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

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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

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.

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 in a semester is assigned certain number of credits based on following

	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	MC	0

		training, Universal human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge (Non-Credit)		
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
Summer / Industrial / Research Internship	--	100
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 15 (50%) 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% 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 15 (50%) 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. If a student fails to obtain 15 marks in CIE, he can register for the course repetition as per the guidelines mentioned in 6.5.

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 25 (50%) 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 50% 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 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.

6.6 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.

6.7 There shall four be 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 (either Professional Elective Courses in clause 6.6 or Open Electives/ Job Oriented Courses in clause 6.7) under MOOCs (Massive Open Online Courses) offered by NPTEL and other reputed organizations as 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 agency during the semester only in order to earn 3 Credits.

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

6.9 **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. a)Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering
b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

b. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

c. The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

d. There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

e. The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

f. A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) upto the end of 2^{nd} semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4^{th} semester. If a student fails to acquire 8 SGPA upto 3^{rd} semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

g. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the

Under Graduate Degree in Major Discipline (i.e. 160 credits).

h. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

i. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

j. Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

k. A committee should be formed at the level of College/Universities/department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

l. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

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

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

o. Minimum enrollment for a Minor course to be offered is 12

p. Students fulfilling the stipulated criterion can register for a Minor by paying a prescribed registration fee.

6.12 Honors degree in a discipline:

Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

a. A student shall be permitted to register for Honors program at the beginning of 4th

semester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2 semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

b. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

c. In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

d. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

e. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

f. The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

g. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component. (Model pool list is enclosed in the Annexure-2).

h. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

i. The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

j. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree

certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

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

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

m. Minimum enrollment for the Honors to be offered is 12.

n. Students fulfilling the stipulated criterion can register for Honors by paying a prescribed registration fee.

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 Un-satisfactory 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.
- Further the student must obtain a minimum of 50% attendance in each subject failing which; the student shall not be permitted to write the SEE of that subject. Student has to register this subject through course repetition and satisfy the CIE qualification criteria of attendance and marks in the subsequent semesters.
- 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 15 marks in CIE and 25 marks in SEE. In case of, internships, project work viva – voce, he/she should secure 40% of the total marks. For mandatory courses minimum 15 marks in CIE are to be secured.

8.2 B.Tech students: 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.

Lateral Entry students: 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 examination of III semester.

8.3 B.Tech students: 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.

Lateral entry students: 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 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	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 4.0 < 5.5$

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 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).	Expulsion from the examination hall and cancellation of the performance in that course only.
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

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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

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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				Scheme of Examination (Maximum marks)			No. of Credits	CATOGORY
		L	T	P	Total	CIE	SEE	Total Marks		
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

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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/ SC 02	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**

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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 – V)

Code No.	Subject	Scheme of Instruction (HOURS per week)				Scheme of Examination (Maximum marks)			No. of credits	Catagory
		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
20EI505/ PE 11- 13	Professional Elective - 1	3	0	0	3	30	70	100	3	PE
20EIL501/ SAC01	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	

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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
SAC – Skill Advanced 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
20EI604/ PE 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
20EI606/ MC03	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

Bapatla Engineering College: Bapatla

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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	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

(Autonomous)

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		
20EI701/ DE 31-33	Professional Elective Course	3	0	0	3	30	70	100	3	PE
20EI702/DE 41-43	Professional Elective Course	3	0	0	3	30	70	100	3	PE
20EI703/DE 51-53	Professional Elective Course	3	0	0	3	30	70	100	3	PE
20EI704/ IE 01--02	Open Elective	2	0	2	4	30	70	100	3	OE
20EI705/ IE 03-04	Open Elective	2	0	2	4	30	70	100	3	OE
20EIH 01-09	*Humanities and Social Science Elective*	3	0	0	3	30	70	100	3	HS
20EIL701/SA 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

(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		
OE - Openelective		

S.No.	CATEGORY	Credits
1	PC –Professional Core Courses	
2	OE – Open ELectives	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

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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
INTURNSHIP (6 MONTHS)										
								TOTAL CREDITS	12	

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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

OPEN ELECTIVES:

20EII01 : **Principles And Applications Of Mems**
20EII02 : **Power Plant Instrumentaiton**
20EII03 : **Robotics And Automation**
20EII04 : **Sensors And Signal Conditioning**

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

CREDIT DISTRRIBUTION FOR SEMESTER WISE

S.No.	YEAR	SEMESTER	NUMBER OF CREDITS

Bapatla Engineering College: Bapatla

(Autonomous)

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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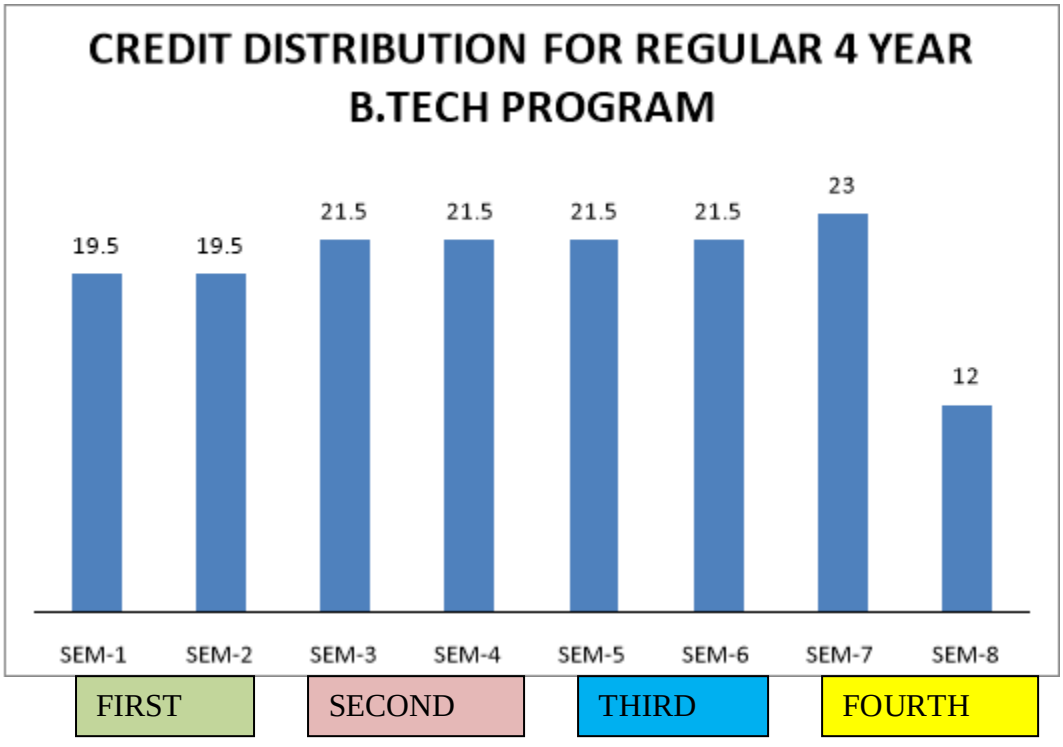
CREDIT DISTRRIBUTION SEMESTER WISE

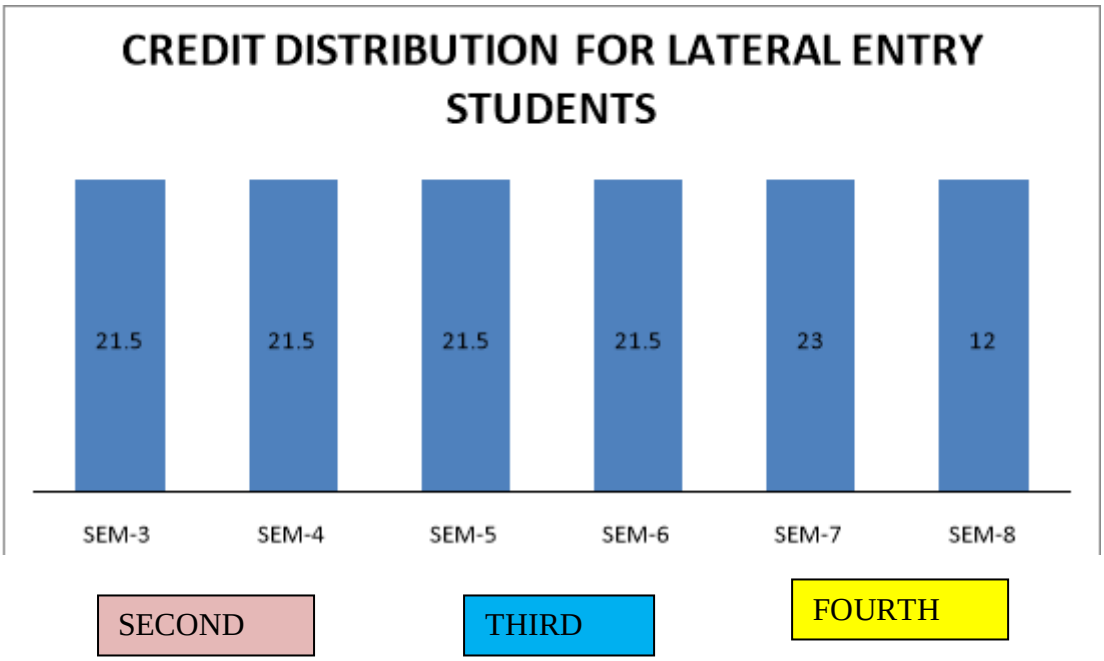
FOR REGULAR 4 YEAR BTECH			
.No.	YEAR	SEMESTER	NUMBER OF CREDITS
1	FIRST	1	19.5
		2	19.5
2	SECOND	3	21.5
		4	21.5
3	THIRD	5	21.5
		6	21.5
4	FOURTH	7	23.0
		8	12.0
		TOTAL	160



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

FOR LATERAL ENTRY STUDENT



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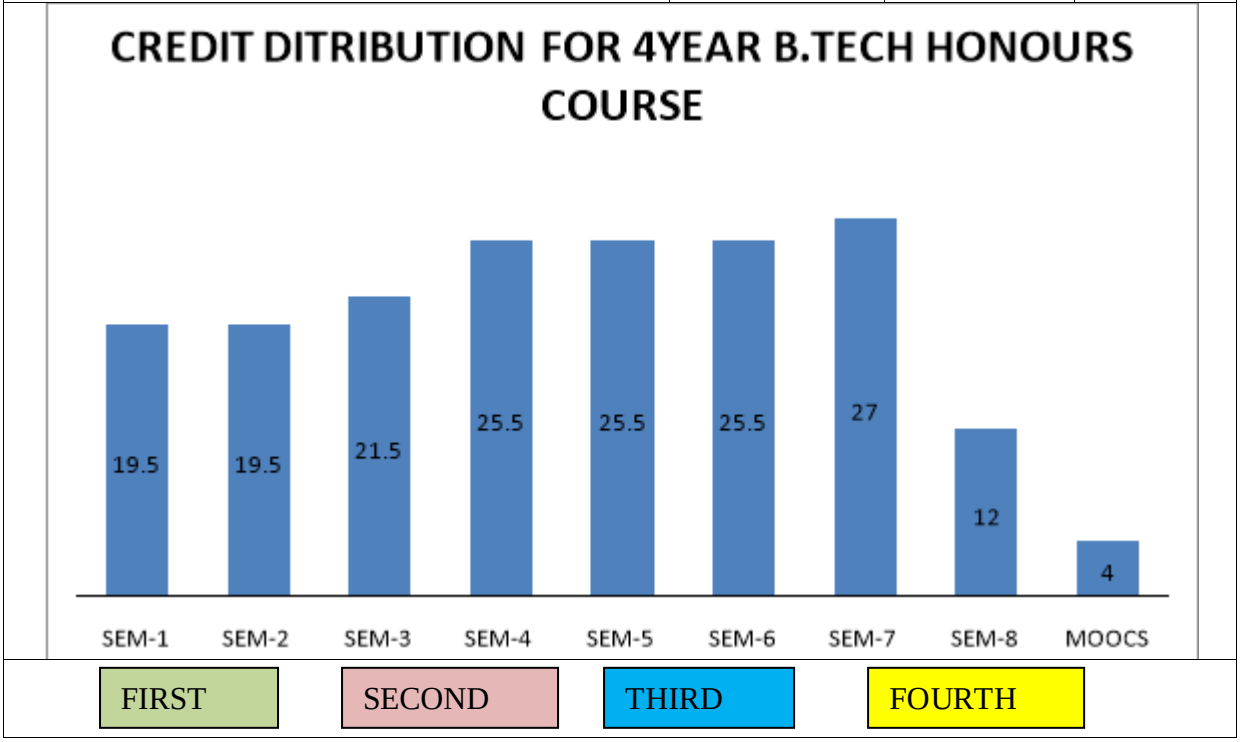
FOR HONOURS COURSE

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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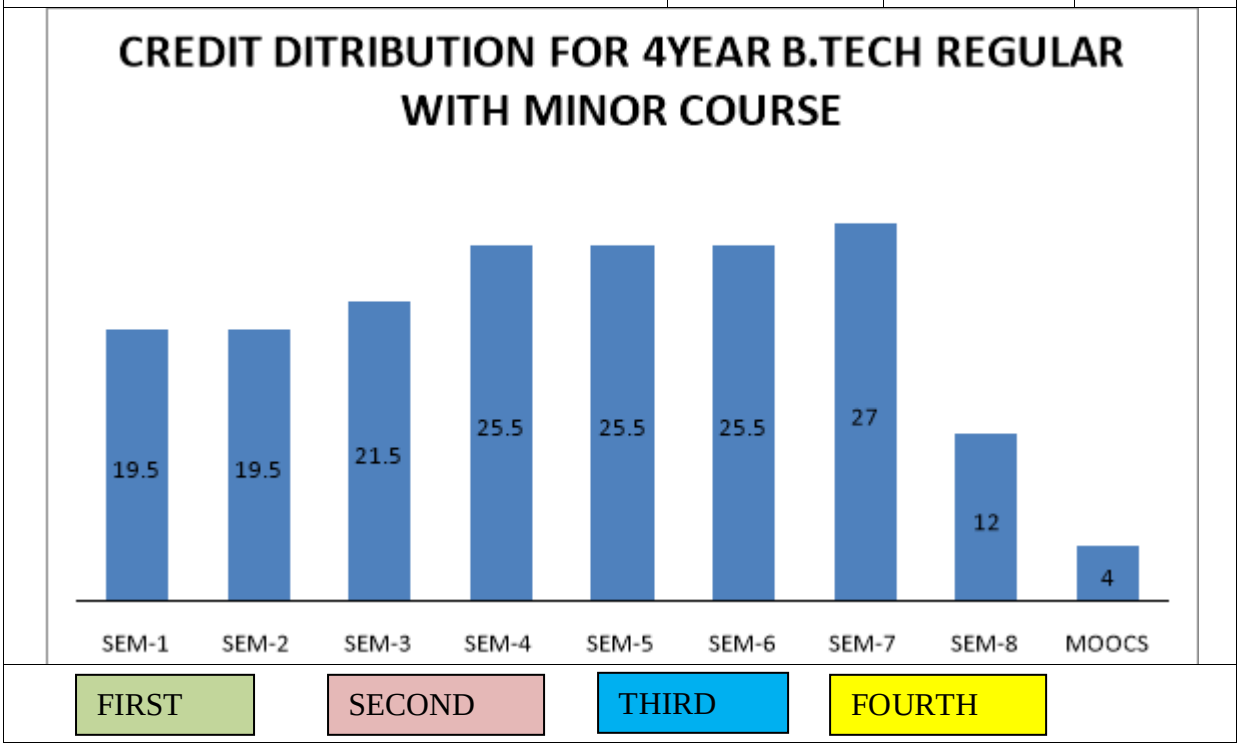
FOR REGULAR WITH MINOR COURSE

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



Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

First Year B. Tech (SEMESTER – I) SYLLABUS

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

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 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.

