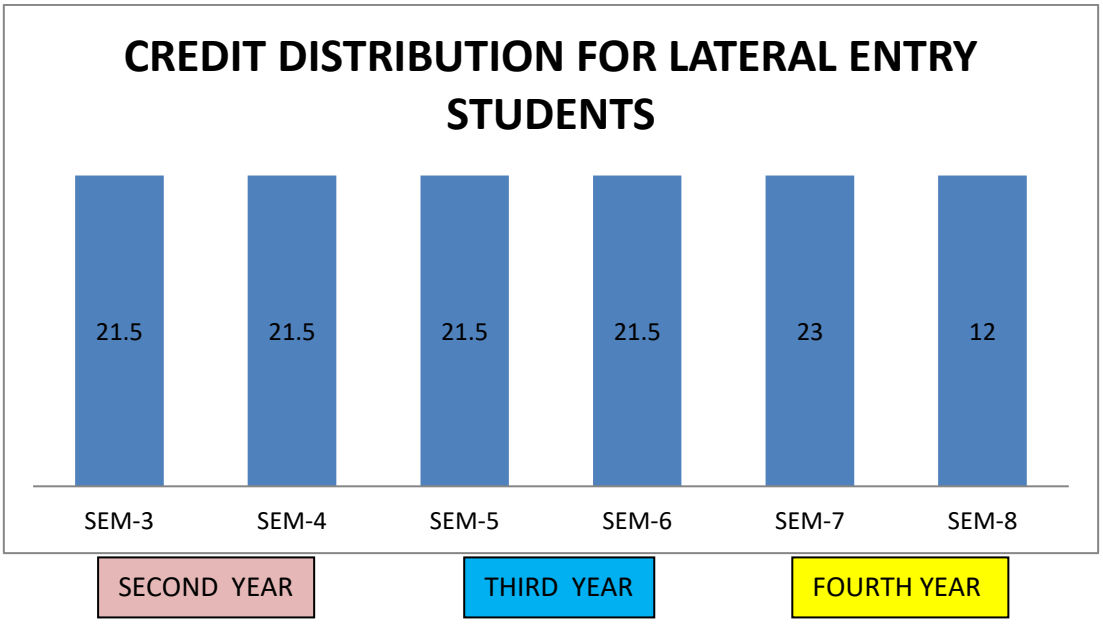
FOR LATERAL ENTRY STUDENT

S.No.	YEAR	SEMESTER	NUMBER OF CREDITS
2	SECOND	3	21.5
		4	21.5
3	THIRD	5	21.5
		6	21.5
4	FOURTH	7	23.0
		8	12.0
		TOTAL	121



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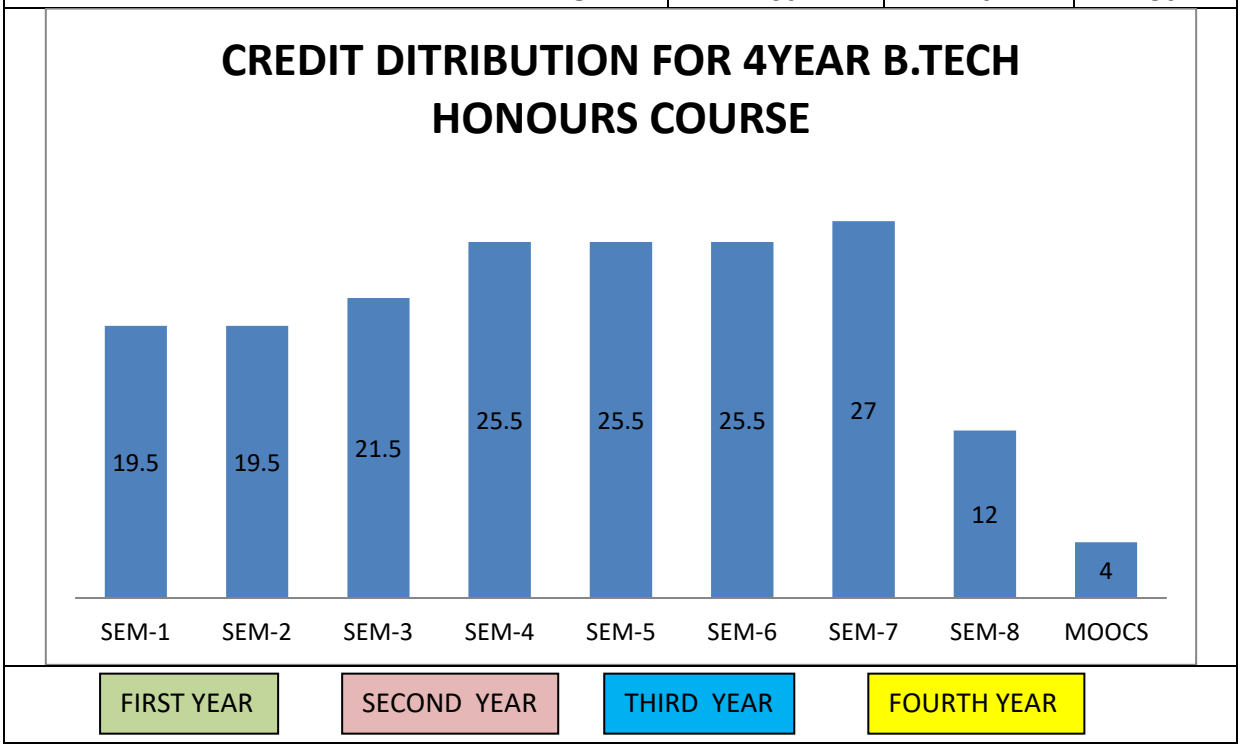
FOR HONOURS COURSE

S.No.	YEAR	SEMESTER	CREDITS FOR REGULAR	CREDITS FOR HONOURS	TTOAL CREDITS
1	FIRST	1	19.5		19.5
		2	19.5		19.5
2	SECOND	3	21.5		21.5
		4	21.5	4	25.5
3	THIRD	5	21.5	4	25.5
		6	21.5	4	25.5
4	FOURTH	7	23.0	4	27
		8	12.0		12
	ONLINE COURSES			4	4
		TOTAL	160	20	180



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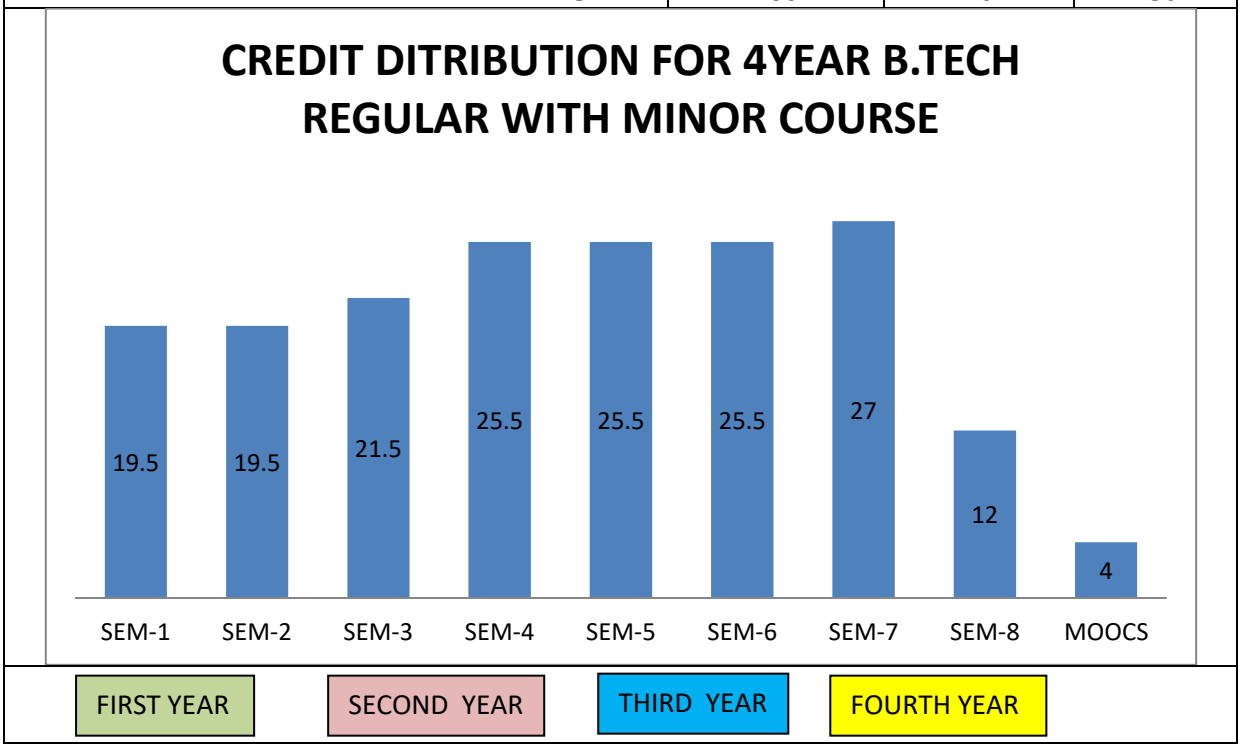
FOR REGULAR WITH MINOR COURSE

S.No.	YEAR	SEMESTER	CREDITS FOR REGULAR	CREDITS FOR MINOR	TTOAL CREDITS
1	FIRST	1	19.5		19.5
		2	19.5		19.5
2	SECOND	3	21.5		21.5
		4	21.5	4	25.5
3	THIRD	5	21.5	4	25.5
		6	21.5	4	25.5
4	FOURTH	7	23.0	4	27
		8	12.0		12
	ONLINE COURSES			4	4
		TOTAL	160	20	180



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Department of electronics & Instrumentation Engineering

First Year B. Tech (SEMESTER – I)

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS
(Code: 20EI101/ MA001)

Lecture: 4 **Tuorial : 0** **Practical : 0** **Credits : 3**
Continuous Internal Assessment : 30M **Semester End Examination (3 Hours) :70M**

Prerequisites: None

Course Objectives:

1. To learn about solving a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors.
2. Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order and higher order ordinary differential equations.
3. Create and analyze mathematical models using first and second order differential equations to solve application problems that arises in engineering.
4. To learn about solving linear Differential equations with constant coefficients with the given initial conditions using Laplace transform technique

COURSE OUTCOMES: Students will be able to

CO1 Apply elementary row operations to find the rank of a matrix, to solve a system of linear equations and to find the inverse of a matrix.
CO2 Find the Eigen values and Eigen vectors of the given square matrix and also compute the higher powers of the given matrix.
CO3 Solve separable, linear, exact differential equations with and without initial conditions
CO4 Distinguish between linear and non-linear differential equation.
CO5 Write the piecewise continuous functions in terms of unit step functions and hence find its Laplace transforms.
CO6 Solve linear differential equation with constant coefficients and unit step input functions using Laplace transforms technique.

	POS												PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
2	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
3	3	2	-	1	-	-	-	-	-	-	-	-	3	-	-
4	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-

UNIT - I

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).

[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT - II

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli‟s equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy=0. Applications of a first order Differential equations: Newton‟s law of cooling; Rate of decay of Radio-active materials. [Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2;11.12.4; 12.6; 12.8] [12 Hours]

UNIT – III

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits. [Sections:
13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5] [12 Hours]

UNIT – IV

Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by tn; Division by t; Inverse transforms-Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms. [Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1] [12 Hours]

TEXT BOOK:

1. B.S.Grewal, “Higher Engineering Mathematics”, 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

2. ErwinKreyszig, “Advanced Engineering Mathematics”, 9th edition, John Wiley & Sons.
3. N.P.Bali and M.Goyal, “A Text book of Engineering Mathematics” Laxmi Publications, 2010.

Bapatla Engineering College

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Department of electronics & Instrumentation Engineering

WAVES AND MODERN PHYSICS (ENGINEERING PHYSICS-1)

(CODE-20EI102/ PH001) (Common for ECE,EEE,EIE)

Lecture: 4 **Tuorial : 0** **Practical : 0** **Credits : 3**

Continuous Internal Assessment : 30M **Semester End Examination (3 Hours) :70M**

Course Objectives:

1. To familiarize the students in getting knowledge about modern optics and their Engineering applications.
2. To make aware of the students to obtain circuit knowledge regarding electrical, Electronics and Magnetism.
3. To make the students to understand the quantum theory and solving the various Physical problems using quantum mechanics.
4. To get the knowledge of various methods of analytical techniques for material testing.

COURSE OUTCOMES : Students will be able to

CO1 Learn about principle and working of different types of lasers and their applications.

CO2 Know about principle, types of optical fibers of their importance in communication.

CO3 Analyse the electromagnetic principles in electrical and electronic circuits and Maxwell‟s equations.

CO4 Study about quantum mechanics and its applications.

CO5 Read about properties and applications of ultrasonic in various fields.

CO6 Know about radio isotopes and their applications.

