Bapatla Engineering College

(*Autonomous*)

BAPATLA

ACADEMIC RULES & REGULATIONS (2020-2021)

Electrical & Electronics Engineering

Four Year B.Tech. Syllabus

Bapatla Engineering College:: Bapatla

(Autonomous under Acharya Nagarjuna University)

(Sponsored by Bapatla Education Society)

BAPATLA-522102, Guntur District, A.P.

www.becbapatla.ac.in

Vision of the Institute

To build centers of excellence, impart high quality education and instill high standards of ethics and professionalism through strategic efforts of our dedicated staff, which allows the college to effectively adapt to the ever-changing aspects of education.

To empower the faculty and students with the knowledge, skills and innovative thinking to facilitate discovery in numerous existing and yet to be discovered the fields of engineering, technology and inter-disciplinary endeavours.

Mission of the Institute

To impart the quality education at par with global standards to the students from all over India and in particular those from the local and rural areas.

To maintain high standards so as to make them technologically competent and ethically strong individuals who shall be able to improve the quality of life and economy of our country.

Vision of the Department

The Department of Electrical & Electronics Engineering will provide programs of the highest quality to produce globally competent technocrats who can address challenges of the millennium to achieve sustainable socio - economic development.

Mission of the Department

1. To provide quality teaching blended with practical skills.
2. To prepare the students ethically strong and technologically competent in the field of Electrical and Electronics Engineering.
3. To motivate the faculty and students in the direction of research and focus to fulfill social needs.

PROGRAM OUTCOMES (PO'S)

Program Outcomes		Engineering Graduates will be able to
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis	Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of com plex problems	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage	Create, select, and apply appropriate techniques, Resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and teamwork	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to com prehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO1	The Electrical and Electronics Engineering graduates are capable of applying the Knowledge of mathematics and sciences in modern power industry.
PSO2	Analyse and design efficient systems to generate, transmit, distribute and utilize electrical energy to meet social needs using power electronic systems.
PSO3	Electrical Engineers are capable to apply principles of management and economics for providing better services to the society with the technical advancements in renewable and sustainable energy integration.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

PEO1	Have a strong foundation in the principles of Basic Sciences, Mathematics and Engineering to solve real world problems encountered in modern electrical engineering and pursue higher studies/placement/research.
PEO2	Have an integration of knowledge of various courses to design an innovative and cost effective product in the broader interests of the organization & society.
PEO3	Have an ability to lead and work in their profession with multidisciplinary approach, cooperative attitude, effective communication and interpersonal skills by participating in team oriented and open-ended activities.
PEO4	Have an ability to enhance in career development, adapt to changing professional and societal needs by engage in lifelong learning.

Academic Regulations

Regulations for Four Year Bachelor of Technology (B.Tech) 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 Learning 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

Description	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 suggested 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 /	ES	24

		computer etc.		
4	Professional core	Professional core Courses	PC	51
5	Open Electives	Open Elective Courses- from other technical/ emerging and job oriented	OE	12
6	Professional Courses	Professional Elective Courses relevant to chosen specialization/ branch	PE	18
7	Project Work	Project Work, Seminar, Internship in industry elsewhere	PW	16.5
8	Mandatory courses	Environmental Studies, Induction training, Universal human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge (Non-Credit)	MC	0
9	Skill Oriented Courses	Skill Oriented Courses relevant to domain, interdisciplinary, communication skill, industry	SC	10
Total Credits				160

5. 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 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.

<table>
<tr><th>Particulars</th><th>Term Exams
(Max. 20 marks)</th><th>AAT
(Max. 10 marks)</th></tr>
<tr><td>Better Performed exam</td><td>75% of marks obtained</td><td rowspan="2">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.</td></tr>
<tr><td>Other exam</td><td>25% of marks obtained</td></tr>
</table>

A minimum of 15 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as qualified in that course and eligible to write the SEE of that 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.

6.3.2 Semester End Examination (SEE) in Theory and Design 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 qualified 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.

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.

6.6 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 8/12 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 the credits for that course.

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

6.8 **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. i) 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

ii) 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 4th 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 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA upto 3rd 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.

6.10 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 thecommencement 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 continuewith 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 poollist 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 theBOS with grading or marks or pass/fail in order to earn credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the BOS/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 duringthe 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 droppedMinor 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.

6.11 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. Gradeswill 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/shehas to repeat theabove activityin the subsequent years along with the next year students.

6.12 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 members. 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.**

6.13 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.

6.14 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 on medical ground duly approved by the Principal.
- 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.

Lateral entry students who fail to earn 121 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

9. Course Pattern:

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

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

(ii) With–holding of Results

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

(iii) Grading

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

Table – Conversion into Grades and Grade Points assigned

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

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

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

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

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

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

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

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

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

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

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

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

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

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

11. Award of Class

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

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

12. Gap Year

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

13. Transitory Regulations

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

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

14. Minimum Instruction Days

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

15. Medium of Instruction

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

16. Rules of Discipline

(i) Use of mobile phones with camera, in the campus is strictly prohibited.
(ii) Students shall behave and conduct themselves in a dignified and courteous manner in the campus/Hostels.
(iii) Students shall not bring outsiders to the institution or hostels.
(iv) Students shall not steal, deface, damage or cause any loss to the institution property.
(v) Students shall not collect money either by request or coercion from others within the campus or hostels.
(vi) Students shall not resort to plagiarism of any nature/extent. Use of material, ideas, figures, code or data without appropriate acknowledgement or permission of the

original source shall be treated as cases of plagiarism. Submission of material, verbatim or paraphrased, that is authored by another person or published earlier by oneself shall also be considered as cases of plagiarism.

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

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

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

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

(xi) Dress Code

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

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

17. Punishments for Malpractice cases – Guidelines

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

S.No.	Nature of Malpractice/Improper conduct	Punishment
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm 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 / 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	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.

	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.	
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.	

18.0 ADDITIONAL ACADEMIC REGULATIONS:

18.1 Any attempt to impress upon the teachers, examiners, faculty and staff of Examinations,bribing for either marks or attendance will be treated as malpractice.

18.2 When a component of Continuous Internal Evaluation (CIE) or Semester End Examination(SEE) is cancelled as a penalty, he/she is awarded zero marks in that component.

19.0 AMENDMENTS TO REGULATIONS:

The Academic Council of Bapatla Engineering College (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations and / or Syllabi, Academic schedules, Examination schedules, Examination pattern, Moderation to students, Special opportunityto complete degree beyond stipulated time and any other matter pertained that meets to the needs of the students, society and industry without any notice and the decision is final.

Department of Electrical and Electronics Engineering

Course Structure Summary

S.No	Category	Credits	% of Credits
1	Humanities & Social Science including Management Courses	10.5	7
2	Basic Science Courses	21	13
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	24	15
4	Professional Core Courses	55.5	35
5	Professional Elective Courses	15	9
6	Open Elective Courses/Job Oriented Courses	12	7.5
7	Project work, seminar, and internship in industry or elsewhere	12	7.5
8	Skill Oriented Courses	10	6
9	Mandatory Courses [Environmental Science, PEHV, Indian Constitution, Essence of Indian Traditional Knowledge etc]	-	-
Total		**160**	100

Semester Wise Credits Summary

Semester	Credits	With Honor Credits
Semester-I	16.5	16.5
Semester-II	22.5	22.5
Semester-III	21	21
Semester-IV	21	25
Semester-V	22.5	26.5
Semester-VI	21.5	25.5
Semester-VII	23	27
Semester-VIII	12	16
Total	**160**	**180**

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

First Year B.Tech (SEMESTER – I)

for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Hours per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	S	P	Total	CIE	SEE	Total Marks	
20EE101/MA01	BS	Linear algebra and differential equations	3	0	1	0	4	30	70	100	3
20EE102/PH01	BS	Waves and Modern Physics	3	0	0	0	3	30	70	100	3
20EE103/EL01	HS	Communicative English	3	0	0	0	3	30	70	100	3
20EEL101/PHL01	BS	Physics Lab	0	0	0	3	3	30	70	100	1.5
20EEL102/ELL01	HS	English Communication skills Lab	0	0	0	3	3	30	70	100	1.5
20EEL103/MEL02	ES	Workshop Practice Lab	0	0	0	3	3	30	70	100	1.5
20EEL104/MEL01	ES	Engineering Graphics	1	0	0	4	5	30	70	100	3
20EE104/MC01	MC	Environmental Studies	2	0	0	0	2	30	0	30	0
INDUCTION PROGRAM		First Three Weeks (Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Familiarization to Dept./Branch & Innovations)									
TOTAL			**12**	**0**	**1**	**13**	**26**	**240**	**490**	**730**	**16.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical S: Self-study

BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses

MC: Mandatory course

1 Hr. Lecture (L) per week - 1 credit
1 Hr. Practical (P) per week - 0.5 credits
1 Hr. Tutorial (T) per week - 1 credit
1 Hr. Self-study (S) per week - 0 credits
2 Hours Practical (Lab)/week - 1 credit