SYLLABUS

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

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:

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

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

WAVES AND MODERN PHYSICS (ENGINEERING PHYSICS-1) (CODE-20EI102/ PH001)

(Common for ECE,EEE,EIE)

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

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 ultrasonics in various fields.

CO6 : Know about radio isotopes and their applications.

SYLLABUS

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 AND MAXWELL'S EQUATIONS) 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

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

(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. Applied physics - Dr.P.SrinivasaRao, Dr.K.Muralidhar, Himalaya publication.

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

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

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

Course Objectives:

1 : With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.

2 : To understand the thermodynamic concepts, energy changes, concept of corrosion & its control

3 : 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 water at cheaper cost.

CO2 : Apply their knowledge in converting various energies of different systems and protection of different metals from corrosion.

CO3 : 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.

SYLLABUS

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 **15hrs.**

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.

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

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 **15hrs**

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).

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

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.

SYLLABUS :

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

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

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

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

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

SYLLABUS :

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:

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

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)

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

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

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:

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

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

Electronics and Instrumentation Engineering

Effective From the Academic Year2020-2021(R20 Regulations)

ENGLISH COMMUNICATION SKILLS LABORATORY CODE (20EIL12/ 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

CO 1 : Better understanding of nuances of English language through audio- visual experience and group activities

CO 2 : Students will be able to attain Neutralization of accent for intelligibility

CO 3 : To improve clarity in thought process and build confidence to enhance their speaking skills.

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

SYLLABUS :

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

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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

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WORKSHOP PRACTICE

(Code: 20EIL13 / 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.

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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SEMESTER - II
NUMERICAL 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

CO1 : Solve non-linear equations in one variable and system of linear equations using iteration methods.

CO2 : Choose appropriate interpolation formulae based on the given data.

CO3 : Compute the value of a definite integral using numerical integration techniques.

CO4 : Predict the numerical solution of the derivative at a point from the given initial value
problem using appropriate numerical method.

CO5 : Evaluate the double and triple integrals using change of variables.

CO6 Transformline integrals to surface and surface to volume integrals and evaluate them.

SYLLABUS :

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 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

C 1 understand concepts of band structure of solids, concept of hole and effective mass of electron in semiconductors.

C 2 know the concept of Fermi level and various semiconductor junctions.

C 3 familiar with working principles of various opto-electronic devices and their applications.

C 4 understand importance of nano-materials and their characteristic properties.

SYLLABUS :

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.

SYLLABUS :

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.

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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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Effective From the Academic Year2020-2021(R20 Regulations)

BASIC ELECTRICAL ENGINEERING *(E&I)*

(Code: 20EI204 / EE002)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment :			50	Semester End Examination (3 Hours) :			50

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.

SYLLABUS :

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.

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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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Effective From the Academic Year2020-2021(R20 Regulations)

PROBLEM SOLVING USING PROGRAMMING
(CODE:20EI205 / 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.

CO5 : Identify tasks in which the numerical techniques learned are applicable and apply them
to write programs, and hence use computers effectively to solve the task.

SYLLABUS :

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.

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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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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

LIST OF EXPERIMENTS

1. **Introduction to Chemistry Lab** (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.

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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

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

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	1.00 per unit

2. Write a C program to evaluate the following (usingloops):
   a) 1 + x2/2! + x4 / 4!+ …upto tenterms
   b) x +x3/3! + x5/5!+ … upto ten terms
3. Write a C program to check whether the given numberis
   a) Prime ornot.
   b) Perfect or Abundant orDeficient.
4. Write a C program to display statistical parameters (using one – dimensionalarray).
   a) Mean
   b) Mode
   c) Median
   d) Variance.
5. WriteaCprogramtoreadalistofnumbersandperformthefollowingoperations
   a) Print thelist.
   b) Delete duplicates from thelist.
   c) Reverse thelist.

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 theList”.

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

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

10. 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.

11. 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.

12. 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

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.

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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) :			70

Prerequisites: NONE

Course Objectives:

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

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.

CO4 : Gain the knowledge of Environment.

CO5 Create awareness among the youth on environmental concerns important in the long-
term interest of the society

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.

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)

Second Year B. Tech (SEMESTER – III)

Code No.	Subject	Scheme of Instruction Hours per week				Scheme of Examination (Maximum marks)			No. of Cre dits	CATO GORY
		L	T	P	Tot al	CIE	SEE	Total Marks		
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

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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)				Scheme of Examination (Maximum marks)			No. of Credi ts	CATO GORY
		L	T	P	Tot al	CIE	SEE	Total Mark s		
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

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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		

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**

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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.

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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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, Analyse FET amplifiers

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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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 Outcomes :

CO1 : Apply basic network reduction techniques for analysis of electrical circuits.

CO2 : To learn the energy properties of electric elements and the techniques

CO3 : Apply Network Theorems for DC and AC Circuits.

CO4 : Analyze RL,RC,RLC circuits and understand response of circuits with excitations

CO5 : Analyze transient response of circuits with dc and sinusoidal excitations using LT

CO6 : Understand the concept of resonance and two port networks

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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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 Outcomes:

CO1 : Apply basic network reduction techniques for analysis of electrical circuits.

CO2 : To learn the energy properties of electric elements and the techniques

CO3 : Apply Network Theorems for DC and AC Circuits.

CO4 : Analyze RL,RC,RLC circuits and understand response of circuits with excitations

CO5 : Analyze transient response of circuits with dc and sinusoidal excitationsusing LT

CO6 : Understand the concept of resonance and two port networks

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,
1.

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.

WEB RESOURCES:

http://nptel.iitm.ac.in/courses/

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TRANSDUCERS

(20EI305)

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

Course Outcomes:

CO1 : Analyze the various performance characteristics of instrument and the quality of measurement.

CO2 : Identify the type of transducer based on the transduction principles.

CO3 : Select the relevant transducer for measurement of physical quantities to meet the requirements of industrial applications.

CO4 : Identify the additional attributes in advanced sensors.

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)
[3] D.V.S.Murty, "Transducers & Instrumentation", IIed, PHI. (UNIT IV)
1.

REFERENCE BOOKS:

[1] Raman Pallas-Arney & John G.Webster, "Sensors & Signal Conditioning", II nd
ed., J. Wiley,2012.
[2] D.Patranabis, "Sensors and Transducers" II nd ed., PHI, 2013.
[3] 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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DATA STRUCTURES USING 'C'

(20EIl301)

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

Course Outcomes:

CO1 : Student will be able to choose appropriate data structure as applied to specified problem definition.

CO2 : Student will be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.

CO3 : Students will be able to apply concepts learned in various domains
like DBMS, compiler construction etc.

CO4 : Students will be able to use linear and non-linear data structures like stacks , queues , linked list.

SYLLABUS :

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

2) circular linked list implementation,

3) Double linked list implementation, insertion, deletion and searching operations. 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,
9) insertion sort, quick sort,

10) Merge sort, shell sort,

11) Radix sort ,Heap sort

12) Searching-linear and binary search methods

13) Trees – tree representation, properties of trees, Binary tree, Binary tree representation, binary tree properties, binary tree traversals,

14) Binary search tree implementation, applications of trees.

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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 :

CO1 : Calculate The Time Period And Frequency Of Signals And The Concept Of Depletion Layer And Cut-In Voltage.

CO2 : Understand The Active, Saturation And Cut-Off RegionsAnd Calculate The Parameters Of Bjt, Fet And Ujt.

CO3 : Understand The Concept Of Ripple Factor, Efficiency, Regulation And Tuf Of Rectifiers.

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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DIGITAL ELECTRONICS LAB

(20EI1303)

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

Course Outcomes:

CO1 : Describe the numeric information indifferent bases, binary arithmetic's, various codes.

CO2 : Analyze various logic gates and logic families for the design of digital system.

CO3 : Design combinational and sequential logic circuits.

CO4 : Synthesize the fundamental concepts of state machines.

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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TRANSDUCERS LAB

(20EI1304)

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

Course Outcomes:

CO1 : An ability to know the standards to measure and to compute the statistical error analysis.

CO2 : An ability to analyze and understand various sensors based on its classification.

CO3 : An ability analyze and understand various sensors based working principle.

CO4 : An ability to identify the problem use the appropriate sensors with resistive, capacitive, inductive in real time situations.

LIST OF EXPERIMENTS

1.To study the characteristics of LVDT transducer.

2. To study the characteristics of RTD transducer.

3. To study the characteristics of thermistor transducer.

4. To study the characteristics of thermocouple transducer.

5. To study the characteristics of Pressure transducer.

6. To study the characteristics of Speed transducer.

7. To study the characteristics of Light Dependent resistor.

8. To study the characteristics of load cell transducer.

9. To study the characteristics of Torque transducer.

10. To study the characteristics of Synchro Transmitter receiver

11. To study the characteristics of first order and second order systems

12. To study the characteristics of Hall-effect transducer.

13.To study the testing and calibration of T, J, K ,R and S thermocouples.

14. To study the characteristics of pH Transducer.

15. To design LabVIEW VI for measurement of voltage, current and Power.

16. To study the characteristics Piezo – electric Transducer.

17. To study the Loading effect of Potentiometer.

18.To study the operation of sensor and actuator modules.

19. To study the operation of DAQ system for application with sensor signals.

20. Data acquisition and storage of signals through serial/parallel port (or sound card) to PC.

21. PC based data acquisition using add-on (PCI) card: analog/digital inputs.

22. To study the voltage – intensity characteristics of a photo – transistor

23. To study the ramp response characteristics of filled in system thermometer.

24.To study the characteristics of Angular potentiometer transducer model.

25.To study the Measurement of temp, depth etc by optical fibre sensor.

NOTE:

A minimum of 10(Ten) experiments have to be performed and recorded by the Candidate to attain eligibility for Final Practical Examination.

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CONSTITUTION OF INDIA
CODE : (20EI306/MC01)

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

Course Objectives:

1. To realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
2. To identify the importance of fundamental rights as well as fundamental duties.
3. To understand the functioning of Union, State and Local Governments in Indian federal system.
4. To learn procedure and effects of emergency, composition and activities of election commission 1and amendment procedure.

UNIT - I

Introduction to Constitution: Meaning and importance of the Constitution, salient features of Indian Constitution. Preamble of the Constitution. Fundamental rights- meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance.

UNIT - II

Union Government: Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition and powers and functions.

UNIT - III

State and Local Governments: State Executive- Governor, Chief Minister, Council of Ministers. State Legislature-State Legislative Assembly and State Legislative Council. State Judiciary-High court. Local Government-Panchayat raj system with special reference to 73rd and Urban Local Self Govt. with special reference to74th Amendment.

UNIT - IV

Elections: Election provisions, Emergency provisions, Amendment of the constitution L-6Hrs. Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure and limitations.

TEST BOOKS:

1. M.V.Pylee, “Introduction to the Constitution of India”,4th Edition, Vikas publication,2005.
2. Durga Das Basu(DD Basu) , “Introduction to the constitution of India”,(Student Edition),19th edition,Prentice-Hall EEE, 2008.

Reference Book:

Merunandan, “Multiple Choice Questions on Constitution of India”, 2 nd Edition,Meraga publication,2007.

Course Outcomes:

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

CO-1	Understand and explain the significance of Indian Constitution as the fundamental law of the
CO-2	Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
CO-3	Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail
CO-4	Understand Electoral Process, Emergency provisions and Amendment procedure.

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)				Scheme of Examination (Maximum marks)			No. of Credits	CATO GORY
		L	T	P	Total	CIE	SEE	Total Marks		
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/ SO02	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

Bapatla Engineering College: Bapatla

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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		

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

Bapatla Engineering College: Bapatla

(Autonomous)

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 : 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.

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

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.

Bapatla Engineering College: Bapatla

(Autonomous)

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.

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:

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

Bapatla Engineering College: Bapatla

(Autonomous)

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.

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.
2. David.A.Bell , Electronic Instrumentation and Measurements, PHI.

Bapatla Engineering College: Bapatla

(Autonomous)

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 Out comes:

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

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 Edition
2. Electronic Devices and Circuit Theory", Robert L. Boylestad and Louis Nashelsky
3. 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

Bapatla Engineering College: Bapatla

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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 Outcomes :

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

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

Bapatla Engineering College: Bapatla

(Autonomous)

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 Outcomes :

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

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)

ANALOG ELECTRONIC CIRCUITS LAB

(20EIL402)

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

Course Objectives :

CO1 : To understand Analysis of HWR and FWR with & without filter

CO2 : Able to design both small signal and large signal amplifiers

CO3 : Can understand the feed back amplifier and RC coupled amplifiers

CO4 : Able to design any type of nonlinear wave shaping circuits

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

Bapatla Engineering College: Bapatla

(Autonomous)

Measurements Lab

(20EIL403)

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

Course Objectives :

CO1 : To understand Analysis of HWR and FWR with & without filter

CO2 : Able to design both small signal and large signal amplifiers

CO3 : Can understand the feed back amplifier and RC coupled amplifiers

CO4 : Able to design any type of nonlinear wave shaping circuits

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.

Bapatla Engineering College: Bapatla

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SIGNALS AND SYSTEMS LAB

(20EI1404)

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

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.

LIST OF LAB EXPERIMENTS

1. Basic Operations on Matrices.

2. Generation of basic continuous time signals namely unit impulse, step, ramp, exponential

and Sinusoidal signals.

3. Generation of basic discrete time signals namely unit impulse, step, ramp, exponential and Sinusoidal signals.

4. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.

5. Finding the Even and Odd Parts of Signal or Sequence and Real and Imaginary Parts of Signal.

6. Verification of linearity and time invariance properties of a given continuous /discrete system.

7. Convolution between Signals and Sequences.

8. Autocorrelation and Cross correlation between Signals and Sequences.

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

10. mputation of Unit Sample, Unit Step and Sinusoidal Responses of the Given LTI System and Verifying its Physical Realizability and Stability Properties.

11. Finding the Trigonometric Fourier Series of a given Signal.

12. Finding the Fourier Transform of a given Signal and plotting its Magnitude and Phase spectrum.

13. Sampling Theorem Verification.

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

15. 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.

Bapatla Engineering College: Bapatla

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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
20EI505/ PE11-13	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	

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
SA – Skill advanced 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

Bapatla Engineering College: Bapatla

(Autonomous)

Control Systems

(20EI501)

Course category : PROFESSONAL CORE			Course type : Theory	
LectureHours: 3Hr./Week	Tutorial : 1Hr.	C I E: 30M	SEE : 70M	Credits : 3

Course Objectives :

1 : Able to apply Laplace transform and state space techniques to model dynamic systems.
2 : Able to understand of the fundamentals of control systems.
3 : Able to determine the time domain responses of first and second-order systems.
4 : Able to analyze the system behaviour in frequency domain and able to manipulate the system stability using compensator.

UNIT – I

Introduction: Basic concept of simple control system, open loop – closed loop control systems. Effect of feedback on overall gain – stability , sensitivity and external noise. Types of feed back control systems – Liner time invariant, time variant systems and non linear control systems.