	POS												PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
2	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
3	3	2	-	1	-	-	-	-	-	-	-	-	3	-	-
4	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-

UNIT – I

(ADVANCED OPTICS)

Lasers: Interaction of radiation with matter. Einstein co- efficients, Properties of laser, Population inversion, LASER principle, pumping schemes-Three level and four level laser, types of lasers: solid-state lasers (Ruby), gas lasers (He-Ne), Semiconductor lasers; applications of lasers in industry and medicine. Fibre Optics: Importance of optical fibre, Structure and principle of optical fibre, acceptance angle and numerical aperture, Types of optical fibers based on modes and refractive index, V-number, losses associated with optical fibers, ,fibre optical communication, advantages of optical fibers

UNIT – II

(ELECTRO-MAGNETIC INDUCTION ANDMAXWELL'SEQUATIONS)

Maxwell's equations in vacuum and conducting medium.Velocity of electromagnetic wave in vacuum. Electromagnetic oscillations in LC circuit, LCR series resonance in

A.C circuit and resonant frequency, Quality factor. Concept of skin effect, Energy in an
electromagnetic field; Flow of energy and Poynting vector.Principle of circulating charge and cyclotron, Hall Effect.

UNIT – III

(MODERN PHYSICS) Dual nature of light, Debroglie concept of matter waves, Davission-Germer experiment, Heisenberg uncertainty principle and applications (non
existence of electron in nucleus and finite width of spectral lines), one dimensional time independent and dependent Schrodinger wave equation, physical significance of wave function, application of Schrödinger wave equation to particle in a one dimensional potential box, concept of quantum tunnelling and construction and working of Scanning Tunnelling Electron Microscope.

UNIT – IV

(ANALYTICAL TECHNIQUES) Ultrosonics: Properties of ultrasonics, Production of ultrasonic waves by magnetostriction andpiezo-electric method, Determination of velocity of ultrasonic wave in liquids by Ultrasonic interferometer. Medical applications, Ultrasonic Imaging technique(Doppler Ultrasound Imaging advantages and limitations), industrial applications, NDT : Pulse echo technique, Time of flight diffraction technique. Nuclear Techniques: Radio isotopes and its applications (medical and Industrial), GM counter, Scintillation counter

TEXT BOOK:

1. Engineering physics M.V.Avadhanulu, P.G.KshirsagarS.Chand& Company Pvt. Ltd.
2. Engineering physics, PalaniSwamy,Scitech publication

REFERENCE BOOKS:

1. Basic engineering physics – Dr.P.srinivasaRao, Dr.K.Muralidhar, Himalaya Publication
2.
pplied physics - Dr.P.SrinivasaRao, Dr.K.Muralidhar, Himalaya publication.

ENGINEERING CHEMISTRY-1
(code: 20EI103/CY001) (Common to all Branches)

Lecture: 4 **Tuorial : 0** **Practical : 0** **Credits : 3**
Continuous Internal Assessment : 30M **Semester End Examination (3 Hours) :70M**

Course Objectives:

1. With the principles of water characterization and treatment of water for industrial
2. purposes and methods of producing water for potable purposes.
3. To understand the thermodynamic concepts, energy changes, concept of corrosion & its control With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics.
4. With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

COURSE OUTCOMES : Students will be able to

CO1 Develop innovative methods to produce soft water for industrial use and potable waterat cheaper cost.
CO2 Apply their knowledge in converting various energies of different systems and
CO3 protection of different metals from corrosion.Have the capacity of applying energy sources efficiently and economically for various needs.
CO4 Design economically and new methods of organic synthesis andsubstitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	3	1			2	3					3	2		
2	3	3	2			2	2					3		2	
3	3	3	0			2	3					3		3	
4	3	3	2			2	1					2		2	

UNIT - I

Water Chemistry
15 hrs

Introduction: water quality parameters **Characteristics**: Alkalinity, Hardness - Estimation & simple neumerical problems, **Boiler Troubles** - Sludges, Scales, Caustic embrittlement, boiler corrosion, Priming and foaming; **Internal conditioning**- phosphate, calgon and carbonate methods. **External conditioning** - Ion exchange process & Zeolite proess WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration. Disinfection methods: Chlorination, ozonization and UV treatment. Salinity – Treatment of Brackish water by Reverse Osmosis and Electrodialysis.

UNIT – II

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications. **Corrosion:** Types of corrosion - Chemical or dry corrosion, Electrochemical or wet corrosion; Galvanic, stress, pitting and differential aeration corrosion; Factors effecting corrosion, **Corrosion control** – Cathodic protection, and

electro plating (Au)&electoless Ni plating.

UNIT – III

Fuels
15 hrs

Classification of fuels; Calorific value of fuels (lower, higher) **Solid fuels**: Determination of calorific value (Bomb Calorimeter) & related problems, Coal ranking, **Liquid Fuels:** Petroleum refining and fractions, composition and uses. Knocking and anti- knocking Agents, Octane number and Cetane number; Bio fuels- Biodiesel, general

methods of preparation and advantages **Gaseous fuels:** CNG and LPG, Flue gas analysis – Orsat apparatus.

UNIT – IV

Organic reactions and synthesis of a drug molecule Introduction to reactions involving substitution (SN1, SN2), addition (Markownikoff‟s and anti-Markwnikoff‟s rules) , elimination (E1& E2), Synthesis of a commonly used drug molecule.(Aspirin and Paracetamol) **Polymers:** Conducting polymers: Classification, Intrinsic and Extrinsic conducting polymers and their applications**.** Plastics: Thermoplasts and thermosetting plastics, Bskelite and PVC. Bio degradable polymers: types, examples- Polyhydroxybuterate (PHB), Polyhydroxybuterate-co-β-hydroxyvalerate (PHBV), applications.

TEXT BOOK:

1. P.C. Jain and Monica Jain, “Engineering Chemistry” DhanpatRai Pub, Co., New Delhi 17th edition (2017).
2. SeshiChawla, “Engineering Chemistry”DhanpatRai Pub, Co LTD, New Delhi 13 th edition, 2013.

REFERENCE BOOKS:

1. Essential Of Physical Chemistry by ArunBahl, B.S. Bahl, G.D.Tuli, by ArunBahl,
   B.S. Bahl, G.D.Tuli, Published by S Chand Publishers, 12th Edition, 2012.
2. Text Book of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S.
   Publications, Hyderabad (2006).

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Department of electronics & Instrumentation Engineering

COMMUNICATIVE ENGLISH (Code: 20EI104/ EL001)

Course Schedule: I B.Tech – I Semester (CIV, CSE, EEE & EI) I B.Tech – II Semester (ECE, IT& Mech)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment :			30	Semester End Examination (3 Hours) :			70

Course Objectives:

1 : at enhancing the vocabulary competency of the students
2 : to enable the students to demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation
3 : to enhance theoretical and conceptual understanding of the elements of grammar
4 : understand and apply the conventions of academic writing in English
5. to enhance the learners' ability of communicating accurately and fluently

COURSE OUTCOMES : Students will be able to

CO1 : able to build academic vocabulary to enrich their writing skills
CO2 : produce accurate grammatical sentences
CO3 : make inferences and predictions based on comprehension of a text
CO4 : discuss and respond to content of the text in writing
CO5 : produce coherent and unified paragraphs with adequate support and detail.

	POS												PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	-	-	-	-	-	-	-	-	**2**	**3**	**2**	-	-	**2**	1
2	-	-	-	-	-	-	-	-	**2**	**3**	**2**	-	-	**2**	1
3	-	-	-	-	-	-	-	-	**2**	**3**	**2**	-	-	**2**	1
4	-	-	-	-	-	-	-	-	**2**	**3**	**2**	-	-	**2**	1

UNIT - I

Vocabulary Development: Word formation-Formation of Nouns, Verbs & Adjectives from Root words-Suffixes and Prefixes
Essential Grammar: Prepositions, Conjunctions, Articles
Basic Writing Skills: Punctuation in writing
Writing Practices: Mind Mapping, Paragraph writing (structure-Descriptive,

UNIT - II

Vocabulary Development: Synonyms and Antonyms **Essential Grammar**: Concord, Modal Verbs, Common Errors **Basic Writing Skills**: Using Phrases and clauses
Writing Practices: Hint Development, Essay Writing

UNIT – III

Vocabulary Development: One word Substitutes
Essential Grammar: Tenses, Voices
Basic Writing Skills: Sentence structures (Simple, Complex, Compound)
Writing Practices: Note Making

UNIT – IV

Vocabulary Development: Words often confused
Essential Grammar: Reported speech, Common Errors
Basic Writing Skills: Coherence in Writing: Jumbled Sentences
Writing Practices: Paraphrasing & Summarising

REFERENCE BOOKS:

Communication Skills, Sanjay Kumar & Pushpa Latha. Oxford University Press: 2011. Practical English Usage, Michael Swan. Oxford University Press: 1995.
Remedial English Grammar, F.T.Wood. Macmillan: 2007.
Study Writing, Liz Hamp lyons & Ben Heasley. Cambridge University Press:2006

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Department of electronics & Instrumentation Engineering

ENGINEERING GRAPHICS I (Code: 20EI105 ME001)

Lectures	1	Tutorial	0	Practical	4	Credits	3
Continuous Internal Assessment :			30	Semester End Examination (3 Hours) :			70

Prerequisites: None

Course Objectives:

1 : clear picture about the importance of engineering graphics in the field of engineering
2 : the drawing skills and impart students to follow Bureau of Indian Standards
3 : To give an idea about Geometric constructions, Engineering curves, orthographic projections and pictorial projections
4 : imagination skills about orientation of points, lines, surfaces and solids
5 : basic drafting skills of AutoCAD

COURSE OUTCOMES : Students will be able to

CO1 : draw projections of points and projections of lines using Auto CAD
CO2 : plot projections of surfaces like circle, square and rhombus
CO3 : plot the Projections of solids like Prisms and pyramids
CO4 : convert the of Orthographic views into isometric views of simple objects
CO5 : generate the of pictorial views into orthographic views of simple castings

	POS												PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-
2	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-

UNIT - I

INTRODUCTION: Introduction to Drawing instruments and their uses, geometrical construction procedures INTRODUCTION TO AUTOCAD: Basics of sheet selection, Draw tools, Modify tools, dimensioning METHOD OF PROJECTIONS: Principles of projection - First angle and third angle projectionof points. Projection of straight lines.Traces of lines.

UNIT - II

PROJECTIONS OF PLANES: Projections of plane figures: circle, square, rhombus, rectangle, triangle, pentagon and hexagon.

UNIT – III

PROJECTIONS OF SOLIDS: Projections of Cubes, Prisms, Pyramids, Cylinders and Cones Inclined to one plane.

UNIT – IV

ISOMETRIC PROJECTIONS: Isometric Projection and conversion of Orthographic views into isometric views. (Treatment is limited to simple objects only).

UNIT-V

ORTHOGRAPHIC PROJECTIONS: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings).

TEXT BOOKS:

1. Engineering Drawing with AutoCAD by Dhananjay M. Kulkarni (PHI publication)
2. Engineering Drawing by N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand). (First angle projection)

Bapatla Engineering College

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(Autonomous)

Department of electronics & Instrumentation Engineering

PHYSICS LABORATORY (Code: 20EIL11 / PHL01)
(COMMON TO ALL BRANCHES)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment :			30	Semester End Examination (3 Hours) :			70

CO1	Acknowledge the important aspects of earth magnetic field, realize the use of Maxwells equations in various magnetic applications
CO2	Applications of basic principles of optics to estimate physical parameters.
CO3	Realization of material properties and parameters.
CO4	Get hands on experience in various opto-electronic devices like Solar Cell, Photo Cell and their applications.

	POS												PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
3	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
4	2	2	3	-	1	-	-	-	-	-	-	-	-	-	-

SYLLABUS :

LIST OF EXPERIMENTS

1. Determination of acceleration due to gravity at a place using compound pendulum.
2. Study the variation of intensity of magnetic field along the axis of a circular coil using
3. Stewart-Gee's apparatus.
4. Determination of thickness of thin wire using air wedge interference bands
5. Determination radius of curvature
6. Determination of wavelengths of mercury spectrum using grating normal incidencemethod.
7. Determination of dispersive power of a given material of prism using prism minimum deviation method.
8. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonant frequency.

9. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
10. Verify the laws of transverse vibration of stretched string using sonometer.
11. Determine the rigidity modulus of the given material of the wire using Torsional pendulum.
12. Draw the load characteristic curves of a solar cell.
13. Determination of Hall coefficient of a semiconductor.
14. Determination of voltage and frequency of an A.C. signal using C.R.O.
15. Determination of Forbidden energy gap of Si &Ge.
16. Determination of wavelength of laser source using Diode laser. Any three experiments are virtual

TEXT BOOK:

1. Engineering physics laboratory manual P.Srinivasarao & K.Muralidhar

Bapatla Engineering College

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(Autonomous)

Department of electronics & Instrumentation Engineering

ENGLISH COMMUNICATION SKILLS LABORATORY
CODE (20EIL103/ ELL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment :			30	Semester End Examination (3 Hours)			70

Prerequisites: None

Course Objectives:

1 : To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm

2 : To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking

3 : To improve students' fluency in English and neutralize their mother tongue

4 : To make them use effective vocabulary both in formal and informal situations

COURSE OUTCOMES : Students will be able to

CO1 : Better understanding of nuances of English language through audio- visual experience and group activities

CO2 : Students will be able to attain Neutralization of accent for intelligibility

CO3 : To improve clarity in thought process and build confidence to enhance their speaking skills.