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

First Year B.Tech (SEMESTER – II)

for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Hours per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	S	Total	CIE	SEE	Total Marks	
20EE201/ MA02	BS	Numerical methods& Advanced Calculus	3	0	0	1	4	30	70	100	3
20EE202/ PH03	BS	Semiconductor Physics and Nano Materials	3	0	0	0	3	30	70	100	3
20EE203/ CY01	BS	Chemistry	3	0	0	0	3	30	70	100	3
20EE204/ CS01	ES	Programming for Problem Solving	3	0	0	1	4	30	70	100	3
20EE205	PC	Circuit Theory	3	0	0	1	4	30	70	100	3
20EE206/ CE03	ES	Engineering Mechanics	3	0	0	1	4	30	70	100	3
20EEL201 /CY L01	BS	Chemistry Lab	0	0	3	0	3	30	70	100	1.5
20EEL202	PC	Circuit Theory Lab	0	0	3	0	3	30	70	100	1.5
20EEL203 /CS L01	ES	Programming for Problem Solving Lab	0	0	3	0	3	30	70	100	1.5
NCC/NSS			0	0	3	0	3	0	0	0	0
TOTAL			**18**	**0**	**12**	**4**	**34**	**270**	**630**	**900**	**22.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture T: Tutorial P: Practical S: Self-study
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Second Year B.Tech (SEMESTER – III)

for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Hours per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	S	Total	CIE	SEE	Total Marks	
20EE301/ MA03	BS	Probability and Statistics	3	0	0	1	4	30	70	100	3
20EE302	PC	Network Analysis	3	0	0	1	4	30	70	100	3
20EE303	PC	Electro Magnetic Fields	3	0	0	0	3	30	70	100	3
20EE304	PC	DC Machines and Transformers	3	0	0	1	4	30	70	100	3
20EE305/ EL02	HS	Technical English	2	0	0	0	2	30	70	100	2
20EEL301 / SO01	SC	Software Tools to Electrical Engineering	1	0	2	0	3	30	70	100	2
20EEL302	ES	Measurement and Instrumentation Lab	2	0	2	0	4	30	70	100	3
20EEL303 /IT01	ES	Data Structures and Algorithms Lab	1	0	2	0	3	30	70	100	2
20EE306/ MC02	MC	Professional Ethics and Human Values	2	0	0	0	2	30	0	30	0
NCC/NSS			0	0	3	0	3	0	0	0	0
TOTAL			**20**	**0**	**9**	**3**	**32**	**270**	**560**	**830**	**21**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture T: Tutorial P: Practical S: Self-study

BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses

MC: Mandatory course PC: Professional Core Course SO: Skill Oriented Course

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Second Year B.Tech (SEMESTER – IV)

for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Hours per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	S	Total	CIE	SEE	Total Marks	
20EE401	PC	Analog Electronics	3	0	0	0	3	30	70	100	3
20EE402	PC	Digital Electronics	3	0	0	1	4	30	70	100	3
20EE403	PC	Induction Motors and Synchronous machines	3	0	0	1	4	30	70	100	3
20EE404	PC	Signals & Systems	3	0	0	1	4	30	70	100	3
20EE405	PC	Generation and Transmission	3	0	0	0	3	30	70	100	3
20EEL401/ SO02	SO	Python	1	0	2	0	3	30	70	100	2
20EEL402	PC	Analog and Digital Electronics Lab	0	0	3	0	3	30	70	100	1.5
20EEL403	PC	DC Machines and Transformers Lab	0	0	3	0	3	30	70	100	1.5
20EEL404/ ELL02	HS	Soft Skills Lab	0	0	2	0	2	30	70	100	1
Internship during summer (2 months)											
TOTAL			**16**	**0**	**10**	**3**	**29**	**270**	**630**	**900**	**21**
20EEM41_/ 20EEH41_	**Minor/Honor Course**		**4/3**	**0/1**	**0**	**0**	**4**	**30**	**70**	**100**	**4**
Grand Total			**19**	**1**	**10**	**3**	**33**	**300**	**700**	**1000**	**25**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture T: Tutorial P: Practical S: Self-study
BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory course PC: Professional Core Course SO: Skill Oriented Course

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Third Year B.Tech (SEMESTER – V)

for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Hours per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	S	Total	CIE	SEE	Total Marks	
20EE501	ES	Micro Processor and Microcontroller	3	0	0	0	3	30	70	100	3
20EE502	PC	Power System Analysis	3	0	0	1	4	30	70	100	3
20EE503	PC	Control Systems	3	0	0	1	4	30	70	100	3
20EE504	PC	Power Electronics	3	0	0	1	4	30	70	100	3
20EE505/ PE_ _	PE	Professional Elective Course -I	3	0	0	0	3	30	70	100	3
20EEL501/ SO03	SO	Application of IOT in Electrical Engineering	1	0	2	0	3	30	70	100	2
20EEL502	ES	Micro Processor and Microcontroller Lab	0	0	2	0	2	30	70	100	1
20EEL503	PC	Induction Motors and Synchronous machines Lab	0	0	3	0	3	30	70	100	1.5
20EEL504	PC	Control Systems Lab	0	0	3	0	3	30	70	100	1.5
20EEL505/ INT01	INT	Internship	0	0	0	0	0	30	70	100	1.5
20EE506/ MC03	MC	Constitution of India	2	0	0	0	2	30	0	30	0
TOTAL			**18**	**0**	**10**	**3**	**31**	**330**	**700**	**1030**	**22.5**
20EEM52_/ 20EEH52_	**Minor/Honor Course**		**4/3**	**0/1**	**0**	**0**	**4**	**30**	**70**	**100**	**4**
Grand Total			**21**	**1**	**10**	**3**	**35**	**360**	**770**	**1130**	**26.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture T: Tutorial P: Practical S: Self-study

Professional Elective – I:

PE51: Electrical Power Distribution System

PE52: Renewable Energy Sources

PE53: Electrical Machine Design

PE54: Digital Signal Processing

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Third Year B.Tech (SEMESTER – VI)

for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	S	Total	CIE	SEE	Total Marks	
20EE601	PC	Power System Protection	3	0	0	0	3	30	70	100	3
20EE602/ PE_ _	PE	Professional Elective Course -II	3	0	0	0	3	30	70	100	3
20EE603/ PE_ _	PE	Professional Elective Course -III	3	0	0	0	3	30	70	100	3
20EE604/ JO_ _	JO	Job Oriented Elective - I	2	0	2	0	4	30	70	100	3
20EE605/ JO_ _	JO	Job Oriented Elective - II	2	0	2	0	4	30	70	100	3
20EEL601/ SO04	SO	Quantitative Aptitude	1	0	2	0	3	30	70	100	2
20EEL602	PC	Power Electronics Lab	0	0	3	0	3	30	70	100	1.5
20EEL603	PC	Power Systems Lab	0	0	3	0	3	30	70	100	1.5
20EEL604	PC	Electronics Design Lab	0	0	3	0	3	30	70	100	1.5
20EE606/ MC04	MC	Indian Traditional Knowledge	2	0	0	0	2	30	0	30	0
Internship during summer (2 months)											
TOTAL			**16**	**0**	**15**	**0**	**31**	**300**	**630**	**930**	**21.5**
20EEM63_/ 20EEH63_	**Minor/Honor Course**		**4/3**	**0/1**	**0**	**0**	**4**	**30**	**70**	**100**	**4**
Grand Total			**19**	**1**	**15**	**0**	**35**	**330**	**700**	**1030**	**25.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

Professional Elective – II & III:

PE61: Switched Mode Power Supply
PE62: Electric Drives
PE63: HVDC & FACTS
PE64: Machine Modelling and Analysis
PE65: Digital Control Systems
PE66: Optimization Techniques
PE67: Power Quality

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Fourth Year B.Tech (SEMESTER – VII)

for the Academic Year 2020-21

Code No.	Category code	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	S	Total	CIE	SEE	Total Marks	
20EE701	PC	Power System Operation Control and Stability	3	0	0	1	4	30	70	100	3
20EE702/ PE_ _	PE	Professional Elective Course - IV	3	0	0	0	3	30	70	100	3
20EE703/ PE_ _	PE	Professional Elective Course - V	3	0	0	0	3	30	70	100	3
20EE704/ JO_ _	JO	Job Oriented Elective - III	2	0	2	0	4	30	70	100	3
20EE705/ JO_ _	JO	Job Oriented Elective - IV	2	0	2	0	4	30	70	100	3
20EE706	HS	Industrial Management & Entrepreneurship Development	3	0	0	0	3	30	70	100	3
20EEL701/SO05	SO	Industrial Automation	1	0	2	0	3	30	70	100	2
20EEL702/ INT02	INT	Internship						30	70	100	3
TOTAL			**17**	**0**	**6**	**1**	**24**	**240**	**560**	**800**	**23**
20EEM74_/20EEH74_	**Minor/Honor Course**		**3**	**1**	**0**	**0**	**4**	**30**	**70**	**100**	**4**
Grand Total			**20**	**1**	**6**	**1**	**28**	**270**	**630**	**900**	**27**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture T: Tutorial P: Practical S: Self-study

BS: Basic Science Courses HS: Humanities and Social science ES: Engineering Science Courses MC: Mandatory Course PC: Professional Core Course SO: Skill Oriented Course PE: Professional Elective Courses JE: Job oriented elective courses

Professional Elective – IV & V:

PE71: High Voltage Engineering
PE72: Advanced Electrical Drives
PE73: Solar & Fuel cell Energy Systems
PE74: Smart Grid Technology and Applications
PE75: Adaptive Control Systems
PE76: AI Applications to Electrical Engineering
PE77: Digital Protection of Power System
PE78: Computer Application on power Systems

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Fourth Year B.Tech (SEMESTER – VIII)

for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	S	Total	CIE	SEE	Total Marks	
20EE801/PW01	PW	Project Work	0	0	24	0	24	50	100	150	12
20EEM85_/ 20EEH85_	Minor/Honor Course (Through MOOC only)		0	0	0	0	0	0	0	0	2
20EEM85_/ 20EEH85_	Minor/Honor Course (Through MOOC only)		0	0	0	0	0	0	0	0	2
TOTAL			**0**	**0**	**24**	**0**	**24**	**50**	**100**	**150**	**16**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture T: Tutorial P: Practical S: Self-study

BS: Basic Science Courses HS: Humanities and Social science ES: Engineering Science Courses MC: Mandatory Course PC: Professional Core Course SO: Skill Oriented Course PE: Professional Elective Courses JE: Job oriented elective courses

Note: Any one course of Professional Elective courses is permitted to pursue through MOOC during four years of B.Tech course i.e., 3 credits shall be earned.