Mathematical models and Transfer functions of Physical systems: Differential equations – impulse response and transfer functions – translational and rotational mechanical systems. Transfer functions and open loop and closed loop systems. Block diagram representation of control systems – black diagram algebra – signal flow graph – Mason's gain formula Components of Control Systems: DC servo motor – AC servo motor – synchro transmitter & receiver.

UNIT – II

Time domain analysis: Standard test signals – step, ramp, parabolic and impulse response function – characteristic polynomial and characteristic equations of feed back systems – transient response of first order and second order systems to standard test signals. Time domain specifications – steady state response – steady state error and error constants. Effect of adding poles and zeros on over shoot, rise time, band width – dominant poles of transfer functions.

Stability Analysis in the complex plane: Absolute, relative, conditional, bounded input – bounded out put, zero input stability, conditions for stability, Routh – Hurwitz criterion.

UNIT – III

Frequency domain analysis: Introduction – correlation between time and frequency responses – polar plots – Bode plots – Nyquist stability criterion – Nyquist plots. Assessment of relative stability using Nyquist criterion – closed loop frequency response.

UNIT – IV

Root locus Technique: Introduction – construction of root loci State space analysis: Concepts of stat, state variables and state models – digitalization –

solution of state equations – state models for LTI systems. Concepts of controllability and Observability.

TEXT BOOKS:

1. B.C. Kuo, Automatic control systems, 7th edition, PHI.
2. I.J.Nagrath & M Gopal, Control Systems Engineering, 3rd edition, New Age International.
3. K. Ogata, Modern Control Engineering, 3rd edition, PHI.

REFERENCE BOOKS:

1. Schaum Series, Feedback and Control Systems, TMH
2. M.Gopal, Control Systems Principles and Design, TMH
3. John Van de Vegta, Feedback Control Systems, 3rd edition, Prentice Hall,1993.

Linear Integrated Circuits and Applications

(20EI502)

Course category : PROFESSONAL CORE			Course type : Theory	
LectureHours: 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.

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)
[3] D.V.S.Murty, "Transducers & Instrumentation", IIed, PHI. (UNIT IV)

REFERENCE BOOKS:

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

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(Autonomous)

MICROCONTROLLERS

(20EI503)

Course category : PROFESSIONAL CORE			Course type : Theory	
LectureHours: 3Hr./Week	Tutorial : 0	C I E: 30M	SEE : 70M	Credits : 3

Course Objectives :

1 : To understand the concept of microcontroller based system
2 : To enable design and programming of microcontroller (8051)based system.
3 : To know about the interfacing circuits.
4 : To enable design and programming of PIC microcontroller based system.

UNIT-1

Introduction: Comparison of microprocessor and microcontroller, evolution of microcontrollers from 4 bit to 32 bit, development tools for microcontrollers, Assembler-Compiler- simulator/ Debugger.
Microcontroller Architecture: Over view and block diagram of 8051,Architecture of 8051, memory organization, , PSW registers, register banks, and stack, pin diagram of 8051, port organization, Interrupts and timers, Addressing modes.

UNIT-II

Instruction set of 8051: Arithmetic, Logical, Simple bit, jump, loop and call instructions and their usage. Time delay generation and calculation, Timer/ Counter programming.
Assembly language programming: Data types and directives ,Addition, Multiplication, Subtraction, division, finding from a given set of numbers, arranging given set of numbers in ascending / descending order.

UNIT-III

Interfacing and application of Microcontroller: Interfacing of PPI 8255, Temperature measurement (LM35). Interfacing and application of Microcontroller: DAC (0804), interfacing seven segment displays, displaying information on a LCD, control of a stepper motor (Uni – polar), Interfacing a 4 X 3 matrix Keypad, Generation of different types of waveforms using DAC.

UNIT- IV

PIC 16F8XX Flash Microcontrollers : Introduction,pin diagram of 16F8XX,Registers –STATUS,OPTION_REG,PCON,Program Memory,Data Memory,Interrupts,I/O ports,Timers,Capture/compare/PWM Modules in PIC16F877,MSSP Module,USART,ADC.

TEXT BOOKS:

1. The 8051 microcontroller and embedded systems By Muhammad Ali Maxzali and Janice Gillispe MazaDi – Pearson edition Asis, 4th Reprint 2002.
2. Microcontroller theory and application by Ajay V.Deshmukh.

REFERENCE BOOKS:

1. The 8051 Microcontroller Architecture, programming and applications by Kenneth J.Ayala, West publishing company .
2. Microcontrollers Architecture programming, Interfacing and systems design by Ral kamal
3. Douglas V. Hall, Microprocessors and interfacing: programming and hardware, Tata
McGraw Hill, 2editon, 2007.

PYTHON PROGRAMMING

(20EI504/JO 05)

Course category : PROFESSIONAL CORE			**Course type : Theory**
Lecture Hours: 2Hr./Week	**Tutorial -0**		**Practical Hours :2Hr./Week**
C I E: 30M	**SEE : 70M**		**Credits : 3**

Course Objectives:

1. The course shows you how to use the free open-source Python to write basic
2. programs
3. level applications using concepts such as Class, BIF of Python,
4. understanding of the basic components of computer programming using the Python language
5. Understanding how the database and web services can be accessed using python programming.

UNIT - I

Introduction to Python Language, Strengths and Weaknesses, IDLE, Dynamic Types, Naming Conventions, String Values, String Operations, String Slices, String Operators, Numeric Data Types, Conversions, Built In Functions

Data Collections and Language Component : Introduction, Control Flow and Syntax, Indenting, The if Statement, Relational Operators, Logical, Operators, True or False, Bit Wise Operators, The while Loop, break and continue, The for Loop, Lists, Tuples, Sets, Dictionaries, Sorting Dictionaries,

UNIT - II

Object and Classes : Classes in Python, Principles of Object Orientation, Creating Classes, Instance Methods, Special Methods, Class Variables, Inheritance, Polymorphism, Type Identification, Custom Exception Classes

UNIT – III

Functions and Modules : Introduction, Defining Your Own Functions, Parameters

Function Documentation, Keyword and Optional Parameters, Passing Collections to a Function, Variable Number of Arguments, Scope, Functions - assing Functions to a Function, Mapping Functions in a Dictionary, Lambda, Modules, Standard Modules – sys, math.

UNIT –IV

I/O and Error Handling In Python : Introduction ,Data Streams, Creating Your Own Data Streams, Access Modes, Writing Data to a File, Reading Data From a File, Handling IO Exceptions, Working with Directories, Metadata, Errors, Run Time Errors, The Exception Model, Exception Hierarchy, Handling Multiple Exceptions.

Text Books:

1. Dive into Python, Mike
2. Learning Python, 4th Edition by Mark Lutz

Reference Books:

1. Programming Python, 4th Edition by Mark Lutz

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ANALOG AND DIGITAL COMMUNICATIONS

(20EI505/PE11)

Course category : PROFESSIONAL ELECTIVE		Course type : Theory
Lecture Hours: 3Hr./Week	Tutorial -0	Practical Hours :0
C I E: 30M	SEE : 70M	Credits : 3

Course objectives

1. Understand analog and digital communication techniques.
2. Learn data and pulse communication techniques.
3. Be familiarized with source and Error control coding.
4. Gain knowledge on multi-user radio communication.

UNIT I

ANALOG COMMUNICATION (15P)

Introduction to Communication Systems: Modulation – Types – Need for Modulation. Theory of Amplitude Modulation – Evolution and Description of SSB Techniques – Theory of Frequency and Phase Modulation – Comparison of various Analog Communication System (AM – FM – PM).

UNIT II

PULSE COMMUNICATION (15P)

Pulse Communication: Pulse Amplitude Modulation (PAM) – Pulse Time Modulation (PTM) – Pulse code Modulation (PCM) – Comparison of various Pulse Communication System (PAM – PTM – PCM). Noise: Source of Noise – External Noise- Internal Noise- Noise Calculation.

UNIT III

DIGITAL COMMUNICATION(15P)

Amplitude Shift Keying (ASK) – Frequency Shift Keying (FSK) Minimum Shift Keying (MSK) –Phase Shift Keying (PSK) – BPSK – QPSK – 8 PSK – 16 PSK – Quadrature Amplitude Modulation (QAM) – 8 QAM – 16 QAM – Bandwidth Efficiency– Comparison of various Digital Communication System (ASK – FSK – PSK – QAM).

UNIT IV

SOURCE AND ERROR CONTROL CODING(8P)

Entropy, Source encoding theorem, Shannon fano coding, Huffman coding, mutual information, channel capacity, channel coding theorem, Error Control Coding, linear block codes, cyclic codes, convolution codes, viterbi decoding algorithm.

MULTI-USER RADIO COMMUNICATION(7P)

Advanced Mobile Phone System (AMPS) – Global System for Mobile Communications (GSM) – Code division multiple access (CDMA) – Cellular Concept and Frequency Reuse – Channel Assignment and Hand – Overview of Multiple Access Schemes – Satellite Communication – Bluetooth.

Text Books:

1. B. P.Lathi, “Modern Analog and Digital Communication Systems”, 3rd Edition, Oxford University Press, 2007
2. Wayne Tomasi, “Advanced Electronic Communication Systems”, 6th Edition,

Pearson Education, 2009.

Reference Books:

1. Simon Haykin, “Communication Systems”, 4th Edition, John Wiley & Sons, 2004
2. Rappaport T.S, “Wireless Communications: Principles and Practice”, 2nd Edition, Pearson Education, 2007
3. H.Taub, D L Schilling and G Saha, “Principles of Communication”, 3rd Edition, Pearson Education, 2007.
4. B. P.Lathi, “Modern Analog and Digital Communication Systems”, 3rd Edition, Oxford University Press, 2007.

DIGITAL CONTROL SYSTEMS

(20EI505/PE12)

Course category : professional Core		**Course type : Theory**
Lecture Hours: 3Hr./Week	**Tutorial -0**	**Practical Hours :nil Hr./Week**
C I E: 30M	**SEE : 70M**	**Credits : 3**

Course objectives :

1. Represent discrete time systems under the form of Z-domain transfer functions and state space models
2. Analyse stability, transient response and steady state behaviour of linear discrete time systems, analytically and numerically using tools
3. Design digital control systems using transform techniques and state space models
4. Describe the test controllability and observability of linear systems

UNIT-I

Introduction to Digital Control : The structure of a digital control system, examples of digital control systems.

Discrete time systems : Analog systems with piecewise constant inputs, difference equations, the Z-transform, computer aided design, Z-transform solution of difference equations, the time response of a discrete time system, the modified Z-transform, frequency response of discrete time systems, the sampling theorem.

Modeling of Digital control systems : ADC model, DAC model, the transfer function of the ZOH, effect of the sampler on the transfer function of a cascade, DAC, analog subsystem, and ADC combination transfer function, systems with transport lag, the closed loop transfer function, analog disturbances in a digital system, steady-state error and error constants, MATLAB commands.

UNIT-II

Stability of Digital Control systems :Definitions of stability, stable Z-domain pole locations, stability conditions, stability determination, Jury test, Nyquist criterion

Digital control system Design : z-domain root locus, z-domain digital control system design, digital implementation of analog controller design, direct z-domain digital controller design, frequency response design, direct control design, finite settling time design.

UNIT-III

State space representation of Digital control system : State variables, state-space representation, linearization of nonlinear state equations, the solution of linear state space equations, the transfer function matrix, discrete time state-space equations, solution of discrete time state-space equations, z-transfer function from state space equations, similarity transformation

Properties of discrete state-space models: Stability of state space realizations, controllability and stabilizability, observability and detectability, poles and zeros of multivariable systems, state space realizations, duality, Hankel

realization

UNIT-IV

State feedback control : State and output feedback, pole placement, servo problem, invariance of system zeros, state estimation, observer state feedback, pole assignment using transfer functions.

Optimal control : Optimization, optimal control, the linear quadratic regulator, steady state quadratic regulator, Hamiltonian system

Text Books:

1. M Sami Fadali, Antonio Visioli: Digital Control Engineering : Analysis and design, third edition, Elsevier, Academic press, 2020
2. Hemachandra Madhusudhan Shertukde : Digital control applications illustrated with MATLAB, CRC press

Reference Books:

1. Benjamin C Kuo: Digital control systems, second edition, Oxford University press Katsuhiko Ogata: Discrete time control systems , Prentice Hall

OPERATING SYSTEMS
(20EI505/PE13)

Course category : PROFESSIONAL CORE	**Course type : Theory**

Lecture Hours: 3Hr./Week	Tutorial -0	Practical Hours :nil Hr./Week
C I E: 30M	SEE : 70M	Credits : 3

Corse Objectives

1.To explain main components of OS and their working
2. To familiarize the operations performed by OS as a resource Manager
3. To impart various scheduling policies of OS
4. To teach the different memory management techniques.

UNIT - I

OPERATING SYSTEMS OVERVIEW: Introduction, operating system operations, process management, memory management, storage management, protection and security, distributed systems. OPERATING SYSTEMS STRUCTURES: Operating system services and systems calls, system programs, operating system structure, operating systems generations.

UNIT - II

PROCESS MANAGEMENT: Process concepts, process state, process control block, scheduling queues, process scheduling, multithreaded programming, threads in UNIX, comparison of UNIX and windows. CONCURRENCY AND SYNCHRONIZATION: Process synchronization, critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of synchronization, readers and writers problem, dining philosophers problem, monitors, synchronization examples(Solaris), atomic transactions. Comparison of UNIX and windows.

UNIT – III

DEADLOCKS: System model, deadlock characterization, deadlock prevention, detection and avoidance, recovery from deadlock banker's algorithm. MEMORY MANAGEMENT: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms, allocation of frames, thrashing, case study - UNIX.

UNIT – IV

FILE SYSTEM: Concept of a file, access methods, directory structure, file system mounting, file sharing, protection. File system implementation: file system structure, file system implementation, directory implementation, allocation methods, free-space management, efficiency and performance, comparison of UNIX and windows

I/O SYSTEM: Mass storage structure - overview of mass storage structure, disk structure, disk attachment, disk scheduling algorithms, swap space

management, stable storage implementation, tertiary storage structure. I/O: Hardware, application I/O interface, kernel I/O subsystem,

TEXT BOOKS:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition, Wiley India Private Limited, New Delhi.

REFERENCE BOOKS:

1. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.

2. Andrew S. Tanenbaum (2007), Modern Operating Systems, 2nd edition, Prentice Hall of India, India.

3. Deitel & Deitel (2008), Operating systems, 3rd edition, Pearson Education, India.

PROGRAMMABLE LOGIC CONTROLLERS

(20EIL501/SA 01)

Course category : SKILL ADVANCED		**Course type : Theory**
Lecture Hours: 1Hr./Week	**Tutorial -0**	**Practical Hours :2Hr./Week**
C I E: 30M	**SEE : 70M**	**Credits : 2**

Course Objectives :

1 : Familiarise students with PLC structure and it usage in the industry
2 : Learn the programming of PLC to solve simple problems.
3 : Make the student to develop ladder logic programming.
4 : Develop simple project using PLCs.