CO4 : To make them use effective vocabulary both in formal and informal situations

	POS												PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	-	-	-	-	-	-	-	-	3	3	2	2	2	1	1
2	-	-	-	-	-	-	-	-	2	3	2	2	2	1	1
3	-	-	-	-	-	-	-	-	3	3	2	2	2	1	1
4	-	-	-	-	-	-	-	-	3	3	2	2	2	1	1

UNIT - I

1.1 Listening Skills; Importance – Purpose- Process- Types
1.2 Barriers to Listening
1.3 Strategies for Effective Listening

UNIT-II

2.1 Phonetics; Introduction to Consonant, Vowel and Diphthong sounds
2.2 Stress
2.3 Rhythm
2.4 Intonation

UNIT-III

3.1 Formal and Informal Situations
3.2 Expressions used in different situations
3.3 Introducing Yourself & Others-Greeting & Parting-Congratulating-Giving Suggestions & Advices-Expressing Opinions-Inviting People-Requesting-Seeking Permission-Giving Information- Giving Directions- Sympathizing- Convincing People-Complaining & Apologizing-Thanking Others- Shopping- Travelling- Conversational Gambits

UNIT-IV

4.1 JAM Session
4.2 Debates
4.3 Extempore

REFERENCE BOOKS:

1. Communication Skills, Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011
2. Better English Pronunciation, J.D. O' Connor. Cambridge University Press:1984
3. New Interchange (4rth Edition), Jack C Richards. Cambridge University Press:2015
4. English Conversation Practice, Grant Taylor. Mc Graw Hill:2001

Software:

1. Buzzers for conversations, New Interchange series
2. English in Mind series, Telephoning in English
3. Speech Solutions, A Course in Listening and Speaking

WORKSHOP PRACTICE
(Code: 20EIL104 / MEL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment :			30	Semester End Examination (3 Hours) :			70

Prerequisites: None

Course Objectives:

1 : To impart student knowledge on various hand tools for usage in engineering applications.
2 : Be able to use analytical skills for the production of components.
3 : Design and model different prototypes using carpentry, sheet metal and welding.
4 : Make electrical connections for daily applications.
5 : To make student aware of safety rules in working environments.

COURSE OUTCOMES : Students will be able to

CO1 : Make half lap joint, Dovetail joint and Mortise &Tenon joint
CO2 : Produce Lap joint, Tee joint and Butt joint using Gas welding
CO3 : Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools
CO4 : Make connections for controlling one lamp by a single switch, controlling two lamps by a single switch and stair case wiring.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	3	2	-	2	-	2	-	3	1	-	2	1	2	3
2	2	3	2	-	2	-	2	-	3	1	-	2	1	2	3
3	2	3	2	-	2	-	2	-	3	1	-	1	1	2	3
4	-	-	2	-	2	-	2	-	3	1	-	1	-	-	2

Syllabus:

1. Carpentry
a. Half Lap joint
b. Dovetail joint
c. Mortise &Tenon joint
2. Welding using electric arc welding process/gas welding
a. Lap joint
b. Tee joint
c. Butt joint
3. Sheet metal operations with hand tools
a. Trapezoidal tray
b. Funnel
c. T-joint
4. House wiring
a. To control one lamp by a single switch
b. To control two lamps by a single switch
c. Stair-case wiring

TEXT BOOKS:

1. P.Kannaiah and K.L.Narayana, Workshop Manual, SciTech Publishers, 2009.
2. K. Venkata Reddy, Workshop Practice Manual, BS Publications, 2008.

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Department of electronics & Instrumentation Engineering

SEMESTER - IINUMERICAL METHODS AND ADVANCED CALCULUS (Code: 20EI201/ MA002)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment :			**30**	**Semester End Examination (3 Hours) :**			**70**

Prerequisites: None

Course Objectives:

1 : To learn about some advanced numerical techniques e.g. solving a nonlinear equation, linear system of equations, Interpolation and Approximation techniques.

2 : To learn about evaluation of double and triple integrals and their applications.

3 : To learn some basic properties of scalar and vector point functions and their applications to line, surface and volume integrals.

COURSE OUTCOMES : Students will be able to

CO 1 : Solve non-linear equations in one variable and system of linear equations using iteration methods.

CO 2 : Choose appropriate interpolation formulae based on the given data.

CO 3 : Compute the value of a definite integral using numerical integration techniques. Predict the numerical solution of the derivative at a point from the given initial value problem using appropriate numerical method.

CO 4 : Evaluate the double and triple integrals using change of variables. Transform line integrals to surface and surface to volume integrals and evaluate them.

	POS												PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	2	-	1	-	-	-	-	-	-	-	-	2	-	-
2	2	2		1									2		
3	3	2		1									2		
4	3	3	-	1	-	-	-	-	-	-	-	-	2	-	-

UNIT - I

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss- Jordan method, Factorization method; Iterative methods of solution: Jacobi‟s iterative method, Gauss-Seidel iterative method. [Sections: 28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2]. [12 Hours]

UNIT – II

Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton‟s interpolation formulae: Newton‟s forward interpolation formula, Newton‟s backward interpolation formula; Interpolation with unequal intervals; Lagrange‟sinterpolation formula; Divided differences; Newton‟s divided difference formula; Numerical integration; Trapezoidal rule;

Simpson‟s one- third rule; Simpson‟s three-eighth rule; Numerical solution of ODE‟s: Introduction; Picard‟s method; Euler‟s method; Runge-Kutta method. [Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7]. [12Hours]

UNIT – III

Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integrals, Change of variables. [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2]. [12 Hours]

UNIT – IV

Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green‟s theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof). [Sections: 8.4; 8.5.1; 8.5.3; 8.6; 8.11; 8.12; 8.13; 8.14; 8.16] [12 Hours]

TEXT BOOK

1. B.S.Grewal, “Higher Engineering Mathematics”, 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

1. ErwinKreyszig, “Advanced Engineering Mathematics”, 9th edition, John Wiley & Sons.
2. N.P.Bali and M.Goyal, “A Text book of Engineering Mathematics” Laxmi
3. Publications, 2010.

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SEMICONDUCTOR PHYSICS AND NANO MATERIALS

CODE:20EI202/ PH003

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment :		30		Semester End Examination (3 Hours) :			70

Prerequisites: None

Course Objectives:

1 : This unit aim to build the foundation and inspires interest of freshmen into electrical and electronics and to focus on fundamental concepts and basic principles regarding electrical conduction.

2 : This unit provides various properties of semiconductor materials and their importance in various device fabrications.

3 : This unit aim to educate the student on various opto-electronic devices and their applications.

4 : This unit provide information about the principles of processing, manufacturing and characterization of nanomaterials, nanostructures and their applications.

COURSE OUTCOMES : Students will be able to

CO1 : understand concepts of band structure of solids, concept of hole and effective mass of electron in semiconductors.

CO2 : know the concept of Fermi level and various semiconductor junctions.

CO3 : familiar with working principles of various opto-electronic devices and their applications.

CO4 : understand importance of nano-materials and their characteristic properties.

CO PO AND PSO MAPPING

	POS												PSOS		
COS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	-	2	-	-	-	-	-	-	-	3	-	2	3
CO2	3	3	-	2	-	-	-	-	-	-	-	3	-	-	3
CO3	3	-	3	3	2	2	3	-	-	-	-	3	-	-	3
CO4	3	3	2	2	2	-	-	-	-	-	-	3	-	2	3

UNIT - I

ELECTRONIC MATERILAS: Sommerfeld free electron theory, Fermi level and energy, density of states, Failure of free electron theory (Qualitative), Energy bands in solids, E-K diagrams, Direct and Indirect band gaps. Types of Electronic materials: Metals, Semi conductors and Insulators, Occupation Probability, effective mass, Concept of hole.

UNIT - II

SEMICONDUCTORS: Introduction to semiconductors, intrinsic and extrinsic semiconductors, carrier concentrations, Fermi level and temperature dependence, Continuity equation, Diffusion anddrift, P-N junction (V-I characteristics), Metal –Semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for opto- electronic devices.

UNIT – III

OPTO-ELECTRONIC DEVICES AND DISPLAY DEVICES: Photo voltaic effect, principle and working of LED, Applications of Photo diode, Solar cell, PIN & APD Diode, Liquid crystal display, Opto electric effect: Faraday Effect and Kerr effect

UNIT – IV

NANO-MATERIALS: Introduction to nano technology, quantum confinement, surface to volume ratio, properties of nano materials, synthesis of nano-materials: CVD, sol-gel methods, laser ablation. Carbon nano tubes: types,properties, applications. Characterization of nano materials: XRD, SEM, applications of nano materials.

TEXT BOOKS

1. A text book of engineering physics by Avadhanulu and KshirsagarS.Chand& Co. (2013)
2. Applied physics by Dr.*P.SrinivasaRao*. Dr.K.*Muralidhar*
3. Introduction to solid state state physics, Charles Kittel, 8th edition
4. Solid state physics, S.O. Pillai

REFERENCE BOOKS:

1. Text book on Nanoscience and Nanotechnology (2013): B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath and J. Murday, Springer Science & Business Media.
2. Basic Engineering Physics ,Dr.*P.SrinivasaRao*. Dr.K.*Muralidhar.* Himalaya

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INSTRUMENTATION & NANOTECHNOLOGY .

CODE : 20EI203

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment :			30	Semester End Examination (3Hours)			70

Prerequisites: None

Course Objectives:

1 : To make students understand the role of chemistry in various Nano particles.

2 : To enhance knowledge about the various Nano synthetic techniques and their applications.

3 : To introduce the students to basic principles, constructions and applications of different batteries.

4 : To make students understand different analytical techniques and their importance.

COURSE OUTCOMES : Students will be able to

CO1 : Having capacity to innovate a variety of nonmaterials for engineering applications

CO2 : Design economically and new methods of synthesis nanomaterials.

CO3 : Have the knowledge of converting various forms of energies into most needy electrical energy efficiently and economically to reduce usage of renewable energy sources.

CO4 : Explain instrumentation and applications of UV-Visible, I.R spectroscopy, and various analytical techniques.

CO PO AND PSO MAPPING

	POS												PSOS		
COS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2												3		
CO2			3											2	
CO3		2													
CO4	2			2											

UNIT - I

NanoChemistry 12Hrs.

Introduction to Nano chemistry- Nanoparticles-properties, Introduction to Nanostructures: Carbon Nanotubes (CNT), Graphenes, Fullerenes,Nano Peapods, Quantum Dots and Semiconductor Nanoparticles Metal-based Nanostructures (Iron Oxide Nanoparticles) Nanowires Polymer-based Nanostructures including dendrimers.

UNIT - II

Synthesis of Nanoparticles 12Hrs.

Chemical Vapour Deposition (CVD) Chemical precipitation and coprecipitation;Metalnanocrystals by reduction, Sol - gel synthesis - Microemulsions or reverse micelles, micelle formation – Chemical Reduction - Emulsions, and Dendrimers - Microwave heating synthesis - Sonochemical synthesis – Electrochemical synthesis - Photochemical synthesis. **Engineering applications**-

Drug delivery, Fabric, Reactivity of materials, Micro/ Nano Electro mechanical systems.

UNIT – III

Batteries 12Hrs.

Different types of batteries- primary, secondary and flowcells. Working principle and uses-Laclanche cell, alkaline battery, Ni-Cd battery and Lithium, Lithium ion batteries. Lead acid storage cell, charging and discharging principles- operation and
uses, Solar battery-its working principle and applications, electrochemical sensors.

UNIT – IV

ANALYTICAL TECHNIQUES 12Hrs.

Beer-Lambert‟s law (problem) – UV-visible and IR spectroscopy– principles, instrumentation (block diagram only) and Applications. Estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy

TEXT BOOKS

1. P.C. Jain and Monica Jain, “Engineering Chemistry” DhanpatRai Pub, Co., New Delhi (2002).
2. Rao C. N., A. Muller, A. K. Cheetham, “Nanomaterials Chemistry”, Wiley- VCH, 2007.

REFERENCE BOOKS

1.B.K. Sharma “Engineering Chemistry” Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. Engineering Chemistry J.C Kuriacase&J.Rajaram, Tata McGraw Hills co., New Delhi (2004).
3. Text Book of Engineering Chemistry - ShasiChawla, DhanpatRai publishing company, New Delhi (2008).
4.Kenneth J. Klabunde, “Nanoscale materials in chemistry”, Wiley Interscience Publications, 2001.
5. Sergeev G.B., “Nanochemistry”, Elseiver publication, 2006.
6. Nanoparticles: From theory to applications – G. Schmidt, Wiley Weinheim 2004.
7. T. Pradeep, A Textbook of Nanoscience and Nanotechnology, Hardcover – 2012

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PROBLEM SOLVING USING PROGRAMMING
(CODE:20EI204 / CS001)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment :		30	Semester End Examination (3 Hours)				70

Prerequisites: MATHEMATICS

Course Objectives:

1 : Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetic rules.