Professional Elective Courses (15 credits):

Professional Elective – I:
PE51: Electrical Power Distribution System
PE52: Renewable Energy Sources
PE53: Electrical Machine Design
PE54: Digital Signal Processing

Professional Elective – II & III:
PE61: Switched Mode Power Supply
PE62: Electric Drives
PE63: HVDC & FACTS
PE64: Machine Modelling and Analysis
PE65: Digital Control Systems
PE66: Optimization Techniques
PE67: Power Quality

Professional Elective – IV & V:
PE71: High Voltage Engineering
PE72: Advanced Electrical Drives
PE73: Solar & Fuel cell Energy Systems
PE74: Smart Grid Technology and Applications
PE75: Adaptive Control Systems
PE76: AI Applications to Electrical Engineering
PE77: Digital Protection of Power System
PE78: Computer Application on power Systems

Job oriented (12 credits): Choose any two courses from POOL – 1 for sixth semester electives and any one courses from POOL – 2 and one course from Open Elective offered by other branch for Seventh Semester.

POOL - 1:
JO61: Anolog IC Design
JO62: Circuit Analysis for Analog Designer
JO63: Operations Research
JO64: PIC Microcontrollers and ARM Processors
JO65: Solar PV and Wind Plant Design

POOL - 2:
JO71: Analog VLSI
JO72: Computer Organisation
JO73: Metaheuristic Techniques to Electrical Engineering

Open Elective: (Offered by EEE Department)
OE01:Non-Conventioanl Energy sources
OE02: Electrical Energy Conservation & Auditing
OE03: Industrial Electrical Systems

Minor Courses (20 Credits): Courses offered to non EEE branch B.Tech., students for obtaining Minor degree in Electrical and Electronics Engineering.

S.NO	Course Title	Prerequisite Course
	Level-I	
1	Linear Control System	Basic Electrical and Electronics Engineering
2	Basics of Signals and Systems	Basic Maths
3	Utilization of Electrical Energy	Basic Electrical and Electronics Engineering
	Level -II	
1	Power Generation and Transmission	Basic Electrical and Electronics Engineering
2	Principles of Power Electronics	Basic Electrical and Electronics Engineering
3	Digital Control Systems	Linear Control System
	Level -III	
1	Power Quality	Basic Electrical and Electronics Engineering, Power Generation and Transmission
2	Smart Grid	Power Generation and Transmission
3	Energy Management & Audit	Basic Electrical and Electronics Engineering, Power Generation and Transmission
	Level -IV	
1	Industrial Drives	Principles of Power Electronics
2	Solar & Fuel cell Energy Systems	Basic Electrical and Electronics Engineering
3	Hybrid Electrical Vehicles	Principles of Power Electronics, Industrial Drives

Honor Courses (20 Credits): Additional courses offered to B.Tech., EEE students to obtain Honors degree in Electrical and Electronics Engineering

S.NO	Course Title	Prerequisite Course
A	Power Systems Dynamics and Control	Induction motors and Synchronous Machines (20EE403)
B	Advanced Power System Protection	Power System Protection (20EE601)
C	Advanced Electrical Drives	Electrical Drives (20EE602/603)
D	Smart Grid Technology and Applications	Generation and Transmission (20EE405) and Power System Analysis (20EE502)
E	Non-Linear Control Systems	Control Systems (20EE503)
F	Adaptive Control Systems	Control Systems (20EE503)
G	Energy Storage Systems	Basic physics and Chemistry
H	Electrical and Hybrid Vehicles	Induction motors and Synchronous Machines (20EE403) and Power Electronics (20EE504)
I	Sensors and Actuators	Basic Physics
J	Optimization Techniques	Basic Maths
K	Machine Learning for Engineering Applications	Probability and Statistics (20EE301)
L	Big data Analytics for Smart Grid	Generation and Transmission (20EE405) and Power System Analysis (20EE502)
M	Extra High Voltage AC Transmission	High Voltage Engineering (PE71)
N	Block Chain Technology for Electrical Systems	Generation and Transmission (20EE405) and Power System Analysis (20EE502)
O	Automotive Electrics	Measurements and Instrumentation

LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

I B. TECH – I SEMESTER (Code: 20EE101/MA01)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: None

Course Objectives: To make the students

CO1: 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.

CO2: 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.

CO3: Create and analyse mathematical models using first and second order differential equations to solve application problems that arises in engineering.

CO4: To learn about solving linear Differential equations with constant coefficients with the given initial conditions using Laplace transform technique.

Course Learning Outcomes: By the end of the course the student will be able to

CLO1: Solve a system of linear simultaneous equations, finding the inverse of a given matrix and also its Eigen values and Eigen vectors.

CLO2: Apply the appropriate analytical technique for finding the solution of a first order ordinary differential equation and use these techniques to solve some real-life problems.

CLO3: Solve higher order linear differential equations with constant coefficients and apply them to solve the circuit problems

CLO4: Evaluate Laplace transform of a given function and apply Laplace transform techniques to solve linear differential equations with constant coefficients.

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]

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]

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 t^n; 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]

TEXTBOOK:

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.

NPTEL Course Links:

1. https://nptel.ac.in/courses/122/104/122104018/

CLO, PO and PSO Mapping:

LINEAR ALGEBRA AND ODE (20EE101/MA01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Solve a system of linear simultaneous equations, finding the inverse of a given matrix and also its Eigen values and Eigen vectors.	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CLO2	Apply the appropriate analytical technique for finding the solution of a first order ordinary differential equation and use these techniques to solve some real life problems.	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CLO3	Solve higher order linear differential equations with constant coefficients and apply them to solve the circuit problems	3	2	-	1	-	-	-	-	-	-	-	-	3	-	-
CLO4	Evaluate Laplace transform of a given function and apply Laplace transform techniques to solve linear differential equations with constant coefficients.	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-

WAVES AND MODERN PHYSICS

I B.TECH – I SEMESTER (CODE-20EE102/PH01)

(Common for ECE, EEE, EIE)

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

COURSE OBJECTIVES

CO1: To familiarize the students in getting knowledge about modern optics and their Engineering applications.

CO2: To make aware of the students to obtain circuit knowledge regarding electrical, Electronics and Magnetism.

CO3: To make the students to understand the quantum theory and solving the various Physical problems using quantum mechanics.

CO4: To get the knowledge of various methods of analytical techniques for material testing.

Course Learning Outcomes: At the end of the course the students should be able to

CLO1: Explain about principle and working of different types of lasers and their applications.

CLO2: Demonstrate about principle, types of optical fibres of their importance in communication.

CLO3: Describe the electromagnetic principles in electrical and electronic circuits and Maxwell's equations.

CLO4: Explain about quantum mechanics and its applications.

CLO5: Summarize about properties and applications of ultrasonics' in various fields.

CLO6: Explain about radio isotopes and their applications.

UNIT-I (ADVANCED OPTICS)

Lasers: Interaction of radiation with matter. Einstein co-efficient, 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 fibres based on modes and refractive index, V-number, losses associated with optical fibres, fibre optical communication, advantages of optical fiber.

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 (MODERN PHYSICS)

Dual nature of light, De Broglie concept of matter waves, Davisson- Germier experiment, Heisenberg uncertainty principle and applications (nonexistence 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)

Ultrasonics: Properties of ultrasonics', Production of ultrasonic waves by magneto striction and piezo-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. M.V.Avadhanulu, P.G.Kshirsagar, "Engineering physics", S.Chand & Company Pvt. Ltd.

2. PalaniSwamy, "Engineering physics", Scitech publication

REFERENCE BOOKS:

1. Dr.P.srinivasaRao, Dr.K.Muralidhar, "Basic engineering physics" Himalaya Publication

2. Dr.P.SrinivasaRao, Dr.K.Muralidhar, "Applied physics" Himalaya publication

CLO, PO and PSO Mapping:

Waves and Modern Physics (20EE102/PH01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain about principle and working of different types of LASERS and their applications.	3	_	3	3	3	3	2	_	_	_	_	2	_	2	_
CLO2	Demonstrate about the principle, types of optical fibers and their importance in communication	3	_	3	3	3	3	2	_	_	_	_	2	_	_	1
CLO3	Describe electromagnetic principles in electrical and electronic circuits and Maxwell's equations	3	3	2	2	2	3	_	_	_	_	_	3	_	_	_
CLO4	Explain about quantum mechanics and its applications	3	3	_	2	2	2	_	_	_	_	_	3	_	2	_
CLO5	Summarize about properties and applications of ultrasonic's in various fields	3	_	3	3	3	3	_	_	_	_	_	2	_	_	_
CLO6	Explain about radio isotopes and their applications	_	_	3	3	3	2	2	_	_	_	_	2	2	_	_

COMMUNICATIVE ENGLISH

I B.TECH – I SEMESTER (Code: 20EE103/EL01)

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

Course Objectives : The course aims

CO1: To enhance the vocabulary competency of the students
CO2: To enable the students to demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation
CO3: To introduce corrective measures to eliminate grammatical errors in speaking and writing
CO4: To enhance theoretical and conceptual understanding of the elements of grammar.
CO5: To Understand and apply the conventions of academic writing in English
CO6: To enhance the learners' ability of communicating accurately and fluently

Course Learning Outcomes: By the end of the course the student would be able to

CLO1: Build academic vocabulary to enrich their writing skills
CLO2: Make use of contextual clues to infer meanings of unfamiliar words from context
CLO3: Produce accurate grammatical sentences
CLO4: Skim for main idea(s) & scan for details
CLO5: Distinguish main ideas from specific details

UNIT-I

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

UNIT-II

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

UNIT III

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

UNIT IV

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

TEXT BOOKS/REFERENCE BOOKS:

1. Sanjay Kumar &PushpaLatha, "Communication Skills", Oxford University Press:2011.
2. Michael Swan, "Practical English Usage", Oxford University Press:1995.
3. F.T.Wood, "Remedial English Grammar", Macmillan:2007.
4. Liz Hamplyons& Ben Heasley, "Study Writing", Cambridge University Press:2006.