LIST OF EXPERIMENTS :

1. Direct Online Starter for Three Phase Induction Motor
2. Star Delta Starter for Three Phase Induction Motor
3. Automatic Forward And Reverse Control of Three Phase Induction Motor
4. Plugging of Three Phase Induction Motor 17 - 20 5 Sequential Control of Motors
5. Speed Control of DC Motor
6. Control of Lift 28 - 30 8 Fault Annunciation System
7. Traffic Signal Control
8. Up Down Counter
9. Timers
10. Digital Clock
11. Temperature Control System

Note:

A minimum of 10(ten) experiments have to be performed and recorded by the Candidate to attain eligibility for university practical examination.

CONTROL SYSTEMS LAB
(20EIL502)

Course category : PROFESSIONAL CORE		**Course type : Theory**
Lecture Hours:	**Tutorial**	**Practical Hours :3Hr./Week**
C I E: 30M	**SEE : 70M**	**Credits : 1.5**

Course Objectives :

1 : Develop functions to various control systems simulations..
2 : To determine experimentally the step and impulse responses of a given first order and second order system.
3 : Determination of root locus plot of a control system
4 : Determination of Bode plot and Nquist plot for the given systems and also to study the effect of PI&PD controller on system performance

LIST OF EXPERIMENTS :

1. Familiarization with matlab control system tool box, Matlab /simulink tool box
2. Determination of step & impulse response for a first order unity feedback system.
3. Determination of step & impulse response for a second order unity feedback system
4. Determination of step & impulse response for a type '0', type '1', type '2' systems
5. Determination of bode plot using matlab control system toolbox for 2nd order system &obtain controller specification parameters.
6. Determination of root locus plot using matlab control system toolbox for 2nd order system & obtain controller specification parameters.
7. Determination of Nyquist plot using matlab control system toolbox.
8. Study the effect of pi&pd controller on system performance
9. Study the effect of addition of zeros to the forward path transfer function of a closed loop system
10. Study the effect of addition of poles to the forward path transfer function of a closed loop system
11. Block diagram reduction using matlab
12. Digital simulation of linear control systems using simulink .
13. Transfer function analysis of 3rd order using Simulink

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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MICROCONTROLLERS LAB

(20EIL503)

Course category : PROFESSONAL CORE		Course type : Theory
Lecture Hours:	Tutorial	Practical Hours :3Hr./Week
C I E: 30M	SEE : 70M	Credits : 1.5

Course Objectives :

1 : Develop functions to various control systems simulations..

2 : To determine experimentally the step and impulse responses of a given first order and second order system.

3 : Determination of root locus plot of a control system

4 : Determination of Bode plot and Nquist plot for the given systems and also to study the effect of PI&PD controller on system performance

LIST OF EXPERIMENTS :

1. Addition and subtraction of two 8/16 bit numbers with carry/borrow .

2. Multiplication of 8/16and division of 16/8 bit numbers.

3. BCD operation and reverse and X-OR of given numbers.

4. Subtraction of two 16/32/64 bit numbers (Keil software).

5. Program for swapping and compliment of 8- bit numbers (Keil software).

6. Program to find the largest / Smallest number in given array (Keil software).

7. Interfacing LED to 8051 microprocessor (Keil software).

8. Interfacing buzzer to 8051 microcontroller (Keil software).

9. Interfacing Seven segment to 8051 microcontroller (Keil software).

10 Program to show message on serial monitor(c program).

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PROFESSIONAL ETHICS AND HUMAN VALUES

(20EI506/MC02)

Course category : MANDATORY COURSE			Course type : Theory	
LectureHours: 2Hr./Week	Tutorial : 0	C I E: 30M	SEE :00M	Credits : 0

Course Objectives :

1 : Understand the basic concepts of Professional ethics and human values & Students also gain the connotations of ethical theories.

2 : Explain the duties and rights towards the society in an engineering profession

3 : Realize the importance and necessity of intellectual property rights.

4 : Necessary precautions while conducting the experiments, which may reduce the risk. Understands the importance of risk evacuation system in reality and takes the utmost responsibility while handling the risky situations.

UNIT – I

Human Values: Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully, caring, Sharing, honesty, Courage, Valuing Time, Co-operation, Commitment, Empathy, Self Confidence, Character, Spirituality.

UNIT - II

Engineering Ethics: Senses of 'Engineering Ethics', Variety of model issues, Types of inquiry, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory, Consensus and Controversy, Professions and Professionalism, Professional Ideals and Virtues, Theories about right action, Self-interest, customs and Religion, Uses of Ethical Theories.

UNIT III

Engineering as Social Experimentation: Engineering as Experimentation, Engineers as responsible Experimenters, Codes of Ethics, A Balanced Outlook on Law.

Safety, Responsibility and Rights: Safety and Risk-Assessment of Safety and Risk , risk Benefit analysis and reducing risk.

Collegiality and Loyalty , Respect for Authority , Collective Bargaining - Confidentiality ,

aterials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

UNIT - IV

Global Issues: Multinational Corporations , Environmental Ethics , Computer Ethics , Weapons Development , Engineers as Managers , consulting Engineering , Engineers as Expert Witnesses and Advisors, Moral Leadership,Sample Code of Ethics like ASME, ASCE, IEEE, Institution of engineers (India), Indian Institute of Engineers, Oxford University Press, 2001.

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, New York 1996.

2. Govindarajan. M, Natarajan. S, Senthilkumar. V.S, Engineering Ethics, PHI, 2004

REFERENCE BOOKS:

1. Charles D Fleddermann, Engineering Ethics, Prentice Hall, New Jersey, 2004
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, Engineering Ethics Concepts and Cases, Thomson Learning, United States, 2000.
3. John R Boatright, Ethics and the Conduct of Business, PHI,New Delhi, 2003.

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DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

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
20EI604/ PE 211-23	Professional Elective	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/ SA04,	Soft skills Course /LAB	1	0	2	3	30	70	100	2	SAC
20EIL602	Process Control Lab	0	0	3	3	30	70	100	1.5	PC
20EIL603	Digital Signal Processing Lab	0	0	3	3	30	70	100	1.5	PC
20EIL604	Biomedical Instrumentation Lab	0	0	3	3	30	70	100	1.5	PC
20EI606/ MC03	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		

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**

PROCESS CONTROL
(CODE:20EI601)

Course category : PC			Course type : Theory	
LectureHours: 3Hr./Week	Tutorial : 0	C I E: 30M	SEE :70M	Credits : 3

Course Objectives :

1 : Study the characteristics of physical systems and Controllers
2 : Realise various controllers and to know the functionality of various final control elements
3 : Design advanced controller for any given control system
4 : Tune a controller and to find the mathematical model of any process

UNIT-I

Introduction to Process Control:- Definition, Regulatory and servo control, Elements of Process Control, Process Variables, degrees of freedom, Characteristics of liquid System, gas System, thermal System, Mathematical model of liquid process, gas process and thermal process, self regulation.
Controller Characteristics:- The automatic Controller, Proportional Control, Integral Control, Proportional – Integral Control, Proportional Derivative Control, Proportional – Integral Derivative action, Integral windup and Anti-windup, Transient response of control systems using different control modes, Guideline for selection of controller mode, Two position control, Single speed floating Control, Digital version of PID controllers.

UNIT-II

Controlling Elements:- Self operated controller – pneumatic controllers (displacement type), Air supply for pneumatic systems, Hydraulic Controller, electrical and electronic controllers, pneumatic and electric transmission system, voice – coil motor.
Final Control Elements:- Pneumatic actuators, Electro Pneumatic actuators, Hydraulic actuators, Electric motor actuators, Two position motor actuator, sliding stem control valves, rotating shaft Control valves, Fluid flow through control valves, Control valve sizing

UNIT-III

Advanced Control Strategies:- Cascade Control, Analysis of cascade control, feed forward Control, Analysis of feed-forward control, Ratio Control, Dead time Compensation(Smith Predictor), Internal model control, override control, split range control

UNIT-IV

Controller tuning and process identification:- Controller tuning, criteria for good control, Model based controller design methods : Direct synthesis method, internal model control based method, Ziegler – Nichols tuning rules, Cohen coon tuning rules, Controller tuning by damped oscillation

method, process identification: step testing, Frequency testing, pulse testing.

P & I Diagram :- Introduction**,** Definitions of terms used in P&I diagrams, Instrument identification, Examples of P&I diagrams

TEXT BOOKS:

1. Donald P. Eckman: Automatic process Control, Wiley Eastern, New Delhi, 1958
2. Surekha Bhanot : Process control, principles and applications, oxford university press
3. D.R. Coughanowr: Process systems analysis and control (2/e), McgrawHill, NY, 1991

REFERENCE BOOKS:

1. B. Liptak: Process Control: Instrument Engineers Handbook
2. W.L. Luyben and M.L. Luyben: Essentials of Process Control, McgrawHill, NY, 1997
3. Dale E. Seborg, Thomas F. Edgar, Duncan A. Mellichamp, Francis J. Doyle III : process dynamics and control- 4th edition- Wiley
4. Myke King : Process Control A Practical Approach, Wiley
5. Su Whan Sung, Jietae Lee, In-Beum Lee :Process identification and PID control, IEEE press, John Wiley and sons
6. G. Stephanopoulus: Chemical process Control, Prentice Hall of India, New Delhi, 1995
7. Carlos A. Smith : Aotomated continous process control, John Wiley and sons

DIGITAL SIGNAL PROCESSING
(CODE:20EI602)

Course category : PC			Course type : Theory	
LectureHours: 3Hr./Week	Tutorial : 0	C I E: 30M	SEE :70M	Credits : 3

Course Objectives :

1 : Differentiate the different types of discrete time signals and their representations. Understand the different types of responses of a system.

2 : Calculate Z-transform and Inverse Z-transform and differentiate the different realization techniques of discrete systems.

3 : Differentiate the different types of filters and understand the different transformation techniques

4 : Find the DFT and FFT and understand the importance of FFT in digital signal processing.

UNIT – I

Discrete Time Signals And Systems: Discrete time signals, Discrete time Systems, Analysis of Discrete Time LTI system, Solution of Linear Constant-Coefficient Difference Equations, The Impulse Response of a LTI Recursive system.

Z-Transforms: Z-transform, Region of convergence, Properties of Z-transforms, Inversion of Z-transform, Causality and Stability of LTI systems in Z-domain, The One Sided Z-transform

UNIT – II

Fourier Series for Discrete – time Periodic Signals. DFT: The Discrete Fourier Transform, Properties of the DFT. FFT: Efficient Computations of the DFT, Radxi-2 DITFFT and DIFFFT algorithms, IDFT using DFT, Applications of FFT algorithms, Quantization Effects in the Computation of the DFT.

UNIT – III

Design of Digital Filters: General Considerations, Design of FIR Filters: Symmetric and Antisymmetric FIR filters, Design of Linear-phase FIR filters using Windows, Design of Linear phase FIR filters by the Frequency-Sampling Method. Structural Realization of FIR Systems: Direct, Canonic, Cascade, Frequency Sampling & Lattice Structure. **UNIT – IV**

Design of IIR Filters From Analog Filters: Characteristics of Commonly used Analog Filters, IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation, Frequency Transformations, Structural Realization of IIR Systems: Direct, Canonic, Transposed, Cascade, Parallel, Lattice-Ladder.

TEXT BOOKS:

(vii) 1. John G.Proakis, Dimitris G Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Pearson Education / PHI, 2003

REFERENCE BOOKS:

(viii) S K Mitra, Digital Signal Processing: A Computer Based Approach, 2nd Edition, TMH, 2003

(ix) Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley & Sons, 2003.
(x) Alan V Oppenheim and Ronald W Schafer, Digital Signal Processing, Pearson Education/PHI, 2004 Johnny R. Johnson, Introduction to Digital Signal Processing, PHI, 2001.
(xi) Andreas Antoniou, Digital Signal Processing, TMH, 2006.

BIOMEDICAL INSTRUMENTATION
(CODE:20EI603)

Course category : PC			Course type : Theory	
LectureHours: 3Hr./Week	Tutorial : 0	C I E: 30M	SEE :70M	Credits : 3

Course objectives:

1: Acquire knowledge on operating principles and performance parameters of various medical instruments along with different cell potentials

2: Understand and importance of EEG, EMG, along with Pacemaker, Defibrillators and Short wave Diathermy

3: Illustrate blood flow and pressure measurement using different methods

4: Analyse and evaluate different diagnostic measurement methods for identification clinical laboratory instruments and Thermal imaging systems

UNIT – I

Introduction: Introduction to Bio-Medical Engineering field, Components of Man-Instrument system, problems encountered in measuring a living system

Physiological systems of the Body: Basic Features of cardiovascular system, Nervous system, muscular system, respiratory system.

Resting potential & action potential concepts: Resting potential concept, characteristics of resting potential, action potential concept, propagation of action potential.

Bio-electric potentials: Definition for Bio-electric Potential, Typical Examples of Bio-Electric Potential with important features

UNIT – II

Bio-Medical Electrodes: Introduction to Bio-Medical Electrodes, Various types of Bio-Medical Electrodes: surface electrodes, micro electrodes, needle electrodes depth electrodes.

Electro Cardiograhphy (ECG): Introduction to electro cardiography, ECG LEAD Concept, various types of ECG Lead configurations, typical ECG waveform details, ECG recording, Analysis of Recorded ECG waveform.

Electro Encephalography (EEG): Introduction to Electro Encephalography, EEG Recording EEG in diagnostics

Electro Myography: Introduction to Electro-Myography, EMG Recording, EMG Applications.

UNIT – III

Cardiovascular Measurements: Introduction to various cardiovascular parameters: Blood Pressure Blood flow, cardiac output, Heart sounds. Blood Pressure Measurement techniques: Direct methods & In-direct Methods.

Blood flow measurement techniques: Electro Magnetic Blood flow meter, ultrasonic Blood flow meter, Thermal convection method. Cardiac output Measurement techniques: Fick's technique, Indicator dillution method, thermal dilution method, Impedance change method. Phono cardiography: Heart sounds Recording

UNIT – IV

Therapeutic Instruments: Cardiac Pacemakers, Types of pacemakers: External pace makers, Internal Pacemakers, Pacing modes, lead wires & Electrodes for internal pacemakers, power sources for implantable cardiac pacemakers, hem dialysis. Cardiac defibrillators, defibrillator electrodes, Introduction to diathermy. Various diathermy apparatus: surgical, shortwave, microwave .

Instruments for clinical laboratory: Introduction to Bio-Chemical electrodes, Types of Bio-Chemical electrodes for measurement of various Blood gas parameters such as Blood P^{H}, $P^{O2}P^{CO2}$ Blood gas analyzer, Blood cell counters.

Modern technologies in Bio-Medical field: Use of X-Rays in medicine, CT scan, ultrasound applications in medicine, MRI scan.

TEXT BOOKS:

[1] R.S Kandpur. " Handbook of Biomedical Instrumentation, IInd ed, Tata McGraw Hill,

[2] 2011Leslie Cromwell, Fred J. Weibell and Erich A,Pleiffer, " Biomedical instrumentation and Measurements", IInd ed, Prentice Hall of India,2004

REFERENCE BOOKS:

[1] Webster, Medical Instrumentation Application&Design, John Wiley& sons

[2] Jog: Electronics in Medicine and Biomedical Instrumentation, Prentice Hall of India,2006

[3] Dr.M.Armugam,"Biomedical Instrumentation" IInd ed, Anuradha Publications,2009

. INDUSTRIAL INSTRUMENTATION
(CODE 20EID21)

Course category : PROFESSIONAL ELECTIVE			Course type : Theory	
LectureHours: 3Hr./Week	Tutorial : 0	C I E: 30M	SEE :70M	Credits : 3

Course Objectives:

1. To deal with various types of Sensors & Transducers for measurement of velocity, acceleration and vibration
2. To deal with the measurement techniques of force, torque and pressure
3. To deal with the measurement techniques of process parameters flow and level
4. To deal with the measurement techniques of viscosity, specific gravity, humidity and moisture

UNIT- I

Introduction: Introduction to Speed/Velocity, Acceleration, Vibration Measurements

Speed/Velocity Measurement: Linear Velocity Measurement techniques: Electro dynamic Transducer, Electro Magnetic Transducer, Doppler transducer, Digital Transducer.