2 : Develop problem-solving skills to translate „English" described problems into programs written using C language.

3 : Use Conditional Branching, Looping, and Functions.

4 : Apply pointers for parameter passing, referencing and differencing and linking data structures.

5 : Manipulate variables and types to change the problem state, including numeric,
character, array and pointer types, as well as the use of structures and unions, File.

COURSE OUTCOMES : Students will be able to

CO1 : Choose the right data representation formats based on the requirements of the problem.

CO2 : Analyse a given problem and develop an algorithm to solve the problem.

CO3 : Use the comparisons and limitations of the various programming constructs and choose
the right one for the task in hand

CO4 : Write the program on a computer, edit, compile, debug, correct, recompile and run it.

CO PO AND PSO MAPPING

	POS												PSOS		
COS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	3	2
CO2	2	3	2	-	-	-	-	-	-	-	-	-	-	2	1
CO3	2	2	1	-	-	-	-	-	-	-	-	-	-	2	2
CO4	2	1	2	-	-	-	-	-	-	-	-	-	-	2	1

UNIT - I

(17 Periods) Overview of C, Constants, Variables and Data Types, Operators and Expressions,Managing I/O Operations. Decision Making and Branching.

Programming Exercises for Unit I:C-expressions for algebraic expressions, evaluation of arithmetic and Boolean expressions. Syntactic and logical errors in a given program, output of a given program, values of variables at the end of execution of a program fragment, Programs using Scientific and Engineering formulae. Finding the largest of the three given numbers.Computation of discount amount on different types of products with different
discount percentages. Finding the class of an input character, finding the type of triangle formed with the given sides, computation of income-tax, finding given year is leap year or not, and conversion of lower case character to its upper case.

UNIT - II

(17 Periods)

Decision Making and Looping, Arrays, Character Arrays and Strings. **Programming Exercises for Unit II:** To print the sum of the digits of a given number and to display the image of a given number. To find whether a given number is prime, printing Fibonacci sequence and to find prime factors of a given number.To print graphic patterns of symbols and numbers.To find the length of a string, compare strings, reverse
a string, copy a string and to find whether the given string is palindrome or not with and without using String Handling Functions. Transpose of a matrix and sorting of names using arrays.

UNIT – III

(18 Periods)

User-defined Functions,Structures and Unions,Pointers **Programming Exercises for Unit - III:** Functions - Recursive functions to find factorial & GCD (Greatest Common
Divisor), string operations using pointers and pointer arithmetic. Swapping two variable values. Sorting a list of student records on register number using array of pointers

UNIT – IV

(18 Periods)

File Management in C,Dynamic Memory Allocation,Preprocessor **Programming Exercises for Unit - IV**: Operations on complex numbers, and to read an input file of marks and generate a result file, sorting a list of names using command line arguments. Copy the contents of one file to another file. Allocating memory to variables dynamically.

TEXT BOOKS

1. Programming in ANSI C by E.Balaguruswamy,Fifth Edition.

REFERENCE BOOKS

1. Kernighan BW and Dennis Ritchie M, “C programming language”, 2nded, Prentice Hall.

2. Yashavant P. Kanetkar, “Let us C”, BPB Publications.

3. Herbert Schildt, “C: The Complete Reference”, 4th edition, Tata Mcgraw-Hill.

4. Ashok N.Kamthane, “Programming in C”, PEARSON 2nd Edition.

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BASIC ELECTRICAL ENGINEERING *(E&I)*

(Code: 20EI205 / EE002)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment :			30	Semester End Examination (3 Hours) :			70

Prerequisites: Mathematics, Physics

Course Objectives:

1 : To understand basic Laws in circuits, analysis of simple DC circuits, Theorems and its applications.

2 : To learn basic concepts of AC circuits, its analysis and analysis of three phase balanced circuits

3 : To understand working principle, construction, applications and performance of DC machines, AC machines. .

4 : To gain knowledge about electrical insulators

COURSE OUTCOMES : Students will be able to

CO1 : Solve problems involving with DC excitation sources in electrical circuits.

CO2 : Solve problems involving with AC excitation sources in electrical circuits.

CO3 : Analyze construction, principle of operation, application and performance of DC machines and AC machines.

CO4 : Aware importance of electrical insulators.

CO PO AND PSO MAPPING

	POS												PSOS		
COS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3												3		
CO2	3														
CO3	2													2	
CO4	3		3										2		

UNIT - I

DC Circuits Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first- order RL and RC circuits.

UNIT - II

AC Circuits Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT – III

Electrical Machines Magnetic materials, BH characteristics, Construction, working of DC machines, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections.Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor.Construction and working of synchronous generators.

UNIT – IV

Electrical Installations Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthling. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", 4thedition, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2012.

REFERENCE BOOKS

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 1996.
2. E. Hughes, "Electrical and Electronics Technology", 10th edition, Pearson, 2011.
3. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India,

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ENVIRONMENTAL STUDIES

(Code: 20EI206/ MC001)

Lectures	3	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment			30	Semester End Examination (3 Hours)			0

Prerequisites: NONE

Course Objectives:

1 : To develop an awareness, knowledge, and appreciation for the natural environment.

2 : To understand different types of ecosystems exist in nature.

3 : To know our biodiversity.

4 : To understand different types of pollutants present in Environment.

5 : To know the global environmental problems

COURSE OUTCOMES : Students will be able to

CO1 : Develop an appreciation for the local and natural history of the area.

CO2 : Hope for the better future of environment in India which is based on many positive factors like Biodiversity, successive use of renewable energy resources and other resources, increasing number of people's movements focusing on environment

CO3 : Know how to manage the harmful pollutants. Gain the knowledge of Environment.

CO4 : Create awareness among the youth on environmental concerns important in the long- term interest of the society

	POS												PSOS		
COS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	-	-	-	1	-	2	3	-	-	1	-	2	-	-	-
CO2	-	-	-	-	2	2	3	-	-	1	-	2	-	-	1
CO3	-	-	-	-	-	-	3	-	-	1	1	2	1	-	-
CO4	-	-	-	1	-	2	3	2	-	1	-	2	1	-	-

SYLLABUS :

UNIT – I

Introduction: Definition, Scope and Importance, Need for public awareness. Ecosystems: Definition, Structure and Functions of Ecosystems, types - Forest, Grassland, Desert, Aquatic (Marine, pond and estuaries). *6 periods* **Biodiversity:** Definition and levels of Biodiversity; Values of Biodiversity - Consumptive, Productive, Social, Aesthetic, Ethical and Optional; Threats and Conservation of Biodiversity; Hot Spots of Biodiversity, Bio-geographical Classification of India, India as a mega diversity nation. *Chipko movement case study 6 periods*

UNIT – II

Natural resources: Land: Land as a resource, Causes and effects of land degradation - Soil erosion, Desertification. **Forest**: Use of forests, Causes and effects of deforestation, Afforestation, Mining - benefits and problems. **Water**: Uses, floods and drought, Dams - benefits and problems.

Energy: Importance of energy, Environmental Impacts of Renewable and Non-renewable energy resources. *Silent Valley Project and Narmada BachaoAndolan case studies8 periods*

Sustainability: Definition, Concept and Equitable use of resources for sustainable development; Rain water harvesting and Watershed management. Fieldwork on Rain water harvesting and Watershed management. *6 periods + 6 hours field work/Demonstration*

UNIT – III

Pollution: Definition; Causes, effects and control of air, water and nuclear pollution; *Chernobyl Nuclear Disaster* case study; Solid Waste: urban, Industrial and hazardous wastes; Integrated waste management - 3R approach, composting and vermicomposting.
12 periods **Environmental acts:** Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act. *6 periods*

UNIT – IV

Environmental issues: Green house effect & Global warming, Ozone layer depletion, Acid rains, Green Revolution, Population Growth and environmental quality, Environmental Impact Assessment.Environmental Standards (ISO 14000, etc.) *12 periods*
Case Studies: Bhopal Tragedy, Mathura Refinery and TajMahal, and Ralegan Siddhi (Anna Hazare). *6 periods*
Field work: Visit to a local area to document environmental assets – Pond/Forest/Grassland. Visit to a local polluted site- Urban and industry/ Rural and Agriculture*6 hrs*

TEXT BOOKS.

1. Environmental Studies" by Benny Joseph, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. "Comprehensive environmental studies"- JP Sharma, Laxmi Publications.
3. Text Book of environmental Studies – ErachBharucha

REFERENCE BOOKS

1. "Environmental studies", R.Rajagopalan, Oxford University Press.
2. "Introduction to Environmental Science", Anjaneyulu Y, B S Publications
3. "Environmental Science", 11th Edition – Thomson Series – By Jr. G. Tyler Miller.

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ENGINEERING CHEMISTRY LABORATORY

(Code: 20EIL201/ CYL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment			30	Semester End Examination (3 Hours)			70

COURSE OUT COMES

CO1	Familiar with fundamental basics of Chemistry lab
CO2	Ability to estimate purity of washing soda, bleaching powder and quantity of Iron and other salts.
CO3	Gain the knowledge regarding the quality parameters of water like salinity, hardness, alkalinity etc.
CO4	Able to analyse the given oil for saphonification and iodine value.
CO5	Ability to prepare high polymers and soap.
CO6	Ability to understand the estimation of quality parameters by instrumentation technics.

CO PO AND PSO MAPPING

	POS												PSOS		
COS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	-	-	-	-	-	-	-	3	2	-	-	2	-	3
CO2	2	2	2	2	-	2	-	-	3	2	-	1		-	3
CO3	2	2	2	2	-	2	-	-	3	2	-	1	1	-	3
CO4	2	2	2	2	-	-	-	-	3	2	-	1			3
CO5	2			2	-	-	-	-	3	2	-	1	2	1	-
CO6	2	2	2	2	-	-	-	-	3	2	-	1	2	1	

LIST OF EXPERIMENTS

1. Introduction to Chemistry Lab

a) (the teachers are expected to teach fundamentals likeCalibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. anderror, accuracy, precision, theory of indicators, use of volumetric titrations).

2. Volumetric Analysis:

a. Estimation of Washing Soda.
b. Estimation of Active Chlorine Content in Bleaching Powder
c. Estimation of Mohr‟s salt by permanganometry.
d. Estimation of given salt by using Ion-exchange resin using Dowex-50.

3. Analysis of Water:

a) Determination of Alkalinity of Tap water.
b) Determination of Total Hardness of ground water sample by EDTA method
c) Determination of Salinity of water sample

4. Estimation of properties of oil:

a) Estimation of Acid Value
b) Estimation of Saponification value

5. Preparations:

a) Preparation of Soap
b) Preparation of Urea-formaldehyde resin
c) Preparation of Phenyl benzoate

6. Demonstration Experiments (Any two of the following):

a) Determination of pHof given sample.
b) Determination of conductivity of given sample by conductometer.
c) Potentiometric Determination of Iron.

TEXT BOOKS (for Chemistry 1 and 2):

1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publicaitons, Hyderabad, 2009.
2. Inorganic quantitative analysis, Vogel, 5th edition, Longman group Ltd. London, 1979.

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R.n. Goyal and HarrmendraGoel.
2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

Bapatla Engineering College

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Department of electronics & Instrumentation Engineering

R20

PROBLEM SOLVING USING PROGRAMMING(LAB)

(Code: 20EIL202 /CSL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment :			30	Semester End Examination (3 Hours) :			70

CO1	Identify the right data representation formats for the given problem.
CO2	Use appropriate conditional/iterative statements to solve the problems
CO3	Apply the concepts of user defined functions and recursion to support reusability
CO4	Design an application using the concepts of array, pointer, structure, and file management to solve real world problem.
CO5	Verify fundamental theorems of circuit theory using software.

CO PO AND PSO MAPPING

	POS												PSOS		
COS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	3		2				3	2			2	-	-
CO2	3	3	3		2				3	2			2	-	-
CO3	3	3	3		2				3	2			2	-	-
CO4	3	3	3		2				3	2			2	-	-
CO5	3	2	3	3	-	-	-	-	3	2	-	-	3	2	-

1. A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if-else statement).

Domestic Customer:		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 200	0.50 per unit	
201 – 400	100 plus	0.65 per unit
401 – 600	230 plus	0.80 per unit
601 and above	390 plus	1.00 per unit
Commercial Customer:		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 100	0.50 per unit	
101 – 200	50 plus	0.6 per unit
201 – 300	100 plus	0.70 per unit
301 and above	200 plus	1.00per unit

2. Write a C program to evaluate the following (using loops):
   I. 1 + x2/2! + x4 / 4!+ …upto ten terms
   II. x +x3/3! + x5/5!+ … upto ten terms
3. Write a C program to check whether the given numbers
   I. Prime ornot.
   II. Perfect or Abundant or Deficient.
4. Write a C program to display statistical parameters (using one – dimensional array).
   I. Mean
   II. Mode
   III. Median

IV. Variance.

5. WriteaCprogramtoreadalistofnumbersandperformthefollowingoperations
   I. Print the list.
   II. Delete duplicates from the list.
   III. Reverse the list.

6. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the message “Element not found in the List”.

7. Write a C program to read two matrices and compute their sum and product.

8. Write a C program to read list of student names and perform the following operations a) To print the list of names. b) To sort them in ascending order. c) To print the list after sorting.

9. Write a C program that consists of recursive functions to a) Find factorial of a given number

10. Solve towers of Hanoi with three towers (A, B & C) and three disks initially on tower A.

11. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author, and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed, if it is, then the system displays the book details and request for the number of copies required ,if the requested copies are available the total cost of the requested copies is displayed otherwise the message “required copies not in stock” is displayed. Write a program for the above in structures with suitable functions.

12. Write a C program to read a data file of students’ records with fields(Regno, Name, M1,M2,M3,M4,M5) and write the successful students data (percentage > 40%) to a data file.

13. Write a C program to read a file as command line argument and count the given word frequency in a file

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BASIC ELECTRICAL ENGINEERING LAB

(CODE: 20EIL203)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment :			30	Semester End Examination (3 Hours) :			70

COURSE OUT COMES

CO1	To verify laws in electrical circuits
CO2	Observe the time domain response of networks for various types of inputs
CO3	Conduct tests on transformers to find their parameters
CO4	Analyze three phase circuits

CO PO AND PSO MAPPING

	POS												PSOS		
COS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2												2		
CO2	3	2			3									2	
CO3	3	2											3		
CO4	2														

LIST OF LAB EXPERIMENTS

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Verification of Thevenin‟s theorem
4. Verification of Norton‟s theorem
5. Time domain analysis of RL series circuit
6. Time domain analysis of RC series circuit
7. Parameters of choke coil
8. Measurement of line and phase quantities in 3-phase star connected load
9. Measurement of line and phase quantities in 3-phase delta connected load
10. Measurement of low and medium resistance using volt ampere method
11. OC & SC test of single phase transformer
12. Load test on single phase transformer
13. Load test on three-phase induction motor
14. Speed control of three-phase induction motor
15. Fuse characteristics

Note: Minimum 10 experiments should be carried.

Bapatla Engineering College: Bapatla

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Electronics and Instrumentation Engineering

PROBABILITY AND STATISTICS

(20EI301/ MA301)

Course category : Basic Sciences **Course type : Theory**

Lecture Hours: 3Hr./Week **Tutorial: 1Hr.** **CIE: 30M** **SEE : 70M** **Credits : 3**

Course Objectives :

CO1 : To provide principles of statistical methods and probability concepts that serves the foundations for the applications of methods in engineering.

CO2 : To educate the student on the applications of various t-tests to various problems in the field of engineering.

CO3 : To educate the student on the application of completely randomized designs (CRD) and randomized block designs (RBD) to different realistic problems in the field of engineering.

CO4 : To motivate the student on the applications of single and multiple regression analysis to the regression model arising in the field of engineering.

Course Outcomes :		
CO-1	:	To provide principles of statistical methods and probability concepts that serves the foundations for the applications of methods in engineering.
CO-2	:	To educate the student on the applications of various t-tests to various problems in the field of engineering.
CO-3	:	To educate the student on the application of completely randomized designs (CRD) and randomized block designs (RBD) to different realistic problems in the field of engineering.
CO-4	:	To motivate the student on the applications of single and multiple regression analysis to the regression model arising in the field of

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3												3		
2	2													2	
3	3														
4	2														

UNIT-I

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution,

Gamma Distribution and its applications, Beta Distribution and its applications, Joint Distributions (Discrete),Joint Distributions (Continuous).Populations and Samples, Law of large numbers,Central limit theorem and its applications,The sampling distribution of the mean (σ unknown),The sampling distribution of the variance. [12 Hours]
(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.10, 6.1, 6.2, 6.3, 6.4 of Text Book [1])

UNIT – II

Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean, Comparisons-Two independent Large samples, Comparisons-Two independent small samples, Paired sample t test.
(Sections 7.1,7.2, 7.4, 7.5, 7.6, 8.2, 8.3, 8.4 of Text Book [1])
[12Hours]

UNIT-III

The estimation of variances,Hypotheses concerning one variance,Hypotheses concerning two variances, Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions, Procedure for Analysis of Variance (ANOVA) for comparing the means of k (>2) groups- one way classification(Completely randomized designs), Procedure for Analysis of Variance (ANOVA) for comparing the means of k (>2) groups- two way classification(Randomized

block designs). [12 Hours]

(Sections 9.1, 9.2, 9.3, 10.1, 10.2, 10.3, 12.2, 12.3 of Text Book [1])

UNIT -IV

Multivariate Analysis: The concept of bivariate relationship, scatter diagram, Pearson's correlation and correlation matrix. Simple linear regression model and assumptions, Least Squares Estimation of the parameters of the model, Testing the significance of the model. Regression versus Correlation, Multiple linear regressionmodel with k explanatory variables and assumptions of the model. Least Square Estimation of regression coefficients. Concept of the coefficient of determination R^2 .Test for significance of the regression model and individual regression coefficients.Applications of multiple regression analysis. (1st and 2nd Chapters of Text Book [2]). [12 Hours]

TEXT BOOKS:

1. Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson,
8th Edition, PHI.
2. Introduction to Linear Regression Analysis, Douglas C. Montgomery,
E.A. Peck and G.G. Vining, 3rdedition, Wiley.

REFERENCE BOOKS:

1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI.
2. Fundamentals of Mathematical Statistics, S.C.Gupta and V.K.Kapoor,11th Edition, Sultan Chand & Sons.
3. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability &Satistics', Schaum's outline series.
4. K.V.S.Sarma,'Statistics Made Simple – Do it yourself on PC',Prentice Hall India, Second Edition, 2015.

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Electronics and Instrumentation Engineering

ELECTRONIC DEVICES AND CIRCUITS

(20EI302)

Course category : Professional Core			Course Type : Theory	
Lecture Hours: 3Hr./Week	Tutorial : 1Hr.	C I E: 30M	SEE : 70M	Credits : 3

Course Objectives :

CO1 : Compute carrier concentrations in a semiconductor at a given temperature.

CO2 : List basic equations for semiconductor operation, Draw energy band diagram for a p-n junction

CO3 : Evaluate the current components as well as capacitance in a diode.

CO4 : List carrier transport mechanism at various regions in a transistor, Distinguish the BJT configurations

CO5 : Find the operating region of FET given the biasing voltages

CO6 : Design FET biasing using current sources and current mirrors, Analyze FET amplifiers

Course Outcomes :		
CO-1	:	Compute carrier concentrations, currents in a semiconductor at a given situation.
CO-2	:	Compute the currents components, junction capacitances and voltages in diodes and BJTs.
CO-3	:	Analyse and design single stage amplifiers.
CO-4	:	Analyse and design current mirrors and differential amplifiers.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1													
2	2														
3	2												2		
4	3												2		

UNIT-I

Fundamentals of Semiconductors : Semiconducting materials, elemental and compound semiconductors, the valence bond model of semiconductor, the energy band model, equilibrium concentrations of electrons and holes inside the energy bands, the Fermi level and energy distribution of carriers inside the bands, the temperature dependence of carrier concentrations in an extrinsic semiconductor, the drift of carriers in an electric field, conductivity, the Hall effect, carrier flow by diffusion, Einstein relations, methods of generating excess carriers in semiconductors, quasi Fermi level, basic equations for semiconductor device operation.

UNIT-II

p-n Junctions : Description of p-n junction action, the abrupt junction: calculation of built-in voltage, the electric field and potential distributions,

p-n junction under bias, current components in a p-n diode, p-n diode Volt-Ampere equation, temperature dependence of I-V characteristic, static and dynamic resistance of diode, space charge capacitance , diffusion capacitance and electrical breakdown in p-n junctions
Bipolar Junction Transistor : The junction transistor, transistor current components, transistor as an amplifier, common base, common emitter and common collector configurations, self biasing of transistor, circuit models for transistor: h-parameter model and hybrid π model.

UNIT-III

Field effect Transistor : MOS capacitor, MOSFET, V-I characteristics of MOSFET, current voltage relationship in a MOSFET, small signal model of FET.
FET amplifiers at low frequencies : common source stage, source follower, common gate stage, source degenerated amplifier, swing limits, Cascade stage and cascode stage.

UNIT-IV

Current mirrors and biasing techniques: Basic current mirrors, cascode current mirrors, active current mirrors, CS biasing, CG biasing, source follower biasing, differential pair biasing.
Differential amplifiers : Single ended and differential operation, basic differential pair, common mode response, differential pair with MOS loads.

TEXT BOOKS:

1. Introduction to semiconductor materials and devices- M S Tyagi, Wiley publisher.

2. Design of Analog CMOS integrated circuits- Behzad Razavi, Mc-Graw Hill Education.

3. Integrated Electronics- Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill,2009

REFERENCE BOOKS:

1. Electronic Devices and circuits- Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill

2. Transistors: Fundamentals for the integrated circuit engineer- R M Warner and B L Grung

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Electronics and Instrumentation Engineering

DIGITAL ELECTRONICS

(20EI303)

Course category : Professional Core			Course Type : Theory	
Lecture Hours: 3Hr./Week	Tutorial : 1Hr.	C I E: 30M	SEE : 70M	Credits : 3

Course Objectives :

1 : understand the code conversions and implement boolean expressions using logic gates.

2 : understand and solve the logical expressions and realize with minimum gates.

3 : study about and analyze medium scale combinational logic circuits.

4 : study and Design and analyze sequential logic circuits.

Course Outcomes :		
CO-1	:	To do code conversions and implement boolean expressions using logic gates.
CO-2	:	Simplify logical expressions and realize with minimum gates.
CO-3	:	Design and analyze medium scale combinational logic circuits.
CO-4	:	Design and analyze sequential logic circuits.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2														
2			2										2		
3					3										
4					3								2		

UNIT- I

Number Systems and Codes: Decimal, Binary, Octal and Hexadecimal number systems and their conversion. Binary Addition, Subtraction, Multiplication, Division. Sign-magnitude representation, 1's & 2's complement representations, Subtraction using Method of complements; Codes – BCD code, Excess-3 code, Gray code.

Boolean Algebra and Logic gates: Boolean Postulates & theorems, Digital Logic gates, Simplification of Boolean expression, Implementation of Boolean expressions using logic gates, Canonical and Standard forms.

UNIT- II

Minimization of Switching Functions: Simplification of logical functions using Karnaugh map method (Up to five variables), Don't-Care conditions, Quine-McCluskey minimization technique (Up to five variables).

Combinational Logic Design: General design Procedure, Half-Adder, Full-Adder, Half - Subtractor, Full - Subtractor, BCD to 7 segment decoder, Design of a Binary to Gray and Gray to Binary code converters.

UNIT- III

Combinational Logic Design Using MSI Circuits: Multiplexer, Combinational logic design using multiplexers, Demultiplexers/ Decoders and their use in combinational logic design. Magnitude comparator, Encoders.

Flip-Flops: Clocked S-R flip-flop, Preset and Clear, J-K flip-flop, Race around condition, Master slave J-K flip-flop, D flip-flop, T flip-flop, Excitation tables of flip- flops and flip-flop conversions

UNIT- IV

Sequential Logic Design: Analysis and Synthesis of Clocked sequential circuits, Shift register, Bi-directional shift register, Ring counter, Twisted- Ring counter. Asynchronous counters - UP/DOWN counters, Design of Synchronous counters

Logic Families: Characteristics of digital IC's, MOS Inverter, MOSFET NAND and NOR Gates, CMOS Inverter, CMOS NAND and NOR gates.

Programmable Logic devices: PLA, PAL, PROM

TEXT BOOKS:

1. R P Jain "Modern Digital Electronics", IVth ed., TMH.

REFERENCE BOOKS:

1. A.Anand Kumar, "Fundamentals of Digital Circuits", PHI 2006.
2. M.Morris Mano, "Digital Logic and Computer Design", PHI 2003.

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Electronics and Instrumentation Engineering

NETWORK THEORY

(20EI304)

Course category : Professional Core			Course Type : Theory	
Lecture Hours: 3Hr./Week	Tutorial : 1Hr.	C I E: 30M	SEE : 70M	Credits : 3

Course Objectives :

1 : Apply basic network reduction techniques for analysis of electrical circuits.

2 : To learn the energy properties of electric elements and the techniques, Apply Network Theorems for DC and AC Circuits.

3 : Analyze RL,RC,RLC circuits and understand response of circuits with excitations

4 : Analyze transient response of circuits with dc and sinusoidal excitations using LT ,Understand the concept of resonance and two port networks

Course Outcomes :		
CO-1	:	Solve the network problems using reduction techniques
CO-2	:	Solve the networks using the theorems and will be able to design the networks.
CO-3	:	Solve different types of R,LC circuits and analyse the response characteristics.
CO-4	:	design the dc and AC circuits

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	1														
2	3												3		
3			2		3										
4	3				3								2		

UNIT I

INTRODUCTION OF CIRCUIT ELEMENTS: Circuit concept, Active and Passive circuit elements; Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and Current division; V-I characteristics of Passive elements and their series / parallel combination; Star Delta transformation, Energy stored in Inductors and Capacitors, Kirchhoff's Voltage law and Kirchhoff's Current law.