CLO, PO and PSO Mapping:

Communicative English (20EE103/EL01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Build academic vocabulary to enrich their writing skills	-	-	-	-	-	-	-	-	2	3	2	-	-	2	1
CLO2	Make use of contextual clues to infer meanings of unfamiliar words from context	-	-	-	-	-	-	-	-	2	3	2	-	-	2	1
CLO3	Produce accurate grammatical sentences	-	-	-	-	-	-	-	-	2	3	2	-	-	2	1
CLO4	Skim for main idea(s) & scan for details	-	-	-	-	-	-	-	-	2	3	2	-	-	2	1
CLO5	Distinguish main ideas from specific details	-	-	-	-	-	-	-	-	3	3	2	-	-	2	1

PHYSICS LAB

I B.Tech– I Semester (Code: 20EEL101/PHL01)
(COMMON TO ALL BRANCHES)

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

Course Objectives: To make the students
CO1: Realize the importance of electrical and magnetic laws.
CO2: Quantify the various physical parameters through optical principles.
CO3: Estimate the material parameters through stress and strain experiments.
CO4: Explore and operate the different optoelectronic devices.

Course Outcomes: Students will be able to
CLO1: Acknowledge the important aspects of earth magnetic field, realize the use of Maxwell's equations in various magnetic applications.
CLO2: Applications of basic principles of optics to estimate physical parameters.
CLO3: Realization of material properties and parameters.
CLO4: Get hands on experience in various opto-electronic devices like Solar Cell, Photo Cell and their applications

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 of radius of curvature of a Plano convex lens using Newton's rings.
6. Determination of wavelengths of mercury spectrum using grating normal incidence method.
7. Determination of dispersive power of a given material of prism using prism minimum deviation method.
8. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonant frequency.
9. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
10. Verify the laws of transverse vibration of stretched string using sonometer.
11. Determine the rigidity modulus of the given material of the wire using Torsional pendulum.
12. Draw the load characteristic curves of a solar cell.
13. Determination of Hall coefficient of a semiconductor.
14. Determination of voltage and frequency of an A.C. signal using C.R.O.
15. Determination of Forbidden energy gap of Si &Ge.
16. Determination of wavelength of laser source using Diode laser.

Any three experiments are virtual

TEXT BOOK:

1. P.Srinivasarao & K.Muralidhar, “Engineering physics laboratory manual”, Himalaya publications.

CLO, PO and PSO Mapping:

Physics Lab (20EEL101/PHL01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Acknowledge the important aspects of earth magnetic field, realize the use of Maxwells equations in various magnetic applications	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CLO2	Applications of basic principles of optics to estimate physical parameters.	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CLO3	Realization of material properties and parameters.	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CLO4	Get hands on experience in various opto-electronic devices like Solar Cell, Photo Cell and their applications.	2	2	3	-	1	-	-	-	-	-	-	-	-	-	-

ENGLISH COMMUNICATION SKILLS LAB

I B.TECH – I SEMESTER (Code: 20EEL102/ELL01)

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

English Communication Skills (ECS) Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning

Course Objectives:

CO1: To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm

CO2: To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking

CO3: To improve students' fluency in English and neutralize their mother tongue

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

Course Learning Outcomes:

The student would be able to

CLO1: Better understand the nuances of English language through audio- visual experience and group activities

CLO2: Develop neutralization of accent for intelligibility

CLO3: Build confidence to enhance their speaking skills

CLO4: Use effective vocabulary both in formal and informal situations

UNIT-I

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

UNIT-II

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

UNIT-III

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

UNIT-IV

4.1 JAM Session
4.2 Debates
4.3 Extempore

TEXT BOOKS/REFERENCE BOOKS:

1. Sanjay Kumar &PushpaLatha, "Communication Skills", Oxford University Press:2011.
2. J.D. O' Connor, "Better English Pronunciation", Cambridge University Press:1984
3. Jack C Richards, "New Interchange" (4rth Edition), Cambridge University Press:2015
4. Grant Taylor, "English Conversation Practice", McGraw 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

CLO, PO and PSO Mapping:

ENGLISH COMMUNICATION SKILLS LAB (20EEL102/ELL01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Better understand the nuances of English language through audio-visual experience and group activities	-	-	-	-	-	-	-	-	3	3	2	2	2	1	1
CLO2	Develop neutralization of accent for intelligibility	-	-	-	-	-	-	-	-	2	3	2	2	2	1	1
CLO3	Build confidence to enhance their speaking skills	-	-	-	-	-	-	-	-	3	3	2	2	2	1	1
CLO4	Use effective vocabulary both in formal and informal situations	-	-	-	-	-	-	-	-	3	3	2	2	2	1	1

WORKSHOP PRACTICE LAB

I B.TECH – I SEMESTER (Code: 20EEL103/MEL02)

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

Prerequisites: None

Course Objectives: To make the students

CO1: To impart student knowledge on various hand tools for usage in engineering applications.

CO2: Be able to use analytical skills for the production of components.

CO3: Design and model different prototypes using carpentry, sheet metal and welding.

CO4: Make electrical connections for daily applications.

CO5: To make student aware of safety rules in working environments.

Course Learning Outcomes: At the end of the course the students should be able to

CLO1: Make half lap joint, Dovetail joint and Mortise &Tenon joint

CLO2: Produce Lap joint, Tee joint and Butt joint using Gas welding

CLO3: Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools

CLO4: 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.

CLO, PO and PSO Mapping:

WORKSHOP PRACTICE LAB (20EEL103/MEL02)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Make half lap joint, Dovetail joint and Mortise &Tenon joint	2	3	2		2		2			1		2	1	2	3
CO2	Produce Lap joint, Tee joint and Butt joint using Gas welding	2	3	2		2		2			1		2	1	2	3
CO3	Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools	2	3	2		2		2			1		1	1	2	3
CO4	Make connections for controlling one lamp by a single switch, controlling two lamps by a single switch and stair case wiring			2		2		2			1		1			2

ENGINEERING GRAPHICS

I B.Tech – I Semester (Code: 20EEL104/MEL01)

Lectures	1	Tutorial	0	Practical	4	Self-study	0	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				0

Prerequisites: None

Course Objectives: To make the students To learn

CO1: Clear picture about the importance of engineering graphics in the field of engineering
CO2: Drawing skills and impart students to follow Bureau of Indian Standards
CO3: An idea about Geometric constructions, Engineering curves, orthographic projections, and pictorial projections
CO4: Imagination skills about orientation of points, lines, surfaces, and solids
CO5: Basic drafting skills of Auto CAD

Course Learning Outcomes: By the end of the course the student will be able to

CLO1: Draw projections of points and projections of lines using Auto CAD
CLO2: Plot projections of surfaces like circle, square and rhombus
CLO3: Plot the Projections of solids like Prisms and pyramids
CLO4: Convert the of Orthographic views into isometric views of simple objects
CLO5: Generate the of pictorial views into orthographic views of simple castings

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 projection of 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).

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

TEXT BOOK:

1. Dhananjay M. Kulkarni, "Engineering Drawing with AutoCAD" PHI publication
2. N.D. Bhatt & V.M. Panchal, "Engineering Drawing", Charotar Publishing House.

REFERENCE BOOKS:

1. Dhananjay AJolhe, "Engineering Drawing" Tata McGraw hill publishers
2. Prof.K.L.Narayana& Prof. R.K.Kannaiah, "Engineering Drawing"

CLO, PO and PSO Mapping:

Engineering Graphics (20EEL104/MEL01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Draw projections of points and projections of lines using Auto CAD	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CLO2	Plot projections of surfaces like circle, square and rhombus	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO3	Plot the Projections of solids like Prisms and pyramids	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CLO4	Convert the of Orthographic views into isometric views of simple objects	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CLO5	Generate the of pictorial views into orthographic views of simple castings	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-

ENVIRONMENTAL STUDIES

I B.TECH – I SEMESTER (Code: 20EE104/CE01)

Lectures	2	Tutorial	0	Practical	0	Self-study	0	Credits	2
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				0

Prerequisites: None

Course Objectives: The course aims

CO1: To develop an awareness, knowledge, and appreciation for the natural environment.
CO2: To understand different types of ecosystems exist in nature.
CO3: To know our biodiversity.
CO4: To understand different types of pollutants present in Environment.
CO5: To know the global environmental problems.

Course Learning Outcomes: By the end of the course the student will be able to

CLO1: Develop an appreciation for the local and natural history of the area.
CLO2: 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.
CLO3: Know how to manage the harmful pollutants.
CLO4: Gain the knowledge of Environment.
CLO5: Create awareness among the youth on environmental concerns important in the long-term interest of the society

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

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 Bachao Andolan 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.

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 vermin composting.

Environmental acts: Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act.

UNIT – IV

Environmental issues: Greenhouse effect & Global warming, Ozone layer depletion, Acid rains, Green Revolution, Population Growth and environmental quality, Environmental Impact Assessment. Environmental Standards (ISO 14000, etc.)

Case Studies: Bhopal Tragedy, Mathura Refinery and TajMahal, and Ralegan Siddhi (Anna Hazare).

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.

TEXTBOOKS:

1. Benny Joseph, "Environmental Studies", Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. JP Sharma, "Comprehensive environmental studies", Laxmi Publications.

REFERENCE BOOKS:

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

CLO PO and PSO Mapping:

ENVIRONMENTAL STUDIES (20CE01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Develop an appreciation for the local and natural history of the area.	-	-	-	1	-	2	3	-	-	1	-	2	-	-	-
CLO2	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.	-	-	-	-	2	2	3	-	-	1	-	2	-	-	1
CLO3	Know how to manage the harmful pollutants.	-	-	-	-	-	-	3	-	-	1	1	2	1	-	-
CLO4	Gain the knowledge of Environment.	-	-	-	1	-	2	3	-	-	1	-	2	1	-	-
CLO5	Create awareness among the youth on environmental concerns important in the long-term interest of the society	-	-	-	-	-	2	3	2	-	1	-	2	-	-	1

NUMERICAL METHODS AND ADVANCED CALCULUS

I B.Tech –II Semester (Code: 20EE201/MA02)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: None

Course Objectives: To make the students

CO1: Solve algebraic, transcendental and system of linear equations with the help of numerical methods.