Rotational Speed/Angular velocity Measurement techniques: Revolution counter/Timer, Eddy Current tachometer, DC generator tachometer, AC generator tachometer, Variable reluctance tachometer, Photo-electric pick up, Stroboscope.

Acceleration Measurement: Acceleration Measurement techniques: Seismic Accelerometer, LVDT Accelerometer, Piezo-electric accelerometer, Strain gauge accelerometer.

Vibration Measurement: Vibration Measurement techniques: Capacitive vibration sensor, Inductive vibration sensor, Reed type vibration sensor.

UNIT- II

Force Measurement: Introduction, Force Measurement techniques: Analytical Balance, Unequal lever arm balance, Force balance method, Hydraulic load cell, Pneumatic load cell, Strain gauge load cell, Piezo-electric load cell, Vibration string transducer.

Torque Measurement: Introduction, Torque Measurement techniques: Torque Measurement using stroboscope, Strain gauge torque transducer, Optical torsion meter, Electrical torsion meter.

Pressure Measurement: Introduction, Pressure Measurement techniques: Force summing devices, McLeod gauge, Knudson gauge, thermo couple and Pirani gauges, Ionization gauge.

UNIT- III

Flow Measurement: Introduction, Flow Measurement techniques: Head type devices (Orifice plate, Venturi tube, and Pitot tube), Rota meter, Electromagnetic flow meter, Ultra sonic flow meter.

Level Measurement: Introduction, Level Measurement techniques: Dip sticks (Both ordinary and Optical Dipsticks), Hydro static devices, Ultra sonic level gauge, Radiation level sensor, Vibrating level sensor, Radar Methods, Using

Hot-Wire elements, Laser methods, Fiber optic level sensors.

UNIT- IV

Viscosity Measurement: Introduction, Units of Viscosity, Viscosity Measurement techniques: Co-axial cylindrical viscometer, Capillary tube viscometer, Redwood &Say bolt viscometers, Falling sphere viscometer, Two float viscometer, Definition for consistency, Consistency Measurement techniques: Rotating vane consistency meter, Oscillating type consistency meter.

Density/Specific gravity: Introduction, Specific gravity scales/Standards, Density/Specific gravity Measurement techniques: Buoyancy density meter, Hydrometer, Bubbler system, Gamma ray method.

Humidity & Moisture Measurement: Introduction, Humidity Measurement techniques: Hair Hygrometer, Electrical type Humidity transducer, Dry & Wet bulb Psychro meter, Al_2O_3 Hygro meter, Dew-point meter. Moisture Measurement techniques: Dean & Stark technique, Thermal drying technique, Karl Fischer technique, Resistive Moisture sensor, Capacitive Moisture sensor

Text Books:

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

Reference Books:

[[1] Ernest O Doebelin, " Measurement Systems", Vth ed,TMH
[2] D.Patranabis, "Sensors and Transducers" II nd ed., PHI, 2013.
[3] BC Nakra, KK Chaudhry "Instrumentation, Measurement and Analysis", II^{ed} TMH.

POWER PLANT INSTRUMENTATION

(CODE 20EIPE22)

Course category : PROFESSIONAL ELECTIVE			Course type : Theory	
LectureHours: 3Hr./Week	Tutorial : 0	C I E: 30M	SEE :70M	Credits : 3

Course Objectives:

1 Compare various types of power plants
2 Understand the operation of steam generation and its components.
3 Understand the operation of various types of boilers and turbines used in power plants
4 Understand the process operations and maintenance and management of the power plants

UNIT – I

An Overview Of Power Generation: Brief survey of methods of power generation Hydro, Thermal, Nuclear, Solar wind etc. Importance of instrumentation for power generation – Thermal power plants – Building Blocks Details of the Boiler process – PI diagram of Boiler.
Non electrical parameters, flow of feed water, fuel, air and strain with correction factors for temperature, pressure, temperature level –radiation detectors – smoke density measurement, dust monitor.

UNIT – II

Instrumentation and control in water circuit: Boiler feed water circulation: Natural circulation, forced circulation and combined circulation. Measurement in water circuit: water flow measurement, differential pressure measurement, steam flow measurement, water steam pressure, temperature measurements and drum level measurement. Control in water circuit boiler drum level , superheated steam temperature and pressure control. Measurement of impurities in water and feed water treatment.

UNIT – III

Instrumentation and control in air fuel circuit: air fuel circuit: fuels, combustion and flue and waste gases. Measurement of air fuel circuit : measurement of flow , quantity, pressure, temperature and level. Control in air fuel circuit: combustion and forced draft control. Analytical measurements.

Turbine Monitoring And Control: classification of turbines, safety control system, process control system. Lubrication for turbo alternator, and turbo alternator cooling system.

UNIT – IV

Power Plant Management: master control, combustion process, boiler efficiency, maintenance of measuring instruments, intrinsic and electrical safety, interlocks for boiler operation, computer based control and data logging systems. distributed control system

Text Books:

1. Power plant instrumentation by K.Krishna swamy, M.Ponni Bala, PHI publishers, EEE edition 2015.
2. Modern Power station practice: Volume 6, Instrumentation, Controls and Testing, Pergaman Press, Oxford 1971

Reference Books:

1. Elonka S.M. and Kohal, Standard Boiler Operations Questions and Answers, TMH, 1973
2. Wakil. M.M.; Power Plant Technology (Mc Graw Hills), 1985

ROBOTICS AND AUTOMATION

(CODE 20EIPE23)

Course category : PROFESSIONAL ELECTIVE			Course type : Theory	
LectureHours: 3Hr./Week	Tutorial : 0	C I E: 30M	SEE :70M	Credits : 3

Course Objectives:

1 To understand the basic anatomy of robots and trajectory planning
2 To enable students to understand about the work envelopes of robots and its role in automation
3 To give an overview of the various methods of control of robots
4 To select robots based on their applications and their related issues in industrial automation

UNIT–I

Fundamentals of Robots:Definition –Historical background- Robot Anatomy : Polar, Cylindrical, Cartesian coordinate, Joint-arm configuration–Work volume– Robot Drive System : Hydraulic, Electric, Pneumatic – Control System: Limited sequence, Play back with point to point and Continuous path control Intelligent Robots- Dynamic performance: Speed of response and Stability - Precision of movement: Spatial Resolution, Accuracy, Repeatability and Compliance – Introduction to End effectors, Robotic Sensors, Robot Programming and work cell control.

UNIT–II

Robot End Effectors, Sensors, End Effectors: Types-Mechanical grippers- Magnetic grippers, Vacuum cups, Adhesive gripper, Hooks and Scoops- Tools as end effectors - Robot/ End-effectors, interface- Consideration in Gripper selection and Design.

Sensors: Transducers and Sensors – Sensors in Robotics: Tactile, Proximity, and Range Sensors, Miscellaneous sensors and sensor based systems- Machine Vision System.

UNIT–III

Programming and Control of Robots :Robot Programming: Methods of Programming-: Lead through Methods, Robot program as a path in space- Motion interpolation, WAIT, SIGNAL and DELAY Commands, Branching, Capabilities and limitations of Lead through Methods-

Textual Robot Programming- structure, Motion, End effectors and Sensor commands, Program control communication, Monitor mode commands Robot Control: Open and Closed loop control- control Problem- Linear control Schemes- Design of Partitioned PD, PID and Adaptive Controllers for Linear Second order SISO Model of robot and their Block schematic representation- Control of Industrial Robots Using PLCs.

UNIT–IV

Automation :Factory Automation: Fixed Automation, Flexible Automation and Programmable Automation. Intelligent Industrial Automation, Industrial

Networking, Bus Standards Automatic Feeders, Automatic Storage and Retrieval Systems (AS/RS), Transfer Lines, Automatic Inspection Systems Applications of Robots, Factors influencing the selection of Robots – Robots for Welding, Painting, Assembly, Nuclear, Thermal and Chemical Plants.
Introduction to Mobile Robots, Legged Robots and Remote Controlled Robots, Automated Guided Robots, Micro Robots – Control and Safety Issues.

Text Books:

1. Groover, M.P., Weiss, M., Nagel, R.N., Odrey, N.G., Industrial Robots: Technology, Programming and Applications, McGraw-Hill Book Company, 2012.
2. Mittal R K, Nagrath I J, “Robotics and control”, Tata McGraw Hill, 2010.

Reference Books:

1. Groover, M.P., Automation, Production Systems, and Computer-Integrated Manufacturing, Prentice-Hall of India Private Limited, New Delhi, 2007
2. S.R.Deb, “Robotics Technology and Flexible Automation”, Tata McGraw Hill, 1994
3. Yoran Koren, Robotics for Engineers, McGraw Hill, 1980.
4. Saeed B. Niku, An Introduction to Robotics- Analysis, Systems, Applications, Second Edition, John Wiley & Sons Inc., 2010.
5. Wesley, E. Sryda, “Industrial Robots: Computer interfacing and Control” PHI, 1985.

SKILL ADVANCED COURSE (Soft skills course /lab)

(CODE 20EIL601/ SA04 -EL 04)

Course category : SAC			**Course type : PRACTICAL**	
Lecture Hours: 1Hr./Week	**PRACTICAL :2**	**C I E: 30M**	**SEE :00M**	**Credits : 2**

Course Objectives :

1. to understand facial expressions, gestures and postures for effective communication
2. to understand the importance of interpersonal and intrapersonal skills in an employability setting
3. to understand the process of thinking and analytical skills ethically
4. to understand team skills and its effectiveness in inculcating leadership qualities

UNIT - I

1. Body Language & Identity Management

a. Facial Expressions – Kinesics - Occulesics
b. Haptics - Proxemics
c. Para Linguistics
d. Appearance
e. Identity Management Communication

UNIT - II

2. Emotional Intelligence & Life Skills

a. Self Awareness through Johari Window and SWOC analysis
b. Self Motivation
c. Empathy
d. Assertiveness & Managing Stress
e. Positive Attitude
f. Time Management
g. Goal Setting: Short term, Long Term, Vision, Mission.

UNIT - III

3. Business Presentations

a. Preparing effective Presentations Power Point Presentations
b. Power Point Presentations
c. Using Visual Aids
d. Mock Presentations

UNIT – IV

4. Employability Skills

a. Group Discussion
b. Team Building and Leadership Qualities
c. Interview Skills

REFERENCE BOOKS :

1. Personality Development and Soft skills (Second Edition), Barun K. Mithra.

Oxford University Press: 2016
2. The Definitive Book of Body Language, Allan & Barbara. Pease International:2004
3. Working with Emotional Intelligence, Daniel Goleman. Bloomsbury:1998
4. English for Jobseekers, Lina Mukhopadhyay. Cambridge University Press:2013
5. The 7 Habits of Highly Effective People, Stephen R.Covey. St. Martin's Press:2014.

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DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

PROCESS CONTROL LAB

(CODE 20EIL602)

Course category : PROFESSIONAL CORE			Course type : PRACTICAL	
Lecture Hours: --	PRACTICAL :3	C I E: 30M	SEE :00M	Credits : 1.5

Course Objectives :

1 To understand the performance of various types of controllers
2 To know the characteristics of various transmitters
3 To tune a controller for a given process
4 To Design advanced control systems

LIST OF LAB EXPERIMENTS

17. Response of pressure control loop with PI,PD and PID controllers
18. Characteristic of pressure transmitter
19. Response of level control loop with PI,PD and PID controllers
20. Characteristic of level transmitter
21. Response of flow control loop with PI,PD and PID controllers
22. Characteristic of flow transmitter
23. Characteristics of I/P and P/I converters
24. Characteristics of Flopper nozzle system
25. Study of Interacting and Non interacting systems
26. Characteristics of pneumatic control valve
27. Response of first and second order processes with and without transport lag
28. Controller tuning using Ziegler-Nichols Method
29. Controller tuning using Cohen Coon Method
30. Design and analysis Cascade Control
31. Response of Ratio Control
32. Design and analysis of Feed forward Control
33. Design of PID controller with frequency response approach

NOTE: A minimum of 10 experiments have to be performed and recorded by the Candidate to attain eligibility for University Practical Examination

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DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

DIGITAL SIGNAL PROCESSING LAB

(CODE 20EIL603)

Course category : PROFESSIONAL CORE			**Course type : PRACTICAL**	
Lecture Hours: --	**PRACTICAL :3**	**C I E: 30M**	**SEE :00M**	**Credits : 1.5**

Course objectives :

1. Understand various DSP Algorithms.
2. Understand the Magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.
3. Understand Magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.
4. Model the Digital Filters.

LIST OF LAB EXPERIMENTS

1. Linear convolution between two sequences.
2. Circular convolution between two sequences.
3. Linear convolution using circular convolution.
4. Program to perform N-point DFT. Also to perform the IDFT on the result obtained to verify the result.
5. To perform circular correlation using a) direct method b) circular convolution using rotation method.
6. To perform circular convolution and correlation using DFT.
7. To perform linear convolution using (a) overlap save method (b) overlap add method.
8. To perform FFT on a sequence using the following methods.
   (a) Decimation in time (b) Decimation in frequency.
9. To perform IDFT on a transformed sequence using DFT.
10. Design an FIR filter using windowing techniques.
11. Design an IIR filter using impulse invariant method.
12. Design an IIR filter using bilinear transformation method.
13. Program to compute power density spectrum of a sequence.
14. Filter Design and Analysis.

NOTE: A minimum of 10 experiments have to be performed and recorded by the Candidate to attain eligibility for University Practical Examination

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DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

BIOMEDICAL INSTRUMENTATION LAB

(CODE 20EIL604)

Course category : PROFESSIONAL CORE			**Course type : PRACTICAL**	
Lecture Hours: --	**PRACTICAL :3**	**C I E: 30M**	**SEE :00M**	**Credits : 1.5**

Course Objectives :

1 Understand the bio signals.
2 Learn how to read the bio signals and the sensors used.
3 Study the simulators used in the lab to understand the bio signal behaviour.
4 Study the results and interpret them for predictions.

LIST OF LAB EXPERIMENTS

1. Measurement of Blood Pressure
2. Measurement of Blood PH
3. Measurement of Blood PCO2, PO2
4. Study of ECG
5. Study of EEG,
6. STUDY OF EMG
7. Measurement of heart sounds
8. Measurement of respiration parameters.
9. Study of Electronystagmography.
10. Study of stress test system.

LANGUAGE AND COMMUNICATION
(20EIM03)

Course category : MANDATORY COURSE			Course type : Theory	
LectureHours: 2Hr./Week	Tutorial : 0	C I E: 30M	SEE :00M	Credits : 0

Course Objectives.

1 Enable the student address the ideas in an effective way.
2 Helps the student to understand and summarise the reading.
3 Habituate the student to follow the good body language.
4 Differentiate between the communication and miscommunication.