METHODS OF ANALYSIS: Nodal Analysis, Super Node Analysis, Mesh Analysis, Super Mesh Analysis. Nodal vs. Mesh analysis: A comparison

UNIT II

INTRODUCTION TO ALTERNATING CURRENTS AND VOLTAGES: Instantaneous, Peak, Average and RMS values of various waveforms; Concept of phase and phase difference in sinusoidal waveforms; Phase

relation in pure resistor, Inductor and capacitor, series and parallel circuits, compound Circuits. Computation of active, reactive and complex powers, power factor

NETWORK THEOREMS: Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorem, and Millman's theorem, Application of theorems to DC circuits and AC circuits

UNIT III

RESONANCE: Series resonance, Impedance and phase angle, voltages and currents, bandwidth and Q factor, Parallel resonance, resonant frequency, variation of impedance with frequency, Q factor,.

TRANSIENTS ANALYSIS: Steady state and transient response, Source free, DC and Sinusoidal response of an R-L, R-C circuits. R-L-C series and parallel circuits: over damped, Critical damping and under damped parallel RLC circuit.

UNIT IV

LAPLACE TRANSFORMS: Definition of the Laplace Transform. Properties of the Laplace Transform , Inverse Laplace transforms, Initial and final value theorem, Transforms of typical signals, periodic functions, Applications of Laplace transforms in circuit analysis.

TWO PORT NETWORKS: One-port and two-port networks, driving point impedance and admittance, open-, and short circuit parameters.

TEXT BOOKS:

1. A Sudhakar and Shyam Mohan SP - Circuits and Networks: Analysis and Synthesis, TMH, 2015.
2. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin - Engineering Circuit Analysis, TMH,

REFERENCE BOOKS:

1. M.E.Vanvalkenburg - Network Analysis, 3rd Edition, PHI, 2003
2. Franklin F.Kuo - Network Analysis and Synthesis, 2nd Edition, JohnWiley & Sons, 2003.
3. Ch. Alexander and M.N.O Sadiku - Fundamentals of Electrical Circuit, 5th Edition, TMH, 2013.
4. WEB RESOURCES:
5. http://nptel.iitm.ac.in/courses/

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Electronics and Instrumentation Engineering

TRANSDUCERS (20EI305)				
Course category : Professional Core			**Course Type : Theory**	
Lecture Hours: 3Hr./Week	**Tutorial : 1Hr.**	**C I E: 30M**	**SEE : 70M**	**Credits : 3**

Course Objectives :

1 : Analyze the various performance characteristics of Instrument and the quality of measurement.

2 : Identify the type of transducer based on the transduction principles.

3 : Select the relevant transducer for measurement of physical quantities to meet the requirements of industrial applications.

4 : Identify the additional attributes in advanced sensors.

Course Outcomes :		
CO-1	:	Set up testing strategies to evaluate performance characteristics of different types of instruments and develop professional skills.
CO-2	:	Use concepts in common methods for converting a physical parameter into an electrical quantity. Use the resistive and inductive transducers and develop the instruments for different applications
CO-3	:	Able to design an instruments for an application involving capacitive and Piezo-electric Transducers
CO-4	:	Able to identify or choose a transducer for a specific measurement application and applying the knowledge outside the classroom through design of a real-life instrumentation system.

	POS												**PSO**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2														
2			2										2		
3		2											2		
4		2													

UNIT- I

Introduction: Basic definitions related to measurements/ Instrumentation, Block diagram of generalized measurement / Instrumentation system.

Static characteristics of instruments: Introduction, static characteristics: accuracy, precision, resolution, static sensitivity, Linearity, Threshold, Hysteresis, Dead Zone, span, Range Loading effect.

Errors in Measurements: Static error, Types of errors, estimation of static errors: limiting errors & their combinations, error estimates from the normal distribution, probable errors& their combinations statistical analysis of measurement data uncertainty analysis curve fitting: Method of least squares.

Dynamic characteristics: Generalized Mathematical model of measurement system, operational & sinusoidal transfer functions zero, first and second order instruments & their response to step, ramp, and impulse inputs.

UNIT- II

Introduction: Definition of Transducer, Classification of transducers.
Resistive Transducers: Potentiometers, Strain gauges & their types, RTDs, Thermistors, Hotwire anemometers.
Inductive Transducers: Principles of Inductive transducers: Change in self inductance, Change in mutual inductance, Production of eddy currents, Variable reluctance transducer, Linear Variable differential transformer (LVDT), Rotary Variable differential transformer (RVDT), Magneto strictive transducer.

UNIT- III

Capacitive Transducers: Variable dielectric, Variable gap, Variable area type Capacitive devices, Differential type.
Piezo-electric Transducers: Piezo-electric effect, Piezo-electric Materials, Piezo- electric transducer & its characteristics

UNIT- IV

Developments in Sensor Technology: Introduction, Smart sensors, Micro Sensors, IR radiation Sensors, Ultrasonic Sensors, Fiber optic sensors, Chemical sensors and Bio Sensors.

TEXT BOOKS:

[1] A.K.Ghosh, "Introduction to Measurements & Instrumentation", IIIrd ed, PHI,
2009. (UNIT I)
[2] A.K.Sawhney & Puneet Sawhney, "A Course in Mechnanical Measuremnets & Instrumentation", XIIth ed, Dhanapat Rai & Co., 2012. (UNIT II & III)
D.V.S.Murty, "Transducers & Instrumentation", IIed, PHI. (UNIT IV)

REFERENCE BOOKS:

Raman Pallas-Arney & John G.Webster, "Sensors & Signal Conditioning", II nd
ed., J. Wiley,2012.
D.Patranabis, "Sensors and Transducers" II nd ed., PHI, 2013.
BC Nakra, KK Chaudhry "Instrumentation, Measurement and Analysis", IIed
TMH.

E-RESOURCES ;

1] http://nptel.ac.in/courses/112103174/4
[2] http://nptel.ac.in/courses/112103174/3

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Electronics and Instrumentation Engineering

DATA STRUCTURES USING 'C'

(20EII301)

Course category : SKILL ORIENTED COURSE			Course Type : SO	
Lecture Hours: 1Hr.	LAB Hours : 2Hr.	C I E: 30M	SEE : 70M	Credits : 2

Course Objectives :

1 : learn appropriate data structure as applied to specified problem definition.

2 : learn operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.

3 : apply concepts learned in various domains like DBMS, compiler construction etc.

4 : Students will be able to use linear and non-linear data structures like stacks , queues , linked list.

Course Outcomes :		
CO-1	:	Student will be able to choose appropriate data structure as applied to specified problem definition.
CO-2	:	Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.
CO-3	:	Students will be apply concepts learned in various domains like DBMS, compiler construction
CO-4	:	Students will be able to use linear and non-linear data structures like stacks , queues , linked list

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1					3										
2			2		3									2	
3					3									2	
4					3										

SYLLABUS:

1. Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list,

2. Circular linked list implementation, Double linked list implementation, insertion, deletion and searching operations.

3. Applications of linked lists.

4. Stacks-Operations, array representations of stacks,

5. stack applications -infix to postfix conversion, postfix expression evaluation

6. recursion implementation

7. Queues-operations, array representations. Circular Queue operations, Dequeues, applications of queues.
8. Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, Merge sort, shell sort, Radix sort ,Heap sort.

9. Searching-linear and binary search methodS

10. Trees – tree representation, properties of trees, Binary tree, Binary tree representation, binary tree properties.

11. Binary tree traversals, Binary search tree implementation, applications of trees.

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Electronics and Instrumentation Engineering

ELECTRONIC DEVICES LAB

(20EI1302)

Course category : Professional Core			Course Type : SO	
Lecture Hours: 0Hr.	LAB Hours : 3Hr.	C I E: 30M	SEE : 70M	Credits : 2

Course Objectives :

1 : Calculate The Time Period And Frequency Of Signals And The Concept Of Depletion Layer And Cut-In Voltage.

2 : Understand The Active, Saturation And Cut-Off RegionsAnd Calculate The Parameters Of Bjt, Fet And Ujt.

3 : Understand The Concept Of Ripple Factor, Efficiency, Regulation And Tuf Of Rectifiers.

Course Outcomes :		
CO-1	:	Make measurement of voltage, frequency and phase differences using CRO
CO-2	:	Calculate the small signal parameters of diodes and transistors
CO-3	:	Design and develop transistor biasing circuits.
CO-4	:	Design and develop voltage regulator circuits

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	3	-	-	-	-	-	1	-	-	-	3	2	-
2	3	2	2	-	-	-	-	-	1	-	-	-	3	2	-
3	3	1	-	-	-	-	-	-	1	-	-	-	3	1	-
4	3	2	3	-	-	-	-	-	1	-	-	-	3	3	-

LIST OF LAB EXPERIMENTS

1. Characteristics of Silicon and Germanium diodes.
2. Characteristics of Zener diode and its regulation characteristics.
3. Characteristics of BJT in Common Base configuration.
5. Characteristics of BJT in Common Emitter configuration.
6. Characteristics of Emitter follower circuit.
7. Output and Transfer Characteristics of JFET.
8. Characteristics of UJT.
9. Design and verification of self bias circuit for BJT.
10. Design and verification of collector to base bias circuit for BJT.
11. Design and verification of Fixed bias circuit for BJT.
12. Voltage Regulator using BJT.
13. Characteristics of SCR.

14. Study of CRO.
15. Characteristics of Triac.

NOTE: A minimum of 10 (Ten) experiments have to be performed and r

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Electronics and Instrumentation Engineering

DIGITAL ELECTRONICS LAB

(20EIl303)

Course category : Professional Core			Course Type : SO	
Lecture Hours: 0Hr.	LAB Hours : 3Hr.	C I E: 30M	SEE : 70M	Credits : 1.5

Course Objectives :

1 : Describe the numeric information indifferent bases, binary arithmetic's, various codes.

2 : Analyze various logic gates and logic families for the design of digital system.

3 : Design combinational and sequential logic circuits.

4 : Synthesize the fundamental concepts of state machines.

Course Outcomes :		
CO-1	:	Describe the numeric information indifferent bases,binary
CO-2	:	arithmetic's,variouscodes.
CO-3	:	Analyze various logic gates and logic families for the design of digital system.
CO-4	:	Design combinational and sequential logic circuits.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2														
2		3											2		
3			3											2	
4					3								3		

LIST OF LAB EXPERIMENTS

1. Realization of Gates using Discrete Components.
2. Realization of Gates using Universal Building Block (NAND only).
3. Design of Combinational Logic Circuits like Half-adder, Full-adder, Half Subtractor and Full-Sub tractor.
4. Verification of 4-bit Magnitude Comparator.
5. Design of Encoders like 4:2 and 8:3 encoder.
6. Design of Decoders like BCD – Decimal decoder.
7. Design of Code Converters (Binary to Gray).
8. Design of Multiplexers/De Multiplexers.
9. Verification of Truth Table of Flip-Flops using Gates.
10. Design of Shift register (To Verify Serial to parallel, parallel to Serial, Serial to Serial and parallel to parallel Converters) using Flip-Flops.
11. Design of Ring & Johnson Counters using Flip-Flops.

12. Conversion of Flip-Flops (JK-T, JK – D).
13. Design of Binary/Decade Counter.
14. Design of Asynchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.
15. Design of Synchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

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Electronics and Instrumentation Engineering

TRANSDUCERS LAB

(20EI1304)

Course category : Professional Core			Course Type : PC	
Lecture Hours: 0Hr.	LAB Hours : 3Hr.	C I E: 30M	SEE : 70M	Credits : 1.5

Course Objectives :

1 : An ability to know the standards to measure and to compute the statistical error analysis.

2 : An ability to analyze and understand various sensors based on its classification.

3 : An ability analyze and understand various sensors basedworking principle.

4 : An ability to identify the problem use the appropriate sensors with resistive, capacitive, inductive in real time situations.

Course Outcomes :		
CO-1	:	An ability to know the standards to measure and to compute the statistical error analysis.
CO-2	:	An ability to analyze and understand various sensors based on its classification.
CO-3	:	An ability analyze and understand various sensors based working principle.
CO-4	:	An ability to identify the problem use the appropriate sensors with resistive, capacitive, inductive in real time situations.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3												2		
2		2													
3		2													
4		2											2		

LIST OF LAB EXPERIMENTS

16. Realization of Gates using Discrete Components.
17. Realization of Gates using Universal Building Block (NAND only).
18. Design of Combinational Logic Circuits like Half-adder, Full-adder, Half Subtractor and Full-Sub tractor.
19. Verification of 4-bit Magnitude Comparator.
20. Design of Encoders like 4:2 and 8:3 encoder.
21. Design of Decoders like BCD – Decimal decoder.
22. Design of Code Converters (Binary to Gray).
23. Design of Multiplexers/De Multiplexers.
24. Verification of Truth Table of Flip-Flops using Gates.
25. Design of Shift register (To Verify Serial to parallel, parallel to

Serial, Serial to Serial and parallel to parallel Converters) using Flip-Flops.