CO2: Apply the techniques of numerical integration whenever and where routine methods are not applicable and solve the first order ode numerically with the given initial condition using different methods.

CO3: Evaluate double and triple integrals and apply them to find areas and volumes.

CO4: Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

Course Learning Outcomes: By the end of the course the student will be able to

CLO-1: Solve algebraic, transcendental and system of linear equations with the help of Numerical techniques.

CLO-2: Apply the techniques of numerical integration to evaluate real definite integrals, solve the first order ode numerically with the given initial condition.

CLO-3: Transform Cartesian coordinate system to cylindrical or spherical polar coordinate system, Evaluate double and triple integrals and apply them to find areas and volumes.

CLO-4: Explain the concepts scalar and vector fields, gradient, divergence and curl. Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

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's interpolation 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]. [12 Hours]

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", 44th edition, 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.

NPTEL Course Links:

1. NPTEL :: Mathematics - NOC:Numerical methods
2. NPTEL :: Mathematics - NOC:Integral and Vector Calculus

CLO, PO and PSO Mapping:

Numerical methods and advanced Calculus (20EE201/MA02)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Solve algebraic, transcendental and system of linear equations with the help of numerical	2	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CO2	Apply the techniques of numerical integration to evaluate real definite integrals, solve the first order ode numerically with the given initial condition.	2	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CO3	Transform Cartesian coordinate system to cylindrical or spherical polar coordinate system, Evaluate double and triple integrals and apply them to find areas and volumes.	3	2	-	1	-	-	-	-	-	-	-	-	2	-	-
CO4	Explain the concepts scalar and vector fields, gradient, divergence and curl. Evaluate the line, surface and volume integrals and learn their inter-relations and applications.	3	3	-	1	-	-	-	-	-	-	-	-	3	-	-

SEMICONDUCTOR PHYSICS AND NANO MATERIALS

I B.Tech –II Semester CODE: 20EE202/PH03

(Common for CSE, IT, EEE &EIE)

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

Course Objectives:

CO1: 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.

CO2: This unit provides various properties of semiconductor materials and their importance in various device fabrications.

CO3: This unit aim to educate the student on various opto-electronic devices and their applications.

CO4: This unit provide information about the principles of processing, manufacturing and characterization of nano materials, nanostructures and their applications.

Course outcomes: At the end of the course the students should be able to

CLO1: Explain concepts of band structure of solids, concept of hole and effective mass of electron in semiconductors.

CLO2: Describe concept of Fermi level and various semiconductor junctions.

CLO3: Summarize working principles of various opto-electronic devices and their applications.

CLO4: Demonstrate importance of nano-materials and their characteristic properties.

UNIT –I

ELECTRONIC MATERILAS: Somerfield 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 and drift, 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. Avadhanulu and Kshirsagar, “A text book of engineering physics”, S.Chand& Co. (2013)
2. Dr.*P.Srinivasa Rao*. Dr.K.*Muralidhar, “*Applied physics”,
3. Charles Kittel, “Introduction to solid state state physics”, 8th edition
4. S.O. Pillai, “Solid state physics”,

REFERENCE BOOKS:

1. B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath and J. Murday, “Textbook on Nanoscience and Nanotechnology”, Springer Science & Business Media, 2013.
2. Dr.*P.SrinivasaRao*. Dr.K.*Muralidhar. “*Basic Engineering Physics”, Himalaya Publications, 2016

NPTEL COURSE LINKS:

1. NPTEL :: Physics - Fundamental concepts of semiconductors
2. NPTEL :: Metallurgy and Material Science - NOC:Fundamentals of electronic materials and devices
3. NPTEL :: Metallurgy and Material Science - Optoelectronic Materials and Devices

CLO, PO and PSO Mapping:

SEMICONDUCTOR PHYSICS AND NANO MATERIALS (20EE202/PH03)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain concepts of band structure of solids, concept of hole and effective mass of electron in semiconductors.	3	3	-	2	-	-	-	-	-	-	-	3	-	2	3
CLO2	Describe concept of fermi level and various semiconductors junctions	3	3	-	2	-	-	-	-	-	-	-	3	-	-	3
CLO3	Summarize working principles of various optoelectronic devices and their applications	3	-	3	3	2	2	3	-	-	-	-	3	-	-	3
CLO4	Demonstrate importance of nano materials and their characteristic properties	3	3	2	2	2	-	-	-	-	-	-	3	-	2	3

ENGINEERING CHEMISTRY

(Common to all branches)

I B.Tech –II Semester (Code: 20EE203 /CY01)

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

PREREQUISITES: None

COURSE OBJECTIVES: The student should be conversant:

CO1: With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.

CO2: To understand the thermodynamic concepts, energy changes, concept of corrosion & its control.

CO3: With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics.

CO4: With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

COURSE OUTCOME: By the end of the course the student will be able to

CLO1: Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.

CLO2: Explain converting various energies of different systems and protection of different metals from corrosion.

CLO3: Have the capacity of applying energy sources efficiently and economically for various needs.

CLO4: Design economically and new methods of organic synthesis and substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.

UNIT -I

Water Chemistry

Introduction: water quality parameters

Characteristics: Alkalinity, Hardness **-** Estimation & simple numerical problems,

Boiler Troubles - Sludges, Scales, Caustic embrittlement, boiler corrosion, Priming and foaming;

Internal conditioning- phosphate, calgon and carbonate methods.

External conditioning - Ion exchange process & Zeolite proess WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration. Disinfection methods: Chlorination, ozonization and UV treatment. Salinity – Treatment of Brackish water by Reverse Osmosis and Electrodialysis.

UNIT- II

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

Corrosion: Types of corrosion - Chemical or dry corrosion, Electrochemical or wet corrosion; Galvanic, stress, pitting and differential aeration corrosion; Factors effecting corrosion.

Corrosion control – Cathodic protection, and electro plating (Au)& electoless Ni plating.

UNIT- III

Fuels: Classification of fuels; Calorific value of fuels (lower, higher)

Solid fuels: Determination of calorific value (Bomb Calorimeter) & related problems, Coal ranking,

Liquid Fuels: Petroleum refining and fractions, composition and uses. Knocking and anti-knocking Agents, Octane number and Cetane number; Bio fuels- Biodiesel, general methods of preparation and advantages

Gaseous fuels: CNG and LPG, Flue gas analysis – Orsat apparatus.

UNIT- IV

Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution (SN^1, SN^2), addition (Markownikoff's and anti-Markwnikoff's rules) , elimination (E_1& E_2), Synthesis of a commonly used drug molecule.(Aspirin and Paracetamol)

Polymers: Conducting polymers: Classification, Intrinsic and Extrinsic conducting polymers and their applications**.** Plastics: Thermo plasts and thermosetting plastics, Bskelite and PVC.

Bio degradable polymers: types, examples-Polyhydroxybuterate (PHB), Polyhydroxybuterate-co-β-hydroxyvalerate (PHBV), applications.

TEXT BOOKS:

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

REFERENCES:

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, 12^{th} Edition, 2012.

2 Text Book of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).

3 Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015.

CLO, PO and PSO Mapping:

ENGINEERING CHEMISTRY (20EE203 /CY01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Develop innovative methods to produce soft water for industrial use and able to solve the industrial problems	3	3	1	-	-	2	3	-	-	-	-	3	3	-	-
CLO2	Explain converting various energies of different systems and protection of different metals from corrosion.	3	3	2	-	-	2	2	-	-	-	-	3	3	3	2
CLO3	Have the capacity of applying energy sources efficiently and economically for various needs.	3	3	0	-	-	2	3	-	-	-	-	3	3	3	2
CLO4	Design economically and new methods of organic synthesis and substitute metals with conducting polymers and also produce cheaper biodegradable polymers	3	3	2	-	-	2	1	-	-	-	-	2	2	-	-

	to reduce environmental pollution to reduce environmental pollution																

PROGRAMMING FOR PROBLEM SOLVING

(Common for all branches except Civil Engineering)

I B.Tech –II Semester (Code: 20EE204/CS01)

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

Prerequisites: BASIC MATHEMATICS

Course Objectives: To make the students

- CO1: Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetic rules.
- CO2: Develop problem-solving skills to translate 'English' described problems into programs written using C language.
- CO3: Use Conditional Branching, Looping, and Functions.
- CO4: 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 Learning Outcomes: At the end of the course the students should be able to

1. Choose the right data representation formats based on the requirements of the problem.
2. Analyse a given problem and develop an algorithm to solve the problem.
3. Explain the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
4. Write the program on a computer, edit, compile, debug, correct, recompile and run it.

UNIT- I

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

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

UNIT -II

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

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

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 BOOK:

1. E.Balaguruswamy, "Programming in ANSI C, 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, .

NPTEL COURSE LINKS:

1. NPTEL :: Computer Science and Engineering - NOC:Problem Solving through Programming in C
2. NPTEL :: Computer Science and Engineering - NOC:Introduction to programming in C

CLO, PO and PSO Mapping:

PROBLEM SOLVING USING PROGRAMMING (20EE204/CS01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Choose the right data representation formats based on the requirements of the problem	3	2	2	-	-	-	-	-	-	-	-	-	-	3	2
CO2	Analyse a given problem and develop an algorithm to solve the problem.	2	3	2	-	-	-	-	-	-	-	-	-	-	2	1
CO3	Explain the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.	2	2	1	-	-	-	-	-	-	-	-	-	-	2	2
CO4	Write the program on a computer, edit, compile, debug, correct, recompile and run it.	2	1	2	-	-	-	-	-	-	-	-	-	-	2	1

CIRCUIT THEORY

I B.Tech –II Semester (Code: 20EE205)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Basic Mathematics, Basic Physics

Course Objectives: To make the students

CO1: Understand about basic Laws in circuits, circuit elements and sources and their characteristics.

CO2: Understand fundamental concepts of alternating current and voltages, power triangle and power factor.

CO3: Analyze circuits with different DC and AC sources.

CO4: Gain knowledge about statement and application of various theorems.