UNIT-I

APPROACHES TO COMMUNICATION:

a) The information Processing school, Shannon and Weaver; A Mathematical Theory of Communication, Formal Signal Processing approach.
b) Semiotic approach; information, communication and significance.
c) Chomsky an distinction between language structure and language use; form and function.
d) Towards a theory of performance; acceptability and grammaticality.
e) Communicative Competency; Possibility, appropriacy, feasibility.

UNIT-II

MEANING IN LANGUAGE USE:

a) Speech Act Theory; communicative activity, elocutionary act, directives, commissives, expressive, declarations and representatives.
b) Grice's theory of conversational meaning; the cooperative principle, quantity maxim, quality maxim, relational maxim, manner maxim.
c) Ancient Indian theory of meaning; lexical, compositional, extended.
d) Speaker intention in communication.
e) Discourse meaning; context and situation.

UNIT-III

LINGUISTIC AND NON-LINGUISTIC RESOURCE OF COMMUNICATION:

a) Writing and Speech.
b) Gestures and Body language.

STRUCTURE OF DISCOURSE/CONVERSATION:

a) Coherence
b) Cohesion
c) Initiating and closing conversations
d) Intervention e) Turn taking

UNIT-IV

POWER STRUCTURE AND LANGUAGE USE:

a) Gender and language use
b) Politeness expressions and their use
c) Ethical dimensions of language use
d) Language rights as part of human rights

MEDIA COMMUNICATION:

a) Power of media, Orwell's problem (Chomsky)
b) Manufacturing of opinion and hidden agendas.

PERSUASIVE COMMUNICATION AND MISCOMMUNICATION:

a) Fundamentals of persuasive communication.
b) Persuasive quotient
c) Politics and communication barrier.

TEXT BOOKS:

1. Austin, 1962, J.L. How to do things with words. Oxford: Clarendon Press. Grice, P.1989. Studies in the way of words. Cambridge, M.A: Harvard University Press.

2. Chomsky, N.1966. Aspects of the theory of syntax, The MIT press, Cambridge. Chomsky, N.2006. Language and Mind, Cambridge University Press.

3. Hymes. D.N. 1972, On communication competence in J.B. Pride and J.Holmes (ed), Sociolinguistics, pp 269-293, London Penguin.

4. Gilbert, H.Harman, 1976. Psychological aspect of the theory of syntax in Journal of Philosophy, page 75-87.

5. Stephen. C. Levenson, 1983, Pragmatics, Cambridge University press.

6. Stangley, J. 2007. Language in Context. Clarendon press, Oxford.

7. Shannon, 1942. A Mathematical Theory of Communication.

8. Searle, J.R. 1969. Speech acts: An essay in the philosophy of language. Cambridge: Cambridge University Press.

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electronics and Instrumentation Engineering

Effective From the Academic Year 2020-2021(R20 Regulations)

Fourth Year B. Tech (SEMESTER – VII)

S.No	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		
1.	20EI701/ PE 31-33	Professional Elective Course	3	0	0	3	30	70	100	3	PE
2.	20EI702/PE 41-43	Professional Elective Course	3	0	0	3	30	70	100	3	PE
3.	20EI703/PE 51-53	Professional Elective Course	3	0	0	3	30	70	100	3	PE
4.	20EI704/ IE 01--02	Job Oriented Course	2	0	2	4	30	70	100	3	OE
5.	20EI705/ IE 03-04	Open Elective Course	2	0	2	4	30	70	100	3	OE
6.	20EIH 01-09	Humanities and Social Science Elective (IMED)	3	0	0	3	30	70	100	3	HS
7.	20EIL701/SA 01-09	Skill Advanced/ soft skill Course (**INDUSTRIAL AUTOMATION**)	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

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PROFESSIONAL ELECTIVES			
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		
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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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

ANALYTICAL INSTRUMENTATION (20EI701-PE03-01)

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

Course Objectives:

1. Acquire knowledge about the widely used analytical Instruments
2. Select Instrument for a particular analysis with come idea of its merits, demerits and Limitations
3. Know the instruments used in hospital for routine clinical analysis, drug and pharmaceutical laboratories, oil refineries and above all for environmental pollution monitoring
4. Able to design various types of spectrometers

Course Outcomes :

CO 1. Understand the principles, procedures and applications of Analytical Instrument and analytical techniques.

CO 2. Use statistical methods for evaluating and interpreting data.

CO 3. Appreciate the basic principles of spectroscopy and chromatography techniques.

CO 4. Integrate different analytical techniques to solve analytical and bio-analytical problems.

CO-PO MAPPING:

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

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SYLLABUS

UNIT – I

ULTRAVIOLET AND VISIBLE SPECTROSCOPIC INSTRUMENTS: Radiation sources – Monochromators – filters, prism, grating types – detectors – Recording type of instruments– UV & VIS absorption methods – emission methods – various types of instruments –application in Industry.

UNIT – II

INFRARED SPECTROSCOPIC INSTRUMENTS: Fundamentals of Infrared spectrometers –Sources of Infrared – detecting units – different types of Instruments.

Flame Spectrophotometry: Essential parts of flame photometers – different types of flame photometers.

UNIT – III

NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY: Principle of NMR, Measurement of NMR spectrum, Broad band NMR spectrometer – FT NMR spectrometer – application.

Electron Spin Resonance Spectroscopy: Principle of ESR, ESR spectrometer –application.

Mass Spectrometry: Principle of operation – Magnetic deflection Mass Analyzer – Time of flight mass analyzer.

UNIT – IV

NUCLEAR RADIATION MEASUREMENTS: Nuclear Radiation detectors – Ionization chamber, GM Counter, proportional counter, scintillation counter, solid state detector.

X-Ray Spectroscopy: Introduction, Instrumentation for X-ray spectroscopy, X-ray absorption meter, X-ray diffractometer, X-ray fluorescence spectrometer – application.

Gas and Liquid Chromatography: Chromatography – types- Basic principles of gas chromatography, liquid chromatography (HPLC) - different types of columns, detectors, recorders and associated equipment for Gas and Liquid Chromatography and their applications, Interpretation and Analysis.

Text Books:

1. Willard H.H., Merrit L.L. , Dean J.A., Scattle F.I., Instrumental methods of Analysis, 7th Edn., CBS, 1986.
2. R.S.Khandpur , Handbook of Analytical Instruments, TMH 1989.
3. Skoog D.A., Principles of Instrumental Analysis, Holt Soundes publications, 4th Edn.1982.

Reference Books:

1. Mann C.K., Vicker T.J. & Gullick W.H., Instrumental Analysis , Harper and Row Publishers.

E-resources and others : --

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

ADAPTIVE CONTROL SYSTEMS (20EI701-PE03-02)

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

Prerequisite: Control Systems

Course Objectives:

1. To present an overview of theoretical and practical aspects of adaptive control
2. To understand and apply adaptive controls in practical and industrial control systems.
3. To understand deterministic Self tuning regulators (STR):
4. To understand Instability phenomena in adaptive systems.

Course Outcomes:

1. Understand the concept adaptive control systems.
2. Design and implement stable adaptive controllers
3. Design of STR based on pole - placement technique and LQG theory.
4. Design Adaptive control of nonlinear systems.

CO-PO,PSO MAPPING

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

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SYLLABUS

UNIT – I

INTRODUCTION - use of Adaptive control - definitions - essential aspects – classification - Model Reference Adaptive Systems - different configurations - classification - mathematical description - Equivalent representation as a nonlinear time varying system - direct and indirect MRAC.

UNIT – II

CONTINUOUS TIME MRAC SYSTEMS - Model Reference Adaptive System Design based on Gradient method, Design of stable adaptive controllers based on Kalman - Meyer - Yakubovich Lemma, Lyapunov theory, Hyper stability theory.

UNIT – III

SELF TUNING REGULATORS (STR) - different approaches to self tuning - Recursive parameter estimation - implicit STR - Explicit STR. STR design based on pole - placement technique and LQG theory.

UNIT – IV

ADAPTIVE CONTROL OF NONLINEAR SYSTEMS - Adaptive predictive control - Robustness of adaptive control systems - Instability phenomena in adaptive systems.

Concept of learning control systems. Different types of learning control schemes. LTI learning control via parameter estimation schemes. Convergence of learning control.

TEXT BOOKS:

1. K. J. Astrom and Bjorn Wittenmark, “Adaptive control”, Pearson Edu., 2nd Edition,2013.
2. Sankar Sastry, “Adaptive control”2011.
3. K. S. Narendra and A. M. Annaswamy, Stable Adaptive Systems, Prentice Hall INC, 2012.

REFERENCES:

1. V. V. Chalam, “Adaptive Control System - Techniques & Applications”, Marcel Dekker Inc, 2017.
2. Miskhin and Braun, Adaptive control systems, McGraw Hill, 1961
3. Karl Johan Åström, Graham Clifford Goodwin, P. R. Kumar, “Adaptive Control, Filtering and Signal Processing” 4. G. C. Goodwin, “Adaptive control”

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

ARTIFICIAL INTELLIGENCE (20EI701-PE03-03)

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

Prerequisites: None

Course Objectives:

CO1 a: To Gain a historical perspective of AI and its foundations.

CO1 b: To learn the difference between optimal reasoning vs human like reasoning.

CO2 a: To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities

CO2 b: To understand basic principles of AI toward problem solving, inference, perception, knowledge and learning.

CO3 a: To learn different knowledge representation techniques

CO3 b: To explore the current scope, potential, limitations, and implications of intelligent systems.

CO4 a: To Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models.

CO4 b: To understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems.

Course Outcomes:

CLO1 a: Possess the ability to formulate an efficient problem space for a problem.

CLO1 b: Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.

CLO2 a: Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.

CLO2 b: Use of python to understand the concept of AI.

CLO3 a: Possess the skill for representing knowledge using the appropriate technique

CLO3 b: Understanding of Natural Language Tool Kit and implement Application of Natural Language Tool Kit

CLO4 a: Gain awareness of several advanced AI applications and topics such as intelligent agents, planning and scheduling, machine learning, etc.

CLO4 b: Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems.

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CO-PO,PSO MAPPING

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

SYLLABUS

UNIT I

Artificial Intelligence (AI) - History and Foundation, AI Techniques, Problem Solving with AI Models, Data Acquisition and Learning Aspects in AI.

Problem Solving Problem Solving Process, Formulating Problems, Problem Types and Characteristics, Problem Analysis and Representation, Performance Measuring, Problem Space and Search, Toy and Real-World Problems. General Search Algorithms, Uninformed Search.

UNIT II

Informed Search Best First Search, Greedy Search, A* Search, AO* Search, Local Search Algorithm and Optimization Problems.

Intelligent Agents: Rationality and Rational Agent, Performance Measure, Rationality and Performance, Flexibility and Intelligent Agents, Types of Agents.

UNIT III

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT IV

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and Tools.

TEXT BOOKS:

1. Artificial Intelligence: Building Intelligent Systems By Parag Kulkarni and Prachi Joshi, PHI Publications 2015.
2. Russell, Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Second Edition. 2004.

REFERENCE BOOKS:

1. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.
2. Introduction to Artificial Intelligence by Eugene Charniak, Pearson 2009.
3. Introduction to Artificial Intelligence and expert systems Dan W.Patterson. PHI 1992.
4. Artificial Intelligence by George Flugerrearson fifth edition 2002.
5. Saroj Kaushik. Artificial Intelligence. Cengage Learning. 2011

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

OPTOELECTRONICS AND LASER INSTRUMENTATION (20EI702-PE04-01)

Lectures: 3	**Tutorial: 0**	**Practical: 0**	**Self Study:0**	**Credits :3**
Continuous Internal Assessment: 50		**Semester End Examination (3 Hours): 50**		

Course Objectives:

1. Students will be able to understand the basic principles of optical fiber, types of optical fiber, optical sources and optical fiber fabrication.
2. Students will be able to understand the working of fiber optic sensors
3. Students will attain deep knowledge about the Interferometers
4. Students will be able to understand and gain knowledge on LASERS

Course Outcomes

CO:1 Specify and operate optical test instrumentation, for example, optical spectrum analyzers and laser beam profilers.

CO2: Align, maintain and operate optical components and support and positioning equipment.

CO3: Survey a laser work area, citing unsafe conditions present.

CO4: Gain knowledge about Holographic techniques and medical applications of laser

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

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SYLLABUS

UNIT-I

INTRODUCTION TO OPTICAL FIBER COMMUNICATION SYSTEM: advantages of optical fiber communication. Ray theory transmission: Acceptance angle ,Numerical aperture, skew rays. Types of optical fibers: single step ,graded index, single mode fiber and its cut-off wavelength. Transmission characteristics of optical fibers: Attenuation: intrinsic and extrinsic, Linear scattering losses: Rayleigh scattering , mie scattering, Non linear Scattering loss , Fiber bend loss ,Dispersion: Intra model ,Inter model dispersion.

UNIT –II

OPTICAL SOURCES: LASER :Absorption and emission of radiation, Einstein relations, population inversion, optical feedback and laser oscillation. Optical emission: spontaneous emission, stimulated emission and lasing, Types of Lasers: gain-guided lasers, index guided lasers, quantum well lasers. Non semi conductor lasers: Nd:yag laser, Ruby laser,CO_2 laser Laser Instrumentation ; Industrial applications of Lasers, bio medical application, Laser Doppler velocity meter, hologram and applications. LED: Advantages of LEDs ,LED power , LED internal quantum efficiency, external power efficiency. Types of LEDs : Surface emitter LEDS, Edge emitter LEDS, Super Luminescent LED ,LED characteristics: optical output power, output spectrum, modulation bandwidth

UNIT-III

FIBER OPTIC SENSORS: Interferometric sensor, Polarization sensor, micro bending fiber sensor, Extrinsic fiber sensors, for measurement of length, displacement, velocity, pressure, temperature, current, voltage, level, strain.

OPTICAL FIBER MEASURMENTS: Introduction, Fiber Attenuation measurements: Total fiber attenuation, Fiber absorption loss measurement, fiber scattering loss measurement. Fiber dispersion measurements: Time domain measurements, Frequency domain measurements.

UNIT-IV

OPTICAL DETECTORS: Detection principles. Absorption, Quantum efficiency , responsivity. Semiconductor photo diodes: p-n photo diode, p-i-n photo diode, Avalanche photodiode, silicon reach through avalanche photodiode. Electro-optic modulator , magneto-optic modulator, acoustic -optic modulator, polarization maintaining fibers-applications.

Text Books:

1. Senior J.M., Optical Fiber Communication Principles and Practice, Prentice Hall, 2009.
2. Thyagarajan & Ghatak A-Laser theory and applications 2010.
3. Bishnu P Pal-Fundamentals of fiber optics in Telecommunications and sensor systems,1992.

Reference Books:

1. Keiser G., Optical Fiber Communication, McGraw-Hill, 1991
2. Ghatak A.K and Thiagarajan K, Optical electronics foundation book, TMH,1991.
3. O.Svelto , " Principles of Lasers " ,Plenum Press 2006.
4. John F. Ready, "Industrial Applications of Lasers", Academic Press, 1978.
5. J.Wilson and J.F.B.Hawkes , "Optoelectronics: An Introduction", Prentice Hall of India 2007.

E-resources and others :

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

Wireless Sensor Networks (20EI702-PE04-02)

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

Course Objectives

1. Understand different applications of wireless sensor networks
2. Gain the knowledge about working of individual sensor nodes can be connected into a wireless sensor network.
3. Analyze different communication protocols of wireless sensor networks in real time applications
4. Learn about the establishment of wireless sensor network and knowledge of plat forms and tools for the operation of wireless sensor network

Course Outcomes

CO 1. List the types of applications for which wireless sensor networks are intended and capabilities and limitations of the nodes in a sensor network.