26. Design of Ring & Johnson Counters using Flip-Flops.
27. Conversion of Flip-Flops (JK-T, JK – D).
28. Design of Binary/Decade Counter.
29. Design of Asynchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.
30. Design of Synchronous Counter, Mod Counter, Up Counter, Down Counter & Up/Down Counter.

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

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Electronics and Instrumentation Engineering

CONSTITUTION OF INDIA (20EI306)

Lectures: 3	Tutorial: 0	Practical: 0	Self Study:0	Credits :0
Continuous Internal Assessment: 30			Semester End Examination (3 Hours):	

Course Objectives:

- To Enable the student to understand the importance of constitution
- To know the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties
- To understand the functionalities of municipalities and Election Commission

Course Outcomes :

CO1: Able to understand the importance of the constitution in a Democratic Society.
CO2: To Learn the structure of executive, legislature and judiciary
CO3: To Learn about Government structures, methods of functioning
CO4: To understand the about the role and functioning of the Municipalities, Election Commission

CO-PO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1:						3		2					2		
CO2:								2					2		
CO3:						3									
CO4:						2									

Syllabus :

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive.Principles of State Policy.

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers,State Secretariat: Organisation, Structure and Functions. Local Administration - District's Administration Head - Role and Importance

UNIT-IV

Municipalities - Mayor androle of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy -(Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate. State Election Commission

Text Books&

Reference Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. ND
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
5. J.C. Johari, Indian Government and Politics Hans
6. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice –Hall of India Pvt. Ltd.. New Delhi
7. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right),
Challenges to Civil Rights Guarantees in India, Oxford University Press 2012
8. Indian Government and Politics – D C Das gupta. Vikas Publishing house
9. The Oxford Hand Book of the Indian Constitution, SujitChowdary, MadhavKhosla .
10. Indian Constitution and its features – Astoush Kumar, Anmol Publishers
11. The Constitution of India – Bakshi P M – Universal Law Publishers

E-RESOURCES:

1. nptel.ac.in/courses/109104074/8
2. www.hss.iitb.ac.in/en/lecture-details
3. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

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R20

COMPLEX ANALYSIS AND SPECIAL FUNCTIONS

(20EI401/ MA04)

Course category : Basic Sciences			Course type : Theory	
Lecture Hours: 3Hr./Week	Tutorial : 1Hr.	C I E: 30M	SEE : 70M	Credits : 3

Course Outcomes :

CO1 : Under stand vectors and the orthogonality of vectors to the signals

CO2 : study spectral characteristics of signals (continuous and discrete time as well as random signals)

CO3 : Study and Classify the systems and based on their properties.

CO4 : Understand the process of sampling. Study the effects of noise on the system and design systems that are susceptible to noise

Course Outcomes :		
CO-1	:	Apply the knowledge of vectors and the orthogonality of vectors to the signals
CO-2	:	Analyze the spectral characteristics of signals (continuous and discrete time as well as random signals)
CO-3	:	Classify the systems and based on their properties.
CO-4	:	Understand the process of sampling. Study the effects of noise on the system and design systems that are susceptible to noise.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3												2		
2	2														
3	1														
4		2													

UNIT-I

Complex Numbers and functions: Complex Numbers; Geometric Representation of Imaginary numbers; Roots of a complex number; Complex function; Real and imaginary parts of circular and hyperbolic functions; **Calculus of complex functions:** Introduction; Limit of a complex function; Derivative of f(z); Analytic functions; Harmonic functions; Complex integration; Cauchy's theorem; Cauchy's integral formula.

[Sections: 19.1; 19.2; 19.5; 19.7; 19.12; 20.1; 20.2; 20.3; 20.4; 20.5;20.12; 20.13; 20.14]

UNIT – II

Calculus of complex functions: Series of complex terms; Taylor series; Laurent's series; Zeros of an analytic function; Singularities of an analytic function; Residues; Residue theorem; Calculation of residues; Evaluation of real definite integrals: Evaluation around the unit circle, Evaluation around a small semi-circle.

[Sections: 20.16.1; 20.16.2; 20.16.3; 20.17.1; 20.17.2; 20.18.1; 20.18.2; 20.19; 20.20]

UNIT-III

Fourier transforms: Introduction; Definition; Fourier integral theorem (without proof); Fourier sine and cosine integrals; Complex form of Fourier integrals; Fourier integral representation of a function; Fourier transforms ; Properties of Fourier transforms; Convolution theorem(without proof); Fourier transforms of the derivative of a function.
[Sections: 22.1; 22.2; 22.3.1; 22.3.3; 22.3.4; 22.4; 22.5; 22.6.2; 22.9] [12 Hours]

UNIT -IV

Multivariate Analysis: The concept of bivariate relationship, scatter diagram, Pearson's correlation and correlation matrix. Simple linear regression model and assumptions, Least Squares Estimation of the parameters of the model, Testing the significance of the model. Regression versus Correlation, Multiple linear regressionmodel with k explanatory variables and assumptions of the model. Least Square Estimation of regression coefficients. Concept of the coefficient of determination R^2. Test for significance of the regression model and individual regression coefficients.Applications of multiple regression analysis. (1st and 2nd Chapters of Text Book [2]). [12 Hours]

TEXT BOOKS:

1. Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI.

2. Introduction to Linear Regression Analysis, Douglas C. Montgomery, E.A. Peck and G.G. Vining, 3rdedition, Wiley.

REFERENCE BOOKS:

1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI.
2. Fundamentals of Mathematical Statistics, S.C.Gupta and V.K.Kapoor,11th Edition, Sultan Chand & Sons.
3. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability &Satistics', Schaum's outline series.
4. K.V.S.Sarma,'Statistics Made Simple – Do it yourself on PC',Prentice Hall India, Second Edition, 2015.

UNIT -IV

Series Solution of Differential Equations and Special Functions: Introduction; Validity of series solution; Series solution when x = 0 is ordinary point of the equation; Frobenius method; Bessel's function; recurrence formula for $J_n(x)$; expansions for J_0 and J_1; value of $J_{1/2}$; generating function for $J_n(x)$; orthogonality of Bessel functions.
[Sections: 16.1;16.2;16.3;16.4;16.;,16.6;16.7;16.8;16.9;16.11]

TEXT BOOKS:

1. B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons.
2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics", Laxmi publications,2010.

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Electronics and Instrumentation Engineering

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Electronics and Instrumentation Engineering

SIGNALS AND SYSTEMS

(20EI402)

Course category : PROFESSIONAL CORE			Course Type : Theory	
Lecture Hours: 3Hr./Week	Tutorial : 1Hr.	C I E: 30M	SEE : 70M	Credits : 3

Course Objectives :

CO1 : Apply the knowledge of vectors and the orthogonality of vectors to the signals

CO2 : Analyze the spectral characteristics of signals (continuous and discrete time as well as random signals)

CO3 : Classify the systems and based on their properties.

CO4 : Understand the process of sampling.

CO5 : Study the effects of noise on the system and design systems that are susceptible to noise.

Course Outcomes.	
1	List the types of signals and systems and determine the type of the given system.
2	Analyze the spectral characteristics of signals (continuous and discrete time as well as random signals)
3	Analyze and design signals and systems using transformation techniques.
4	Compute energy and power spectral densities of a signal

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3												3		
2					3									2	
3	3													2	
4			2		3										

UNIT-I

Introduction: Signals and systems defined types of signals, systems.
Mathematical description of Continuous–Time Signals: Functions and functional notation, signal functions, scaling and shifting, differentiation and integration, even and odd functions, periodic functions, signal energy and power.
Properties of Continuous –Time systems: Block diagram and system terminology, system modeling, system properties.

UNIT-II

Time-Domain Analysis of Continuous-Time Systems: The convolution integral, block diagram realization of differential equations.

The Continuous-Time Fourier Systems: Periodic excitation and response of LTI systems, Basic concepts and development of the Fourier series, Numerical computation of the Fourier series, convergence of the Fourier series, properties of the Fourier series, band limited signals, responses of LTI systems with periodic excitation.

UNIT-III

The Continuous-Time Fourier Transform: Aperiodic excitation and response of LTI systems, Basic concepts and development of the Fourier transform, Convergence and the generalized Fourier transform, Numerical computation of the Fourier transform, Properties of the continuous time Fourier transform.
Continuous-Time Fourier Transform analysis of signals and systems: Frequency response, Ideal filters, Practical passive filters.

UNIT-IV

Sampling: Representing a continuous time signal by samples, Impulse sampling.
Correlation, Energy Spectral Density and Power Spectral Density: correlation and the correlogram,autocorrelation, cross correlation, correlations and the Fourier series, energy spectral density, power spectral density.

TEXT BOOKS:

1. Fundamentals of Signals and Systems, 2nd Edition, Michael J Roberts, Govind Sharma, Tata McGraw Hill, 2010.

REFERENCE BOOKS:

Signals and Systems, Simon Haykin, John Wiley, 2004.
Signals and Systems, A V Oppenheim, A S Wilsky& IT Young, PHI/ Pearson, 2003.
Signals, Systems and Communications, B P Lathi, BSP, 2003.

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Electronics and Instrumentation Engineering

ELECTRICAL & ELECTRONIC MEASUREMENTS

(20EI403)

Course category : PROFESSIONAL CORE			Course Type : Theory	
Lecture Hours: 3Hr./Week	Tutorial : 1Hr.	C I E: 30M	SEE : 70M	Credits : 3

Course Outcomes :

CO1 : Apply the knowledge of vectors and the orthogonality of vectors to the signals

CO2 : Analyze the spectral characteristics of signals (continuous and discrete time as well as random signals)

CO3 : Classify the systems and based on their properties.

CO4 : Understand the process of sampling.

CO5 : Study the effects of noise on the system and design systems that are susceptible to noise.

Course Outcomes.	
1	Design instruments for measurement of voltage, current, energy and power
2	Determine the values of the unknown components using DC and AC bridges and state the working principles of various digital voltmeters
3	List various front controls of a CRO and their purpose.
4	State the working principles of various analyzers with their specific applications.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3												3		
2		1											2		
3	2														
4	2														

UNIT- I

Measurement and Error: Definitions, Accuracy and precision, significant figures, Types of errors, **Electro mechanical indicating instruments**: Permanent magnet moving coil mechanism, DC Ammeter, DC Voltmeter, Voltmeter Sensitivity, Series type ohmmeter, Shunt type ohmmeter, calibration of DC instruments. **Alternating current indicating instruments**:- AC&DC voltage Measurement: Thermoinstruments Power measurements: Electro dynamometers, Energy Measurement: WattHour meter, Powerfactor meters, Instrument Transformers: Current Transformer, Potential Transformer.

UNIT- II

Precision measurement of Component values(R,L,C):- Wheatstone Bridge, Kelvin double bridge,
Schering bridge, Maxwell's bridge, Hay's Bridge, Wein bridge, Wagner ground connection. **Electronic Instruments**: AC Voltmeter using rectifiers, True RMS responding voltmeter, Electronic Multimeter.
Digital voltmeters :– Ramp type DVM, Stair case ramp DVM, Dual slope DVM, Successive approximation type DVM.
Vector Impedance meter, Q meter, RF power and voltage measurement: RF milli voltmeter.

UNIT- III

Cathode ray oscilloscope:- Oscilloscope: Block diagram, cathode ray tube: Electrical Deflection, screens of CRT, Graticules, CRT Circuits, Vertical deflection system: Blockdiagram, Attenuator. Horizontal deflection system: schematic of Triggered time base, Delay line: Distributed parameter Delay line.
Dual trace Oscilloscope.
Oscilloscope Techniques: Measurement of voltage, frequency and phase, pulse measurements, Oscilloscope probes: current probe with magnetic sensor, Hall effect sensor, Lissajous figures.
Special Oscilloscopes: -Block diagram of Digital storage oscilloscope.

UNIT- IV

Signal Generators & Analyzers:- Sine wave generator, Frequency – Synthesized signal generator, Frequency divider generator, sweep frequency generator, Laboratory square wave and pulse generator, Function generator
Wave analyzers:- Frequency Selective wave analyzer, Heterodyne wave analyzer, Applications. **Harmonic distortion analyzers**:-Tuned circuit Harmonic Analyzer, Heterodyne Harmonic analyzer, Fundamental-suppression Harmonic Analyzer
Spectrum analyzers:- Fourier Transform spectrum analyzer.
Frequency Counters and Time interval Measurements:- Simple frequency counter: Its Applications Period measurement, Automatic and Computing Counters.

TEXT BOOKS:

1. W D Cooper & Albert D .Helfrick, Electronic Instrumentation and Measurement Techniques, PHI.

2.H.S.Kalsi,Elecdtronic Instrumentation ,TMH, Second Edition.