CO5: Understand concept of resonance in series and parallel circuits.

Course Outcomes: By the end of the course the student will be able to

CLO1: Explain about basic Laws, circuit elements and sources and their characteristics.

CLO2: Draw phasor diagrams, phase relations in elements and power triangle.

CLO3: Solve problems involving with different AC and DC sources in electrical circuits.

CLO4: Synthesis the circuits with various theorems.

CLO5: Demonstrate the series and parallel resonance circuits.

UNIT – I

CIRCUIT ELEMENTS: Basic definition of the unit of Charge, Voltage, Current, Power and Energy, Circuit concept, various circuit elements, Energy stored in Inductors and Capacitors, Kirchhoff's laws,
SOURCES: Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and Current division, series / parallel combination of elements, Star-Delta transformation, Instantaneous, Peak, Average and RMS values of various waveforms, Crest factor, Form factor. Concept of phase and phase difference in sinusoidal waveforms, Phase relation in pure resistor, Inductor and capacitor, Impedance diagram, phasor diagram, series and parallel circuits, compound Circuits, Computation of active, reactive and complex powers, power triangle, power factor.

UNIT – II

STEADY STATE ANALYSIS: Mesh and Nodal analysis of DC circuits with and without dependent sources, Mesh and Nodal analysis of AC circuits, Analysis of RL, RC, RLC series and parallel circuits with pulse and impulse excitations.

UNIT – III

NETWORK THEOREMS: Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorems, Tellegen's and Millman's theorems to both DC (with and without dependent) and AC circuits

UNIT – IV

RESONANCE: Series resonance, Impedance and phase angle, voltages and currents, bandwidth and Q factor and its effect on bandwidth, magnification, parallel resonance, resonant frequency, variation of impedance with frequency , Q factor, magnification, reactance curves in parallel resonance, Locus diagrams for series and parallel circuits.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", 8^{th} Edition,TMH, 2012.
2. C K Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 5th Edition, 2016.

REFERENCE BOOKS:

1. Abhijit chakrabarti, "Circuit theory analysis and synthesis" Dhanapatrai & co (p) Ltd, 2018.
2. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", 4th Edition, TMH, 2010.
3. A Edminister, "Electric circuits", Schaum outline series, 7^{th} Edition, McGraw Hill, 2017.
4. M E Vanvalkenburg, "Network Analysis", 3rd Edition, PHI, 2006.
5. C L Wadhwa, "Network analysis and synthesis", New Age International, 2nd Edition, 2006.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Network Analysis, https://nptel.ac.in/courses/108/105/108105159
2. NPTEL :: Electrical Engineering - NOC:Basic Electric Circuits, https://nptel.ac.in/courses/108/104/108104139/
3. NPTEL :: Electrical Engineering - NOC:Basic Electrical Circuits, https://nptel.ac.in/courses/108/106/108106172/

CLO, PO and PSO Mapping:

CIRCUIT THEORY (20EE205)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain about basic Laws, circuit elements and sources and their characteristics.	3	-	-	-	-	-	-	-	-	-	-	-	2	2	-
CLO2	Draw phasor diagrams, phase relations in elements and power triangle.	3	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CLO3	Solve problems involving with different AC and DC sources in electrical circuits.	3	2	-	-	-	-	-	-	-	-	-	-	3	3	-
CLO4	Synthesis the circuits with various theorems.	3	2	-	2	-	-	-	-	-	-	-	-	3	3	-
CLO5	Demonstrate the series and parallel resonance circuits.	3	2	-	2	-	-	-	-	-	-	-	-	2	3	-

ENGINEERING MECHANICS

I B.Tech –II Semester (Code: 20EE206/CE02)

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

Prerequisites: Basic Physics

Course Objectives: To learn

CO1: The concepts Force systems, free body diagrams, resultant of forces and equations of equilibrium, Supports and support reaction sand calculation of Centroid

CO2: The Concept of moment of inertia of plane figures, Laws and applications of friction

CO3: The Analysis of the truss and determination of axial forces by Method of Joints

CO4: Motion of a body and their relationships and application of D Alembert's principle in rectilinear and curvilinear motions

CO5: About Mass moment of inertia of material bodies, Plane motion of a body about a fixed axis

Course Learning Outcomes: Students will be able to

CLO-1: Construct free body diagrams and use appropriate equilibrium equations, Calculate unknown forces in a plane by resolution of force and equilibrium equations

CLO-2: Locate Centroid of composite figures and determine moment of plane figures

CLO-3: Analyze the systems with friction

CLO-4: Determine the axial forces in the members of determinate truss. Calculation of acceleration, velocity and displacement and forces

CLO-5: Determine moment of inertia of material bodies, Calculation of angular displacement, velocity and angular acceleration of rotational bodies.

UNIT – I

Concurrent Forces in a Plane

Principles of statics – composition and resolution of forces – equilibrium of concurrent forces in a plane –Method of moments.

Parallel Forces in a Plane

Two parallel forces – general case of parallel forces in a plane – center of parallel forces – Centroids of composite plane figures and curves.

UNIT – II

Moments of Inertia of Plane Figures

Moment of inertia of a plane figure with respect to an axis in its plane – Moment of Inertia with respect to an axis perpendicular to the plane of the figure – Parallel axis theorem.

Friction

Characteristics of friction – problems involving dry friction, ladder friction and wedge friction.

UNIT – III

Rectilinear Translation

Kinematics of rectilinear motion – principles of dynamics – Differential equations of rectilinear motion D'Alembertsprinciple .

Curvilinear Translation

Kinematics of curvilinear motion – Differential equations of curvilinear motion – D'Alembert's principle.

UNIT – IV

Moments of Inertia of Material Bodies

Moment of inertia of rigid body – Moment of inertia of a lamina – Moments of inertia of three – dimensionalbodies.

Rotation of a Rigid Body about a Fixed Axis

Kinematics of rotation – Equation of motion for a rigid body rotating about a fixed axis – D'Alembert's principle.

TEXT BOOKS:

1. S. Timoshenko and D. H. Young, "Engineering mechanics" Mc Graw-Hill International edition (For concepts and symbolic problems)
2. R. C. Hibbeler and Ashok Gupta, "Engineering mechanics statics and dynamics", Pearson (For numerical problems using S.I. system ofunits)

REFERENCE BOOKS:

1. Beer and Johnston, "Vector mechanics for engineers statics and dynamics" Tata Mc Graw-Hill publishing company, NewDelhi
2. A. K. Tayal, "Engineering mechanics statics and dynamics" Umesh publication, Delhi (For numerical problems using S.I. system of units)

NPTEL COURSE LINKS:

1. NPTEL :: Mechanical Engineering - NOC:Engineering Mechanics
2. NPTEL :: Basic courses-Sem 1 and 2 - Engineering Mechanics

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

CLO, PO and PSO Mapping:

Engineering Mechanics (20EE206/CE02)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Construct free body diagrams and use appropriate equilibrium equations, Calculate unknown forces in a plane by resolution of force and equilibrium equations.	1	1	1	1	1	-	-	-	-	-	-	-	3	3	3
CLO2	Locate Centroid of composite figures and determine moment of plane figures.	1	1	1	1	3	-	-	-	-	-	-	-	3	3	3
CLO3	Analyze the systems with friction	1	1	1	3	3	-	-	-	-	-	-	-	3	3	3
CLO4	Determine the axial forces in the members of determinate truss. Calculation of acceleration, velocity and displacement and forces.	1	1	1	1	-	-	-	-	--	-	-	-	3	3	3
CLO5	Determine moment of inertia of material bodies, Calculation of angular displacement, velocity and angular acceleration of rotational bodies.	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-

ENGINEERING CHEMISTRY LAB
(Common to all branches)
I B.Tech –II Semester (Code: 20EEL201/CYL01)

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

Prerequisites: Nil

Course Objectives: To make the students

CO1: The basics of chemistry lab to carry out the qualitative and quantitative analysis of any given sample.

CO2: To determine the percentage purity of washing soda bleaching powder and given salt.

CO3: The measurement of quality parameters of water to check its suitability for domestic and industrial purpose

CO4: To estimate the characteristic properties of oil for its use at various level.

CO5: To synthesize the Soap, Resin and Aromatic Ester followed by their applications.

CO6: The use and utility of some instruments like P^H meter, Conductometer and Potentiometer for various applications.

Course Outcomes: Students will be able to

CLO1: Familiar with fundamental basics of Chemistry lab.

CLO2: Ability to estimate purity of washing soda, bleaching powder and quantity of Iron and other salts.

CLO3: Gain the knowledge regarding the quality parameters of water like salinity, hardness, alkalinity etc.

CLO4: Able to analyse the given oil for saphonification and iodine value.

CLO5: Ability to prepare high polymers and soap.

CLO6: Ability to understand the estimation of quality parameters by instrumentation technics.

LIST OF EXPERIMENTS

1. **Introduction to Chemistry Lab** (the teachers are expected to teach fundamentals like Calibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, 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 $p^H$of given sample.
   b. Determination of conductivity of given sample by conduct meter.
   c. Potentiometric Determination of Iron.

TEXT BOOKS (for Chemistry 1 and 2):

1. K.Mukkanti, Etal, "Practical Engineering Chemistry" B.S. Publications, Hyderabad, 2009.
2. Vogel, "Inorganic quantitative analysis", 5^{th} edition, Longman group Ltd. London, 1979.

REFERENCE BOOKS:

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

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

CLO, PO and PSO Mapping:

Engineering Chemistry Lab (20EEL201/CYL01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Familiar with fundamental basics of Chemistry lab	2								3	2			2		
CLO2	Ability to estimate purity of washing soda, bleaching powder and quantity of Iron and other salts.	2	2	2	2		2			3	2		1			
CLO3	Gain the knowledge regarding the quality parameters of water like salinity, hardness, alkalinity etc.	2	2	2	2		2			3	2		1	1		
CLO4	Able to analyse the given oil for saphonification and iodine value.	2	2	2	2					3	2		1			
CLO5	Ability to prepare high polymers and soap.	2			2					3	2		1	2	1	
CLO6	Ability to understand the estimation of quality parameters by instrumentation technics.	2	2	2	2					3	2		1	2	1	

CIRCUIT THEORY LAB

I B.Tech –II Semester (Code: 20EEL202)

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

Pre-requisites: Circuit theory, Mathematics

Course Objectives: To make the students

CO1: Understand and verify basic Kirchhoff's laws in circuits.