CO 2. Design modulation schemes ,transceivers and energy efficient sensor networks.

CO 3. Determine the location of a wireless sensor node and to design sensor networks with time synchronization.

CO 4. Design sensor node hardware using simulation tools.

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

SYLLABUS

UNIT – I

OVERVIEW OF WIRELESS SENSOR NETWORKS

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks. Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT – II

NETWORKING SENSORS

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing,Geographic Routing.

UNIT III

Infrastructure Establishment:

Topology Control, Clustering, Time Synchronization, Localization and positioning, Sensor tasking and control.

UNIT IV

Sensor Network platforms and tools:

Sensor Node hardware-Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State -centric programming.

Text Books:

1. Holger Karl & Andreas Wiling, Protocols and Architectures for wireless sensor networks, John Wiley, 2005
2. Fenz Zhao & Leonidas J Guibas, Wireless sensor networks- An information processing approach, Elsevier, 2007

Reference books:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati, Wireless sensor networks- Technology, protocols and applications, John Wiley, 2007
2. Anna Hac, Wireless sensor networks Design, John Wiley, 2003

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

INSTRUMENTATION FOR AEROSPACE AND NAVIGATION (CODE: 20EI702/PE04-03)

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

Course Objectives:

1. The students will have an idea about the history of flight.
2. The students will have an idea about the parts of an aircraft.
3. The students will have an idea about how an aircraft flies.
4. The students will be familiar with the basics of navigation and instrumentation used in aerospace engineering.

Course Outcomes :

CO 1. What are the basics of aerospace engineering and navigation.
CO 2. Have an idea about the instrumentation used in aerospace engineering
CO 3. Compare the features of various flight control systems.
CO 4. Acquire and interpret data from various aircraft instruments.

CO-PO,PSO MAPPING

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

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UNIT-I

HISTORY OF AVIATION AND SPACE FLIGHT- anatomy of airplane and space vehicle with emphasis on control surfaces- airfoil nomenclature- basics of aerodynamics to illustrate lift and drag- types of drag – finite wings – swept wings –flaps.

AIRPLANE PERFORMANCE- thrust –power- rate of climb absolute and service ceiling- range and endurance. Introduction to turbojet and turbofan engines. Space vehicle trajectories- Kepler's laws- rocket engines, propellants and staging. (Introductory treatment of the above topics is only expected, no detailed derivations)

UNIT-II

BASIC ENGINE INSTRUMENTS- Capacitive fuel content- Gauges. Standard atmosphere- Altimeters Aneroid and radio altimeters. Aircraft compass- Remote indicating magnetic compass- Rate of climb indicator- Pitot static system- Air speed indicator- Mach meters- Integrated flight instruments.

UNIT-III

GPS AND GNSS - Automatic Pilots- Aircraft flight simulation instrumentation Introduction to guidance, navigation and avionics- Radio navigational aids- automatic direction finder VHF- Phase- Comparison direction finder.

UNIT-IV

Introduction to navigation and guidance instrumentation- Principle, construction and applications of inertial sensors- Gyroscope and accelerometers- Ring laser gyroscope- Fibre optic gyroscope, MEMS gyroscopes and accelerometers.

Text Books:

1. Nagaraja.M.S, Elements of electronic navigation, Tata McGraw Hill 1975.
2. Pallet.E.H.J , Aircraft instruments- Principles and applications, Pitman Pub 1992.
3. Ernest O Doebelin, Dhanesh N Manik , Measurement Systems-Application and Design,5th Edition, Tata McGraw Hill, 2007

Reference Books:

1. Jewel B Barlow, William H. Rae, Jr. , Alan Pope , Low-Speed Wind Tunnel
2. Testing, John Wiley, Third Edition, 1999
3. Marcel J. Sidi, Spacecraft Dynamics and Control-A Practical Engineering
4. Approach, , Cambridge University Press, 1997

E-resources and others :

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

DATA COMMUNICATIONS (20EI703/PE05-01)

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

Course Objectives:

1. To understand on the basic concepts of data networks.
2. To introduce the basics of internetworking and serial communications.
3. To provide details on HART and Field buses and MODBUS, PROFIBUS.
4. To learn the concepts of industrial Ethernet and wireless communication.

Course Outcomes :

CO 1. Differentiate ISO and TCP/IP protocols.
CO 2.a Describe ARCNET configuration.
CO 2.b Describe ARCNET configuration
CO 2.c Describe AS sensor
CO 3.a List out the applications of HART BUS.
CO 3.b List out the features of Mod bus.
CO 3.c What are the topologies of Field bus.
CO 3.d Discuss about profibus communication model.
CO4.a Compare different ethernets.
CO4.b Draw the block diagram of radio modem.
CO4.c List the features of wireless HART and ISA100.

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

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SYLLABUS

UNIT I

DATA NETWORK FUNDAMENTALS :- Networks hierarchy and switching – Open System Interconnection model of ISO - Data link control protocol - Media access protocol - Command / response - Token passing -CSMA/CD, TCP/IP

UNIT II

INTERNET WORKING - Bridges - Routers - Gateways - Standard ETHERNET and ARCNET configuration special requirement for networks used for control - RS 232, RS 485 configuration Actuator Sensor (AS) – interface, Devicenet

UNIT III

HART AND FIELD BUS AND MODBUS AND PROFIBUS - Introduction - Evolution of signal standard - HART communication protocol - HART networks -

HART commands - HART applications - Fieldbus - Introduction - General Fieldbus architecture - Basic requirements of Fieldbus standard - Fieldbus topology - Interoperability - Interchangeability - Introduction to OLE for process control (OPC). MODBUS protocol structure - function codes – troubleshooting Profibus, Introduction, Profibus protocol stack, Profibus communication model - communication objects - system operation - troubleshooting - review of foundation fieldbus - Data Highway

UNIT IV

INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION -Industrial Ethernet, Introduction, 10 Mbps Ethernet, 100 Mbps Ethernet - Radio and wireless

communication, Introduction, components of radio link - radio spectrum and frequency allocation - radio MODEMs-Introduction to wireless HART and ISA100.

Text Books:

1. Behrouz Forouzan ,Data Communications & Networking ,3RD edition, Tata McGraw hill,2006.
2. William Buchanan, Computer Buses, CRC Press, 2000.

Reference Books:

1. Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, Practical Industrial Data Networks Design, Installation and Troubleshooting' Newnes Publication, Elsevier First Edition, 2004
2. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Prentice Hall of India Pvt. Ltd., 5th Edition. 2011.
3. Theodore S Rappaport, Wireless Communication: Principles and Practice, Prentice Hall of India 2nd Edition, 2001.
4. William Stallings, Wireless Communication & Networks, Prentice Hall of India, 2nd Edition, 2005.

E-resources and others : --

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

DIGITAL IMAGE PROCESSING (20EI703/PE05-02)

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

Course Objectives:

1. Familiarize with basic concepts of digital image processing and different image transforms

2. Learn various image enhancement techniques in spatial domain and frequency domain

3. Learn various image processing techniques for image restoration, segmentation and compression

4. Learn the image segmentation and image representation methods to get the output of the object

Course Outcomes :

CO 1. Understand the fundamentals of digital image processing and image transforms

CO 2. Apply image enhancement techniques in spatial domain and frequency domain

CO 3. Analyze restoration and compression techniques to improve the fidelity of images.

CO 4. Understand the image segmentation and image representation schemes to get the object.

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

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SYLLABUS

UNIT – I

INTRODUCTION: Fields that use Digital Image processing, Fundamental steps in Digital Image Processing , Components of an Image Processing System.

DIGITAL IMAGE FUNDAMENTALS: Elements of Visual perception, Image sampling and Quantization, Basic relationships between Pixels, Linear and Nonlinear operations.

IMAGE TRANSFORMS: Need for image transforms, Discrete Fourier transform (DFT) of two variables, some properties of the 2-D Discrete Fourier transform. Importance of ,Discrete Cosine transform, Discrete Wavelet transform, Comparison of different image transforms

UNIT – II

IMAGE ENHANCEMENT IN SPATIAL DOMAIN: Some basic gray level transformations, histogram processing, enhancement using Arithmetic/ Logic operations, Smoothing Spatial Filters, Sharpening Spatial Filters.

IMAGE ENHANCEMENT IN FREQUENCY DOMAIN: Preliminary concepts, the basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters.

UNIT – III

IMAGE RESTORATION: Noise models, Restoration in the presence of Noise, only Spatial Filtering, Periodic Noise reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Inverse Filtering and Wiener Filtering.

IMAGE COMPRESSION: Fundamentals, Basic compression methods: Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run-Length coding, Bit-Plane coding, Block Transform coding, Predictive coding. Fundamentals – Image compression models – Error Free Compression, Lossy Compression

UNIT – IV

IMAGE SEGMENTATION: Detection of discontinuities, Thresholding, Edge based Segmentation and Region based Segmentation.

IMAGE REPRESENTATION AND DESCRIPTION: Representation Schemes, Boundary Descriptors, Regional Descriptors.

Text Books:

1. R C Gonzalez and Richard E Woods, Digital Image Processing, Person Education, Second Edition, 2002.
2. A R Weeks, Fundamentals of Electronic Image Processing, PHI,2003.

Reference Books:

1. A. K. Jain, Digital Image Processing, PHI, 1989
2. B Chanda and D Dutta Majumder, Digital Image Processing and Analysis, PHI 2001

E-resources and others : --

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)
TELEMETRY AND SCADA (20EI703/PE05-03)

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

Course Objectives:

1. To give Knowledge of functions of telemetry system
2. To know various methods in land telemetry and radio telemetry
3. To know Data Acquisition system, SCADA system components and SCADA architecture.
4. To know SCADA applications, advanced SCADA communications and SCADA protocols

Course Outcomes :

CO1. List the subsystems used to build a telemetry system and to classify the methods of telemetry

CO 2. To know the appropriate use of land line and radio telemetry and to list various transmitting and receiving techniques in radio telemetry.

CO 3. To list SCADA system components, distinguish various communication philosophies and to use appropriately

CO 4. To list and distinguish various SCADA communication technologies and SCADA communication protocols

CO-PO,PSO MAPPING

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

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SYLLABUS

UNIT-I

TELEMETRY FUNDAMENTALS AND CLASSIFICATION: Fundamental concepts, significance, principles, functional blocks of Telemetry and Tele control system - Methods of telemetry – Electrical, pneumatic, Hydraulic and optical telemetry – state of the art. Telemetry standards.

UNIT-II

LAND LINE TELEMETRY: Electrical telemetry – current systems – voltage systems – Synchro systems – Frequency systems – position and pulse systems – Example of land line telemetry system.

RADIO TELEMETRY: Block diagram of a Radio telemetry system – Transmitting and receiving techniques – AM, FM, PM, Multiplexing and Demultiplexing – Transmitting and receiving techniques – Digital coding Methods – Advantages of PCM, PWM, PDM, FSK – Delta Modulation – coding and decoding equipment, Example of a radio telemetry system.

UNIT-III

INTRODUCTION TO SCADA : Introduction, Data Acquisition System, Evolution of SCADA, Communications in SCADA, selection criteria of DAS.

SCADA SYSTEM COMPONENTS: Introduction, Remote Control Unit (RTU), Intelligent electronic devices, programmable logic controller, data concentrators and merging units, master control centres(MCC), Global positioning system(GPS) - Relevance to SCADA, Human Machine interface(HMI), HMI building blocks.

SCADA ARCHITECTURE : Introduction, communication architecture, communication philosophies, System reliability and availability, design and configuration considerations of MCC

UNIT-IV

SCADA APPLICATIONS : Introduction, power sector, oil and gas industry, automobile industry, water distribution sector. **ADVANCED SCADA COMMUNICATIONS :** Introduction, types of transmission, guided media, unguided media, SCADA communication technologies, security in wireless communications

SCADA AND DCS PROTOCOLS : Introduction, evolution of SCADA communication protocols, SCADA communication protocols, other relevant standards, secure communication, selecting the right protocol for SCADA

Text Books:

1. Gruenberg, Handbook of telemetry and remote control, Mc Graw Hill, New York, 1987.
2. Swoboda G, Tele control methods and applications of telemetry and remote control, Reinhold Publishing orporation, London 1991.
3. K S Manoj , Industrial automation with SCADA, Notion press, Chennai 2019.

Reference Books:

1. Young R.E., Telemetry Engineering, Little Books Ltd., London 1988
2. Houslay T. Data Communication and Teleprocessing System, Prentice Hall.
3. Stuart A Boyer, SCADA Supervisory control and Data Acquisition ,ISA-international Society of Automation 2020.
4. Vikalp Joshi, Manoj singh Adhikari, Raju patel, Rajesh Singh, Anita Gehlot, Industrial Automation, BPB Publications

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

VIRTUAL INSTRUMENTATION (20EI704 /JO 04)

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

Course Objectives:

1. To understand the basic concepts in virtual instrumentation
2. To make the student become competent in using state-of-the-art VI tools.
3. To enable the student to gain experience in data acquisition and instrument Control
4. To enable the student to aware of analysis tools and applications of Virtual Instrument Software.

Course Outcomes :

CO 1. Compare graphical programming and conventional programming.
CO 2. Implement sum/factorial of a given number n using for loop/while loop
CO 3. Draw the block diagram of Data acquisition system.
CO 4. Analyse input wave form with fourier transform and filter out noisy components.

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

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SYLLABUS

UNIT I

Introduction Virtual Instrumentation: Historical perspective - advantages - block diagram and architecture of a virtual instrument - Conventional Instruments versus Traditional Instruments - data-flow techniques, graphical programming in data flow, comparison with conventional programming.

UNIT II

VI Programming Techniques: VIs and sub-VIs, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, State machine, string and file I/O.

UNIT III

Data Acquisition: Introduction to latest ADCs, DACs. Introduction to PC based data acquisition - typical plug-in data acquisition board - multiplexing of analog inputs - single ended and differential inputs - different strategy for sampling of multi channelanalog inputs. Concept of universal DAQ card - use of timers/counters

UNIT IV

Toolsets:Use of Analysis tools, Fourier transforms, power spectrum, correlation methods, windowing and filtering. Simulation of level, thermal, reactor processes. On-Off controller PID Controller.
Applications:Virtual Laboratory, Virtual Oscilloscope, Virtual function generator.

Text Books:

1. Jovitha Jerome, “Virtual Instrumentation Using LabVIEW”, Eastern Economy Edition, PHI Learning private ltd ,2010
2. N.Mathivanan, “PC-based Instrumentation :Concepts and Practice”, Eastern Economy Edition, PHI Learning private ltd ,2007.

Reference Books:

1. Gary Johnson, LabVIEW Graphical Programming, McGraw Hill, 2006.
2. Kevin James, “PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control”, Newnes, 2000.

E-resources and others : --

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

INTERNET OF THINGS (20EI704 /JO 06)

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

Course Objectives:

1. Understand the architecture of IOT.
2. Understand the protocols of wireless sensor networks
3. Understand the design methodologies used in IOT applications.
4. To know more about embedded platforms and use them to develop the IOT applications.

Course Outcomes :

CO 1.a Draw the functional blocks of Internet of Things

CO 1.b Draw the communication model of Internet of Things

CO 2. List out wireless MAC protocols.