REFERENCE BOOKS:

1.A K Sawhney, Electrical and Electronic measurements and instrumentation, Dhanpat Rai.
David.A.Bell , Electronic Instrumentation and Measurements

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Electronics and Instrumentation Engineering

ANALOG ELECTRONIC CIRCUITS
20EI404

Course category : Professional Core			Course Type : Theory	
Lecture Hours: 3Hr./Week	Tutorial : 1Hr.	C I E: 30M	SEE : 70M	Credits : 3

Course objectives:

CO1 :Analysis of HWR and FWR with & without filter

CO2 :Design power supplies,3 terminal regulators (78XX and 79XX)

CO3 :Analysis of the BJT and FET Transistor at high frequency

CO4 :Analyze various types of feedback amplifiers like voltage series, current series, current shunt and Voltage shunt.

CO5 :Design power amplifiers and analyse its parameters

Course Outcomes.	
1	To design and analyze rectifiers.
2	To analyze transistor amplifiers at high frequencies.
3	To design and analyze feedback amplifiers.
4	To design and analyze power amplifiers.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2												3		
2			3											2	
3			3												
4			2										2		

UNIT – I

POWER SUPPLIES: Rectifiers: Half wave, Full wave and bridge rectifiers, Efficiency, Ripple factor, Regulation, Harmonic components in rectified output, Types of filters: Choke input (inductor) filter, Shunt capacitor filters; Block diagram of regulated power supply, Series and shunt regulated power supplies, Three terminal regulators (78XX and 79XX),IC723

UNIT – II

TRANSISTOR AT HIGH FREQUENCY: Hybrid-pi CE transistor model, Hybrid-π Conductance, Hybrid-π Capacitances, Validity of Hybrid-π Model, Variation of Hybrid-π model, CE short circuit current gain FET AT HIGH FREQUENCY: FET small signal model, CS / CD configurations at high frequencies

UNIT – III

FEEDBACK AMPLIFIERS: Classification of amplifiers, Feedback concept, Transfer Gain with Feedback, Negative feedback amplifiers and their characteristics, Input &Output resistance, Method of Analysis of a feedback amplifier, Voltage-series Feedback, Current- series Feedback, Current- shunt Feedback, Voltage-shunt Feedback amplifier.

UNIT – IV

POWER AMPLIFIERS: Class A Large-signal amplifier, Second-harmonic Distortion, Higher order Harmonic Distortion, Transformer Coupled Audio Power Amplifier, Efficiency, Push Pull Amplifiers Class B Amplifier ,Class AB Operation. WAVE SHAPING CIRCUITS: Diode clippers, clampers, The high- pass RC circuit, The low-pass RC circuit.

TEXT BOOKS:

1. Electronic Devices and Circuits , S.Salivahanan & N. Suresh Kumar ,3rd EditionMc Graw Hill Education (India) Pvt Ltd.
2. Electronic Devices and Circuit Theory", Robert L. Boylestad and Louis Nashelsky
3. Microelectronics: Circuit Analysis and Desigm, Donald A. Neamen, 4th Edition, Tata Mc-Graw Hill,

REFERENCE BOOKS:

1. Microelectronic Circuits, 7th Edition, Sedra & Smith, Oxford University Pres
2. Electronics- Jacob Millman, Chritos C. Halkies, Tata Mc-Graw HilL

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Electronics and Instrumentation Engineering

TECHNICAL ENGLISH

(20EI405/EL02)

Course category : HUMANITIES			Course Type : Theory	
Lecture Hours: 3Hr./Week	Tutorial : 1Hr.	C I E: 30M	SEE : 70M	Credits : 3

Course Objectives:

CO1 : Read, write and aptly understand what ever is written and spoken in English

CO2 : Speak fluently with acceptable pronunciation and write using appropriate words, spellings, grammar and syntax

CO3 : Read the lines, between lines and beyond lines excelling in comprehension skills

CO4 : Draft Reports, memos, mails & letters as part of their work

CO5 : Speak grammatically error free English

Course Outcomes.	
1	Read,writeandaptlyunderstandwhateveriswrittenandspokeninEnglish
2	Speakfluentlywithacceptablepronunciationandwriteusingappropriatewords, spellings, grammar and syntax
3	Readthelines,betweenlinesandbeyondlinesexcellingincomprehensionskills
4	DraftReports,memos,mails&lettersaspartoftheir work, SpeakgrammaticallyerrorfreeEnglish

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1									2						
2										3					3
3										2					
4										2					3

UNIT- I

1.1 Vocabulary Development: Familiarising Idioms & Phrases
1.2 Grammar for Academic Writing: Making Requests
1.3 Language Development: Using Transition & Link words
1.4 Technical Writing: Letter Writing & Email Writing

UNIT-II

2.1 Vocabulary Development: Analogous words
2.2 Grammar for Academic Writing: Tenses: Simple Past /Present Perfect, The Future: Predicting & Proposing
2.3 Language Development: Cloze tests
2.4 Technical Writing: Technical Reports

UNIT-III

3.1 Vocabulary Development: Abbreviations& Acronyms
3.2 Grammar for Academic Writing:
Describing(People/Things/Circumstances) : Adjectival & Adverbial groups
3.3 Language Development: Transcoding (Channel convertion from chart to text)
3.4 Technical Writing: Circular, Memos, Minutes of Meeting

UNIT-IV

4.1 Vocabulary Development: Corporate vocabulary
4.2 Grammar for Academic Writing: Inversions & Emphasis
4.3 language Development: Reading Comprehension
4.4 Technical Writing: Resume Preparation

TEXT BOOKS:

1. Communication Skills, Sanjay Kumar & Pushpa Latha. Oxford University Press:2011.
2. Technical Communciation Principles and Practice. Oxfor University Press:2014.
3. Advanced Language Practice, Michael Vince. MacMilan Publishers:2003.
4. Objective English(Third Edition), Edgar Thorpe & Showick. Pearson Education:2009.English Grammar: A University Course (Second Edition), Angela Downing & Philip Locke, Routledge Taylor & Francis Group: 2016

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Electronics and Instrumentation Engineering

SKILL ORIENTED COURSE

(20EIL401:)

Course category : Professional Core			**Course Type : SO**	
Lecture Hours: .1Hr.	**LAB Hours :2Hr.**	**C I E: 30M**	**SEE : 70M**	**Credits : 2**

Course Objectives :

CO1 : Student will learn to use and program the hardware boards.

CO2 : Learn about the various types of sensors for different application

CO3 : Students will be able to develop simple real time projects.

CO4 : Students will be able to develop the integrated projects

Course Outcomes.	
1	Student will learn to use and program the hardware boards.
2	Learn about the various types of sensors for different application
3	Students will be able to develop simple real time projects.
4	Students will be able to develop the integrated projects

	POS												PSO		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	**3**												**2**		
2		**2**			**3**										
3					**3**									**2**	
4					**2**										

LIST OF EXPERIMENTS :

1. Learn the hardware Arduino and Raspberry pi boards and interface to the computer for installing the OS.
2. Study about the various hardware interface pins with two boards.
3. Interface the TSOP with Arduino boards and control the appliances with remote control.
4. Applications with proximity sensors and IR sensors.
5. Applications with encoder type sensors
6. Applications with ultrasonic sensors
7. Applications with smoke and gas sensors

8. Applications with LDR and PIR sensors
9. Applications with speed control of servo motors.
10. Applications with IR sensor for colour detection.
11. Integrating the applications to develop small projects -1
12. project - 2
13. Project - 3
14. Project - 4
15. Project - 5

Bapatla Engineering College: Bapatla

(Autonomous)

Electronics and Instrumentation Engineering

ANALOG ELECTRONIC CIRCUITS LAB

(20EIL402)

Course category : PROFESSIONAL CORE			Course Type : SO	
Lecture Hours: .	LAB Hours : 3Hr.	C I E: 30M	SEE : 70M	Credits : 1.5

Course Objectives :

1 : To understand Analysis of HWR and FWR with & without filter

2 : Able to design both small signal and large signal amplifiers

3 : Can understand the feed back amplifier and RC coupled amplifiers

4 : Able to design any type of nonlinear wave shaping circuits

Course Outcomes.	
CO-1	To understand Analysis of HWR and FWR with & without filter
CO-2	Able to design both small signal and large signal amplifiers
CO-3	Can understand the feed back amplifier and RC coupled amplifiers
CO-4	Able to design any type of nonlinear wave shaping circuits

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2												3		
CO2		2													
CO3	2														
CO4	2														

LIST OF EXPERIMENTS:

1. Low pass and High pass Filter characteristics
2. Half–Wave with and without filter
3. Full-Wave Rectifier with and without filter
4. Frequency Response of CE Amplifier
5. Frequency Response of CS Amplifier
6. Verification of Clippers
7. Verification of Clampers
8. Design and Verification of Class-A Power Amplifier
9. Design and Verification of Voltage Regulator
10. Design and Verification of Voltage shunt feedback amplifier
11. Design and Verification of Class B push pull amplifier
12. Verify 78xx and 79xx Voltage regulators
13. Design and Verification of Differential amplifier
14. Design and Verification of RC coupled amplifier

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Electronics and Instrumentation Engineering

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Electronics and Instrumentation Engineering

Measurements Lab

(20EIL403)

Course category : PROFESSIONAL CORE			Course Type : SO	
Lecture Hours: 0Hr.	LAB Hours : 3Hr.	C I E: 30M	SEE : 70M	Credits : 1.5

Course Objectives :

CO1 : STUDY AND Design of instruments for measurement of voltage, current and

CO2 : learn to Measure resistance, inductance and capcitance usung bridges.

CO3 : learn todevelop regulated power supplies

CO4 : learn the Design and develop function generator.

Course Outcomes.	
1	Design of instruments for measurement of voltage, current and resistance
2	Measure resistance, inductance and capcitance usung bridges.
3	Design and develop regulated power supplies
4	Design and develop function generator.

	POS												PSO		
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3												3		
2	2													3	
3			3										2		
4			3											2	

List of Experiments

1. DC meters using D' Arsonval Galvanometers
2. AC meters using D' Arsonval Galvanometers
3. Measurement of resistance using Kelvin Double Bridge
4. Measurement of inductance using Maxwell Bridge
5. Measurement of capacitance using Shearing and DeSauty's Bridge
6. Design and Development of Regulated Current Source
7. Study of spectrum analyzer
8. Study of Wave Analyzer
9. Study of Harmonic distortion Analyzer
10. Study of Q meter
11. Measurement of RF power and Voltage
12. Study of Function generator

13. Study of True RMS voltmeters
14. Study of vector impedance meter
15. Design of ohmmeter.

NOTE: A minimum of 10(Ten) experiments, choosing 5 (Five) from each part, have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

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Electronics and Instrumentation Engineering

SIGNALS AND SYSTEMS LAB

(20EIl404)

Course category : PROFESSIONAL CORE			Course Type : PC	
Lecture Hours: 0Hr.	LAB Hours : 3Hr.	C I E: 30M	SEE : 70M	Credits : 1.5

Course Objectives :

CO1 : Perform basic mathematical operations on basic signals and classifying the systems

CO2 : Analyze the LTI system, Can evaluate systems response and Represent a continuous time periodic signal as a Fourier series and determine response of the LTI system to any input signal

CO3 : Use the Fourier transform to analyze continuous time signals and systems

CO4 : Perform sampling of low pass signals; verify correlation and computation of spectral densities.

Course Outcomes.

CO	POS												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	Perform basic mathematical operations on basic signals and classifying the syste														
CO2	Analyze the LTI system, Can evaluate systems response and Represent a continuous Time periodic signal as a Fourier series and determine response of the LTI sy														
1	3				3										
2		2			3								3		
3	CO3 Use the Fourier transform to analyze continuous time signals and systems				3										
4	CO4 Perform sampling of low pass signals; verify correlation and computation of spectral				3								2		2

LIST OF LAB EXPERIMENTS

1. Basic Operations on Matrices.
2. Generation of basic continuous time signals namely unit impulse, step, ramp, exponential
3. and Sinusoidal signals.
4. Generation of basic discrete time signals namely unit impulse, step, ramp, exponential and Sinusoidal signals.
5. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
6. Finding the Even and Odd Parts of Signal or Sequence and Real and Imaginary Parts of Signal.
7. Verification of linearity and time invariance properties of a given continuous /discrete system.
8. Convolution between Signals and Sequences.
9. Autocorrelation and Cross correlation between Signals and Sequences.

10. Verification of Linearity and Time Invariance Properties of a Given Continuous/Discrete system.

11. mputation of Unit Sample, Unit Step and Sinusoidal Responses of the Given LTI System and Verifying its Physical Realizability and Stability Properties.
12. Finding the Trigonometric Fourier Series of a given Signal.

13. Finding the Fourier Transform of a given Signal and plotting its Magnitude and Phase spectrum.
14. Sampling Theorem Verification.

15. Program to find frequency response of analog LP/HP/BP/BS filters.

16. Program to find the impulse response of a system defined by a difference equation.

NOTE: A minimum of 10 (Ten) Programs have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.