CO2: Understand and verify fundamental theorems of circuit theory.

CO3: Able to determine the parameters of a given choke coil.

CO4: Understand the locus diagrams of series RL, RC circuits.

CO5: Understand and verify fundamental theorems of circuit theory using software.

Course outcomes: At the end of the course the students should be able to

CLO1: Prove basic Kirchhoff's laws for the given circuits.

CLO2: Verify fundamental theorems of circuit theory.

CLO3: Find the parameters of a given choke coil.

CLO4: Draw the locus diagrams of series RL,RC circuits.

CLO5: Verify fundamental theorems of circuit theory using software.

LIST OF 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. Verification of Reciprocity theorem
6. Verification of Maximum Power Transfer theorem
7. Parameters of Choke coil
8. Measurement of low and medium resistance using volt ampere method
9. Locus diagram of RL series circuit
10. Locus diagram of RC series circuit
11. Steady state analysis of RL, RC and RLC series circuits using software
12. Verification of Superposition theorem using software
13. Verification of Thevenin's and Norton's theorem using software
14. Verification of Maximum Power Transfer theorem DC and AC circuits using software
15. Locus diagram of RL and RC series circuit using software

Note: Minimum 10 experiments should be carried out.

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

CLO, PO and PSO Mapping:

Circuit Theory Lab (20EEL202)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Prove basic Kirchhoff's laws for the given circuits .	3	3	3	1	-	-	-	-	3	2	-	-	3	-	-
CLO2	Verify fundamental theorems of circuit theory.	3	3	2	1	-	-	-	-	3	2	-	-	3	2	-
CLO3	Find the parameters of a given choke coil.	3	2	1	2	-	-	-	-	3	2	-	-	2	3	-
CLO4	Draw the locus diagrams of series RL,RC circuits.	3	3	2	3	-	-	-	-	3	2	-	-	2	2	-
CLO5	Verify fundamental theorems of circuit theory using software.	3	2	3	3	-	-	-	-	3	2	-	-	3	2	-

PROGRAMMING FOR PROBLEM SOLVING LAB

I B.Tech –II Semester (Code: 20EEL203/CSL01)

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

Prerequisites: Basic Mathematics

Course Objectives: To make the students

CO1: Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetic rules.

CO2: Develop problem-solving skills to translate "English" described problems into programs written using C language.

CO3: Use Conditional Branching, Looping, and Functions.

CO4: Apply pointers for parameter passing, referencing and differencing and linking data structures.

CO5: 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

CLO1: Identify the right data representation formats for the given problem.

CLO2: Use appropriate conditional/iterative statements to solve the problems.

CLO3: Apply the concepts of user defined functions and recursion to support reusability

CLO4: Design an application using the concepts of array, pointer, structure, and file management to solve real world problem.

LIST OF PROGRAMMES:

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

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

2. Write a C program to evaluate the following (using loops):
    a) $1 + x^2/2! + x^4 / 4!+$ …up to ten terms
    b) $x + x^3/3! + x^5/5!+$ … up to ten terms
3. Write a C program to check whether the given numberis
    a) Prime ornot.
    b) Perfect or Abundant or Deficient.
4. Write a C program to display statistical parameters (using one – dimensional array).
    a) Mean
    b) Mode
    c) Median
    d) Variance.
5. WriteaCprogramtoreadalistofnumbersandperformthefollowingoperations
    a) Print the list.
    b) Delete duplicates from the list.
    c) Reverse the list.
6. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the message “Element not found in the List”.

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

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

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

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

CLO, PO and PSO Mapping:

Programming for problem solving Lab (20EEL203/CSL01)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Identify the right data representation formats for the given problem.	3	3	3		2								2	-	-
CO2	Use appropriate conditional/iterative statements to solve the problems	3	3	3		2								2	-	-
CO3	Apply the concepts of user defined functions and recursion to support reusability	3	3	3		2								2	-	-
CO4	Design an application using the concepts of array, pointer, structure, and file management to solve real world problem.	3	3	3		2								2	-	-

PROBABILITY AND STATISTICS

Common to All Branches

II B.Tech-III Semester (Code: 20EE301/MA03)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment			30	Semester End Examination (3 Hours)					70

Course Objectives:

CO1: Understand various continuous probability density functions and apply them to various problems in science and engineering.

CO2: Estimate the point and interval estimators of the mean, variance and proportion for the given sample data and apply Z-test, t-test to various real life problems.

.CO3: Apply various sample tests like $\chi 2$ -test and F test for decision making regarding the population based on sample data to different realistic problems.

CO4: Compute the level of correlation, the linear relationship for the given bivariate data and the best fit curve to the given data by the method of least squares. Also perform multiple regression analysis to the regression model arising in the field of engineering.

Course Outcomes:

Upon the successful completion of the course, the student will be able to:

1. Apply various continuous probability distributions to solve the complex problems that will arise in engineering applications.
2. Understand the terms sample, population, null hypothesis, alterative hypothesis and perform statistical analysis related to a single population and draw appropriate conclusions about the population parameter.
3. Perform statistical analysis related to a single population or two populations and draw appropriate conclusions about the parameters of the populations.
4. Fit a least squares curve/plane to the given data points. Compute the correlation coefficient between the values of two random variables. Apply the technique of one way ANOVA to the given statistical data and draw conclusions.

UNIT – I

Probability Densities: Continuous Random Variables, The Normal Distribution, The Normal Approximation to the Binomial Distribution, The Uniform Distribution, The Gamma Distribution, The Beta Distribution, The Weibull distribution, Joint Distributions - Discrete and Continuous.

(Sections 5.1, 5.2, 5.3, 5.5, 5.7, 5.8, 5.9, 5.10 of the Text Book) [12 Hours]

UNIT – II

Sampling Distributions: Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance.

Inferences Concerning a Mean: Point estimation, Interval estimation, Tests of Hypotheses, Null Hypotheses and Tests of hypotheses, Hypothesis concerning one mean.

(Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6 of the Text Book) [12 Hours]

UNIT-III

Comparing Two Treatments: Comparisons-Two independent Large samples, Comparisons-Two independent small samples, Matched pairs comparisons.

Inferences Concerning Variances: The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances.

(Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3 of the Text Book) [12 Hours]

UNIT –IV

Inferences Concerning Proportions: Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions.

Regression Analysis: The method of least squares, Curvilinear regression, Multiple regression, Correlation.

(10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6 of the Text Book) [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, 3rd edition, 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. MurrayR Spiegel, John J.Schiller, R. Alu Srinivasa, 'Probability & Statistics', Schaum's outline series.
4. K.V.S.Sarma ,' Statistics Made Simple – Do it yourself on PC', Prentice Hall India, Second Edition, 2015.

NPTEL COURSE LINKS:

1. NPTEL :: Mathematics - NOC:Probability and Statistics
2. NPTEL :: Mathematics - Probability and Statistics
3. NPTEL :: Mathematics - NOC:Introduction to probability and Statistics

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

CLO, PO and PSO Mapping:

Probability and Statistics (20EE301/MA03)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Apply various continuous probability distributions to solve the complex problems tha will arise in engineering applications.	2	2		2									1		
CLO2	Understand the terms sample, population, null hypothesis, alterative hypothesis and perform statistical analysis related to a single population and draw appropriate conclusions about the population parameter.	3	2		2									2		
CLO3	Perform statistical analysis related to a single population or two populations and draw appropriate conclusions about the parameters of the populations.	3	2		3									2		
CLO4	Fit a least squares curve/plane to the given data points. Compute the correlation coefficient between the values of two random variables. Apply the technique of one way ANOVA to the given statistical data and draw conclusions.	2	2		3									2		

NETWORK ANALYSIS

II B.Tech – III Semester (Code: 20EE302)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment			30	Semester End Examination (3 Hours)					70

Prerequisites: Basic Mathematics

Course Objectives: To make the students

CO1: Infer and evaluate transient response, Steady state response for single phase systems.

CO2: Analyze the circuits using Laplace Transforms.

CO3: Understand the concepts of three-phase systems and its analysis.

CO4: Know about the concepts of two-port network parameters and network functions.

CO5: Understand the behaviour of coupled circuits.

CO6: Construct passive filters using constant K and M derived methods.

Course Outcomes: Students will be able to

CLO1: Solve transient response, Steady state response for single phase systems.

CLO2: Explain the circuits using Laplace Transforms.

CLO3: Describe three-phase circuits in the sinusoidal steady-state.

CLO4: Evaluate two-port network parameters, network functions.

CLO5: Explain coupled circuits and its behavior.

CLO6: Design passive filters using constant K and M derived methods.

UNIT – I

Solution of First and Second order networks: Solution of first and second order differential equations for Series and parallel R-L, R-C, RLC circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response for DC and AC excitations.

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, Frequency response (magnitude and phase plots).

UNIT – II

Poly Phase Systems: Advantages of 3-phase systems, generation of 3-phase voltages, phase sequence, star & delta connections, interconnection of 3-phase sources and loads, voltage, current & power in star & delta connected systems, analysis of 3-phase balanced circuit, measurement of 3-phase power, 2 wattmeter method. Analysis of 3-phase unbalanced systems, star / delta transformation method, application of KVL and Mill man's method.

UNIT-III

Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interrelation of two port network, interconnections of two port networks, image parameters, Two-Port bridged – T, Ladder and Lattice networks. transformed network with initial conditions. Transfer function representation. Poles and Zeros - Network functions for the one port and two port - Poles and Zeros of network functions - Restrictions on pole and zero locations for driving point functions and transfer functions - Time domain behavior from the pole zero plot..