CO 3. List out the challenges in IOT.

CO 4. Design IOT applications for weather reporting

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

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SYLLABUS

UNIT - I

INTRODUCTION TO IOT : Defining IOT, Characteristics of IOT, Physical design of IOT, Logical design of IOT, Functional blocks of IOT, Communication models & APIs IOT & M2M Machine to Machine, Difference between IOT and M2M, Software define Network

UNIT - II

NETWORK & COMMUNICATION ASPECTS: Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination

UNIT - III

CHALLENGES IN IOT: Design challenges, Development challenges, Security challenges, Other challenges Domain specific applications of IOT Home automation, Industry applications, Surveillance applications, Other IOT applications

UNIT – IV

DEVELOPING IOTs: Introduction to Python, Introduction to different IOT tools, Developing applications through IOT tools, Developing sensor based application through embedded system platform, Implementing IOT concepts with python.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On Approach”2014.
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"2010.

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

ROBOTICS AND AUTOMATION (20EI704 /JO 07)

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

Course Objectives:

1. To understand the basic anatomy of robots and trajectory planning
2. To enable students to understand about the work envelopes of robots and its role in automation
3. To give an overview of the various methods of control of robots
4. To select robots based on their applications and their related issues in industrial automation

Course Outcomes :

CO 1. Expertise in fundamentals of Robotics
CO 2. Understand the issues related to end effectors and sensors
CO 3. Acquire knowledge in Programming and control of Robots
CO 4. Understand the issues related to implementation of Industrial Automation with robot Applications.

CO-PO,PSO MAPPING

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

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SYLLABUS

UNIT–I

FUNDAMENTALS OF ROBOTS: Definition –Historical background- Robot Anatomy : Polar, Cylindrical, Cartesian coordinate, Joint-arm configuration–Work volume– Robot Drive System : Hydraulic, Electric, Pneumatic – Control System: Limited sequence, Play back with point to point and Continuous path control Intelligent Robots- Dynamic performance: Speed of response and Stability - Precision of movement: Spatial Resolution, Accuracy, Repeatability and Compliance – Introduction to End effectors, Robotic Sensors, Robot Programming and work cell control.

UNIT–II

ROBOT END EFFECTORS, SENSORS, END EFFECTORS: Types-Mechanical grippers-Magnetic grippers, Vacuum cups, Adhesive gripper, Hooks and Scoops- Tools as end effectors - Robot/ End-effectors, interface- Consideration in Gripper selection and Design.

SENSORS: Transducers and Sensors – Sensors in Robotics: Tactile, Proximity, and Range Sensors, Miscellaneous sensors and sensor based systems- Machine Vision System.

UNIT–III

PROGRAMMING AND CONTROL OF ROBOTS : Robot Programming: Methods of Programming-: Lead through Methods, Robot program as a path in space- Motion interpolation, WAIT, SIGNAL and DELAY Commands, Branching, Capabilities and limitations of Lead through Methods-

TEXTUAL ROBOT PROGRAMMING- structure, Motion, End effectors and Sensor commands, Program control communication, Monitor mode commands Robot Control: Open and Closed loop control-control Problem- Linear control Schemes- Design of Partitioned PD, PID and Adaptive Controllers for Linear Second order SISO Model of robot and their Block schematic representation- Control of Industrial Robots Using PLCs.

UNIT–IV

AUTOMATION : Factory Automation: Fixed Automation, Flexible Automation and Programmable Automation. Intelligent Industrial Automation, Industrial Networking, Bus Standards Automatic Feeders, Automatic Storage and Retrieval Systems (AS/RS), Transfer Lines, Automatic Inspection Systems Applications of Robots, Factors influencing the selection of Robots – Robots for Welding, Painting, Assembly, Nuclear, Thermal and Chemical Plants. Introduction to Mobile Robots, Legged Robots and Remote Controlled Robots, Automated Guided Robots, Micro Robots – Control and Safety Issues.

Text Books:

1. Groover, M.P., Weiss, M., Nagel, R.N., Odrey, N.G., Industrial Robots: Technology, Programming and Applications, McGraw-Hill Book Company, 2012.
2. Mittal R K, Nagrath I J, “Robotics and control”, Tata McGraw Hill, 2010.

Reference Books:

1. Groover, M.P., Automation, Production Systems, and Computer-Integrated Manufacturing, Prentice-

Hall of India Private Limited, New Delhi, 2007
2. S.R.Deb, "Robotics Technology and Flexible Automation", Tata McGraw Hill, 1994
3. Yoran Koren, Robotics for Engineers, McGraw Hill, 1980.
4. Saeed B. Niku, An Introduction to Robotics- Analysis, Systems, Applications, Second Edition, John Wiley & Sons Inc., 2010.
5. ` Wesley, E. Sryda, "Industrial Robots: Computer interfacing and Control" PHI, 1985.

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

VLSI Design (20EI704 /JO 09)

Lectures	**2**	**Tutorial**	**0**	**Practical**	**2**	**Credits**	**3**
Continuous Internal Assessment :			**30**	**Semester End Examination (3 Hours) :**			**70**

Course Objectives

1: Interpret the fabrication steps and manufacturing technologies used in IC's.
2: Apply the MOS, CMOS logic gates using stick, layout diagrams.
3: Justify the Sheet resistance, capacitance and delay for MOS logics.
4: Identify the knowledge on different design tools and CMOS testing

Course Outcomes

CO 1. List various IC fabrication technologies
CO 2. Develop stick and layout diagrams for a design
CO 3. Find the design solution to a problem by following subsystem design approach
CO 4. Realize a digital design using VERILOG HDL.

CO-PO,PSO MAPPING

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

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SYLLABUS

UNIT- I

AN INTRODUCTION TO MOS TECHNOLOGY: Introduction to IC technology, Basic MOS transistors, NMOS fabrication, CMOS fabrication and BICMOS technology. Basic Electrical Properties Of MOS and BICMOS Circuits: Ids versus Vds relationships, threshold voltage V_t, Transconductance g_m, Figure of merit ωo , Pass transistor, NMOS inverter, Pull-up to pull- down ratio, CMOS inverter, BICMOS inverters, Latch-up in CMOS circuits.

UNIT- II

MOS AND BICMOS CIRCUIT DESIGN PROCESSES: MOS layers, Stick diagrams, Design rules and layout, Sheet resistance Rs, Standard unit of capacitance, The Delay unit, Inverter delays, Propagation delays, Wiring capacitances, Scaling models, Scaling factors for device parameters.

UNIT- III

SUBSYSTEM DESIGN AND LAYOUT: Architectural issues, Switch logic, Gate Logic, examples of Structured Design (combinational logic). Design of an ALU subsystem, A further consideration of adders.

UNIT- IV

VLSI DESIGN FLOW: Introduction to ASICs, Full Custom ASICs, standard cell based ASICs, Gate array based ASICs, Programmable logic devices, PLAs, PALs, CPLDs and FPGAs,

VERILOG HDL: Gate Level Modeling : gate types, gate delays Dataflow modeling: Continuous assignments, Delays, Expressions, operators and operands, Operator types, Example programs

TEXT BOOKS:

1. Douglas A.Pucknell and Kamran Eshranghian, Basic VLSI Design, Third edition, PHI, 2002.
2. Michael John Sebastian Smith, Application Specific Integrated Circuits, Addison Wesley, 2003.
3. John F Wakerly, Digital Design Principles & Practices, 3rd Edition, Pearson Education, 2002.
4. Samir Palnitkar, VERILOG HDL A guide to digital design and synthesis,2nd edition, Pearson education,2009.

REFERENCE BOOKS:

1. Neil H E Weste and Kamran Eshranghian, Principles of CMOS VLSI Design, A system perspective, 2nd Edition, Pearson Education, 2002.
   Stephen Brown and Z Vonko Vranesic, Fundamentals of Digital Logic with VERILOG Design, TMH, 2005.
2. Debaprasad Das, VLSI Design, 2nd Edition, Oxford University Press,2016

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Electronics and Instrumentation Engineering

Fourth Year B. Tech (SEMESTER – VII)

INDUSTRIAL MANAGEMENT & ENTREPRENEURSHIP DEVELOPMENT (20EIH 01-09)

Course Objectives:

1. To provide students an insight into the concepts of industrial management and various forms of business organizations
2. It aims to provide the students with an understanding of basics of production systems, productivity and quality. To enable the students to understand the inventory control concept.
3. To make the students to learn various financial aspects of the business. To know the depreciation and its methods of measuring depreciation.
4. To Provide an understanding of personnel management. Students are exposed to know the importance of Entrepreneurship. To impart the knowledge of marketing to the students

Course Outcomes :

CO 1. Describe the roles & d responsibilities and various functions of the management. Learn various forms of business organizations and its dynamics

CO 2. Understand concepts of productivity and know the ways of enhancing productivity.

CO 3. Develop knowledge about inventory control. Learn how depreciation occurs and various methods of calculating depreciation

CO 4. Understand how resources to be planned and also understand various motivation theories and leadership styles. Grasp complete knowledge of importance of entrepreneurship and its prerequisites. Develop ability to understand various marketing strategies to enhance sales promotion.

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

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SYLLABUS

UNIT – I

GENERAL MANAGEMENT: Management definition, Functions of Management and Principles of Management.

SCIENTIFIC MANAGEMENT: Definition, Principles of Scientific Management. Forms of Business Organization, Choice of form of organization, Salient features of Sole Proprietorship, Partnership, Joint Stock Company, Private Limited and Public Limited companies; Cooperative societies, Public sector organizations, State ownership, Public corporation, Merits and demerits of above types. Introduction to Strategic Management

UNIT – II

HUMAN RESOURCE MANAGEMENT: Functions of HR management, human resource planning, recruitment, selection, placement, training & development and performance appraisal, Motivation theories, leadership styles.

MARKETING MANAGEMENT: Concepts of Selling and Marketing, Functions of Marketing, Marketing mix (4 Ps); Advertising and sales promotion; Product life cycle; distribution channels

UNIT – III

MATERIALS MANAGEMENT: Inventory Control, Inventory costs, Basic EOQ model, Model with Price breaks, ABC analysis, FSN Analysis, VED Analysis.

Total Quality Management: Importance of quality, Difference between Inspection and Quality control, Components of total quality, Quality Function Deployment

Introduction to Supply Chain Management

UNIT – IV

FINANCIAL MANAGEMENT: Functions of finance, Types of Capital-Fixed and Working Capital, Break Even Analysis. Entrepreneurship Development: Introduction, Entrepreneurial characteristics, Functions of an Entrepreneur; Factors affecting entrepreneurship; Role of communication in entrepreneurship; Entrepreneurial development-Objectives, Need of Training for enterprises; Finance for the enterprises.

Text Books:

1. Essentials of Management /Koontz and Heinz Weihrich/ Tata-McGraw-Hill 10th Ed , 2015.
2. Manufacturing Organization and Management / Amrine / Pearson Education,1987.
3. Management Science, A. R. Aryasri, 2003.

Reference Books:

1. Operations Management, Joseph G Monks, 1996.
2. Marketing Management, Philip Kotler, 2016.
3. Entrepreneurship, Robert D Hisrich, Michael P Peters, Mathew Manimala and Dean A. Shepherd-McGraw Hill, India-2014 (9th Edition)–ISBN: 9789339205386.

E-resources and others : --

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SKILL ADVANCED/ SOFT SKILL COURSE (INDUSTRIAL AUTOMATION)

(20EIL701/SA 01-09)

Lectures	**1**	**Tutorial**	**0**	**Practical**	**2**	**Credits**	**3**
Continuous Internal Assessment :			**30**	**Semester End Examination (3 Hours) :**			**70**

Course Objectives:

1. To make the students to understand and apply the concepts of sensors and PLC in automation.
2. To understand the importance and applications of fluid power in industrial automation.
3. To get familiarized with the theoretical concepts like the process of power generation, transmission, and ontrol of hydraulic and pneumatic drives.
4. To identify and select different components used in fluid power circuits.
5. To build Pneumatic and Hydraulic circuits for different applications and trouble shoot them.

Course Outcomes:

CO 1. Understand the basic principles and applications of different components of pneumatic and hydraulic systems and identify the common hydraulic and pneumatic components, their uses and symbols.

CO 2. Conduct experiments to identify pressure intensification and flow characteristics of single rod hydraulic cylinder.

CO 3. Build and operate pneumatic circuits to gain knowledge about different actuation methods, speed regulation and position-time-pressure control.

CO 4. Design and operate electro pneumatic circuits to perform experiments on AND, OR, Latching and signal overlapping functions

CO 5. Understand the principle & working of various sensors

CO 6. Application of sensors in various automated systems

CO 7. Understand the programming and function of PLC in automated manufacturing

CO 8. Understand the interfacing of sensors and PLC in automation

THEORY

SENSORS & TRANSDUCERS: Basic principle of operation. Role of position / proximity sensors in automation. Sensitivity of proximity sensors. PLC: Typical programs for logic based operations, sequential operations, Timer and counter based applications.

OVERVIEW OF FLUID POWER: Introduction, Fluid Power, Basic Law, Application of Fluid Power, Advantages of Fluid Power Systems, Types of Fluid Power Systems. Hydraulic Systems: Hydraulic Actuators: Linear and Rotary Actuators. Control and Regulation Elements: Pressure, Flow and Direction Control Valves. Introduction to Pneumatic Systems: Pneumatic fundamentals, Pneumatic Components and Pneumatic Circuits.

LIST OF EXPERIMENTS

SENSORICS

1. Behaviour of inductive, capacitive and magnetic sensors.
2. Behaviour of through beam, reflex photoelectric and ultrasonic sensors.
3. Operating range, hysteresis and response curve of the inductive sensor.
4. Operating range, hysteresis and response curve of the capacitive sensor

PLC

1. Write a PLC program for Tank filling device simulator
2. Write a PLC program for Supervise equipment
3. Write a PLC program for Star-Delta starting up

HYDRAULICS

1. Pressure intensification of a single rod cylinder
2. Flow characteristics of a single rod cylinder

PNEUMATICS

1. Direct control, indirect control and speed regulation of a double acting cylinder.
2. Displacement, pressure and time dependent control of a double acting cylinder.
3. Basic circuits with AND function, OR function and electric latching.

REFERENCE BOOKS:

1. W.Bolton., "Mechatronics-Electronic control systems in Mechanical and Electrical Engineering", 3rd edition, Pearson Education Limited, New Delhi. [ISBN 81-7758-284-4]
2. W.Bolton,"Instrumentation & Process measurements", Orient Longman Limited, Hyderabad.
3. W.Bolton, "Programmable logic controllers" Fourth edition, Newnens-An Imprint of Elsevier 2009.
4. Andrew Parr, “Pneumatics and Hydraulics", Jaico Publishing House,1999.
5. Practice for professional‘s pneumatics trainee‘s manual-BOSCH-REXROTH.
6. Practice for professional‘s electro pneumatics trainee‘s manual-BOSCHREXROTH.
7. Project manual on industrial hydraulics-BOSCH-REXROTH

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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)**				**Scheme of Examination (Maximum marks)**			**No. of Credits**	**CATEGORY**
		L	**T**	**P**	**Total**	**CIE**	**SEE**	**Total Marks**		
20EIPR801	Major Project Work			12	12	50	100	150	12	PRJ
INTERNSHIP (6 MONTHS)										
TOTAL CREDITS									12	