UNIT-IV

Coupled Circuits: Defining self and mutual inductance, coefficient of coupling, dot convention, Development of circuit equations in time domain and frequency domain, solution of coupled circuits, series and parallel connections of two coupled coils, tuned circuit analysis (single and double tuned)

Filters: Low pass, high pass, band pass & band reject filters - frequency response, constant K – and M derived – filters.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", 8th Edition,TMH, 2013.
2. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", 5th Edition, TMH, 2017.

REFERENCE BOOKS:

1. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 5th Edition, 2016.
2. Abhijit Chakrabarti, "Circuit theory analysis and synthesis" Dhanapatrai & co(p) Ltd, 2018.
3. M.E.Vanvalkenburg, "Network Analysis", 3rd Edition, PHI, 2006.
4. C. L Wadhwa, "Network analysis and synthesis", New Age International, 2nd Edition, 2006.
5. J. A Edminister, "Electric circuits", Schaum outline series,.

NPTEL COURSE LINKS:

1. **NPTEL :: Electrical Engineering - NOC:Network Analysis**
2. **NPTEL :: Electrical Engineering - NOC:Basic Electrical Circuits**
3. **NPTEL :: Electrical Engineering - NOC:Basic Electric Circuits**

CLO, PO and PSO Mapping:

NETWORK ANALYSIS (20EE302)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Solve transient response, Steady state response for single phase systems.	3	-	-	2	-	-	-	-	-	-	-	-	3	-	-
CLO2	Explain the circuits using Laplace Transforms.	3	-	2	2	-	-	-	-	-	-	-	-	3	-	-
CLO3	Describe three-phase circuits in the sinusoidal steady-state.	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CLO4	Evaluate two-port network parameters, network functions.	3	3	2	2	-	-	-	-	-	-	-	-	2	1	-
CLO5	Explain coupled circuits and its behavior.	3	3	2	2	-	-	-	-	-	-	-	-	2	-	-
CLO6	Design passive filters using constant K and M derived methods.	3	3	3	2	-	-	-	-	-	-	-	-	2	-	-

Bapatla Engineering College::Bapatla

(Autonomous)

ELECTROMAGNETIC FIELDS

II B.Tech – IV Semester (Code: 20EE303)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Basic Physics, Basic Mathematics

Course Objectives: To make the students

CO1: Acquire knowledge in Electromagnetic field theory
CO2: Provide a solid foundation in Electrostatics such as Dipole, Capacitance
CO3: Attain familiarity in Boundary conditions and Magnetic field
CO4: Understand the relation between field theory and circuit theory
CO5: Identify the electromagnetic wave propagation in medium

Course Learning Outcomes: Students will be able to

CLO1: Describe the fundamentals in Electromagnetic field theory
CLO2: Explain basics in Electrostatics such as Dipole, Capacitance
CLO3: Distinguish electric and magnetic properties of material media and Familiarity in Boundary conditions and Magnetic field
CLO4: Explain three dimensional vector differential and integral concepts to solve real life electromagnetic field problems
CLO5: Describe the electromagnetic wave propagation in medium

UNIT – I

Electrostatics I: Introduction to Rectangular, Cylindrical and Spherical Coordinate systems. The experimental law of coulomb, Electric field intensity, Field due to a continuous volume charge distribution, Field of a line charge, sheet of charge. Electric Flux Density, Gauss's law , Applications of Gauss law, Divergence, Maxwell's First equation (Electrostatics), Energy expended in moving a point charge in an electric field, Definition of potential and potential difference. The potential field of a point charge, system of charges, potential gradient.

UNIT – II

Electrostatics II: Electric field intensity due to dipole and Energy density in electrostatic field. The nature of dielectric materials, boundary conditions for perfect dielectric materials .Capacitance. Several capacitance examples. Capacitance of a two wire line. Derivations of Poisson's and Lap lace's equations, Examples of the solution of Laplace's equation. Current and current density, continuity of current, conductor properties and boundary conditions

UNIT – III

Steady Magnetic Field: Biot- Savart Law, Ampere's Circuital Law, Magnetic Flux and Magnetic Flux Density, The scalar and vector magnetic potentials. Magnetic Forces and Materials: Force on a moving charge, Force on a differential current element, Force between differential current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and Permeability. Magnetic boundary conditions. Potential energy in magnetic fields.

UNIT – IV

Time Varying Fields and Maxwell's Equations: Faraday's law, Displacement current, Maxwell's equations in point form, integral form.

Concept of Uniform Plane Wave: Wave propagation in free space, dielectrics. Poynting theorem and wave power. Propagation in good conductors: skin effect. Reflection of uniform plane waves at normal incidence.

TEXT BOOKS:

1. W H Hayt, J A Buck , "Engineering Electromagnetics", 9th Edition TMH, 2020.
2. G S N Raju, "Electromagnetic Field Theory and transmission lines", 1st Edition, Pearson Education India, 2005.

REFERENCE BOOKS:

1. Joseph A Edminister, "Theory and Problems of Electromagnetics", 2nd Edition, Schaum's Outline Series, Mc-Graw Hill International, 1993
2. EC Jordan and KG Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2003.
3. Mathew NO Sadiku, "Elements of Electromagnetics", Oxford University Press, 2003.

NPTEL COURSE LINKS:

1. Electrical Engineering - NOC:Electromagnetic theory - NPTEL **https://nptel.ac.in/courses/108/104/108104087/**
2. Electrical Engineering - Electromagnetic Fields - NPTEL **https://nptel.ac.in/courses/108/106/108106073/**

CLO, PO and PSO Mapping:

ELECTROMAGNETIC FIELDS (20EE303)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Describe the fundamentals in Electromagnetic field theory	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-
CLO2	Explain basics in Electrostatics such as Dipole, capacitance	3	3	2	-	-	-	-	-	-	-	-	-	3	2	-
CLO3	Distinguish electric and magnetic properties of material media and Familiarity in Boundary conditions and Magnetic field	3	3	2	-	-	-	-	-	-	-	-	-	3	2	-
CLO4	Explain three dimensional vector differential and integral concepts to solve real life electromagnetic field problems	2	2	1	-	-	-	-	-	-	-	-	-	3	2	-
CLO5	Describe the electromagnetic wave propagation in medium	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-

DC MACHINES AND TRANSFORMERS

II B.Tech – III Semester (Code: 20EE304)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Basic Physics, Basic Mathematics
Course objectives: To make the students

CO1: Understand the concept of magnetic circuits and electromagnetic force and torque.
CO2: Know the construction of dc generators and its characteristics.
CO3: Understand the speed control techniques and testing methods of dc motor.
CO4: Know the construction and operation of single and three phase Transformers.

Course Learning Outcomes: At the end of this course, students will be able to
CLO1: Explain the concepts of magnetic circuits.
CLO2: Describe the operation of dc generators and its characteristics.
CLO3: Summarize the speed control techniques and testing methods of dc motors.
CLO4: Analyze construction and operation of single and three phase Transformers.

UNIT-I

Magnetic Fields and Magnetic circuits: Review of magnetic circuits-MMF, flux, reluctance, inductance; review of Ampere law and Biot- Savarts law. Visualization of magnetic fields produced by a bar magnet and a current carrying coil-through air and through a combination of iron and air.
Electromagnetic force and torque: B-H curve of magnetic materials; energy stored in magnetic circuit; Field energy and mechanical force-mechanical energy-Multiple excited magnetic field systems-Forces /Torques in systems with permanent magnets. Examples of galvanometer coil-relay contact-lifting magnet-rotating element with eccentricity or saliency.

UNIT-II

DC Generators: Basic construction of a DC machine-Principle and operation of DC Generator-Types of windings- Types of field excitations-EMF equation-Armature reaction-commutation-Characteristics of all types of DC Generators-Applications of DC Generators-Parallel operation of DC Generators.

UNIT-III

DC Motors: Principle and operation of DC motor-Torque equation of DC motor-characteristics of all types of DC motors-starters and their design-speed control-Losses-Swinburne’s test, load testing and back-to-back testing of DC machines.

UNIT-IV

Single phase Transformers: Principle, Construction and operation of single-phase transformer, equivalent circuit, phasor diagrams. Voltage Regulation, losses and efficiency. Testing's-OC and SC test, back-to back test, Separation of hysteresis and eddy current losses. **Three phase transformers:** Construction, types of connection and their comparative features. Parallel operation. Auto- transformers. Magnetizing current, effect of non-linear B-H curve of magnetic core material. Scott connection, tap changing transformers. Cooling of transformers.

TEXT BOOKS:

1. P.S.Bhimbra, "Electric Machinery", ,Khanna Publications, 7th edition, 2011.
2. I.J.Nagrath & D.P.Kotari, "Electric Machines", Tata Mc Graw-Hill Publication, 3rd edition, 2002.

REFERENCES BOOKS:

1. A.E. Fitzgerald and C.Kingsley, "ElectricMachimery", New York, McGraw Hill Education, 2013.
2. A.E.Clayton and N.N. Hancock, "Performance and design of DC Machimes", CBS Publishers, 2004.
3. M.G.Say,"Performance and design of AC machines", CBS Publishers, 2002.
4. Clayton & Hancock, "Performance and design of DC Machines", BPB Publishers.

NPTELCOURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Electrical Machines - I, https://nptel.ac.in/courses/108/105/108105155/
2. NPTEL :: Electrical Engineering - Electrical Machines -I, https://nptel.ac.in/courses/108/105/108105017/

CLO, PO and PSO Mapping:

DC Machines & Transformers (20EE304)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of magnetic circuits.	3	-	2	1	-	-	-	-	-	-	-	-	3	-	-
CLO2	Describe the operation of dc generators and its characteristics.	3	-	2	1	-	-	-	-	-	-	-	-	3	2	-
CLO3	Summarize the speed control techniques and testing methods of dc motors.	3	-	2	1	-	-	-	-	-	-	-	-	3	-	2
CLO4	Explain construction and operation of single and three phase Transformers.	3	2	2	1	-	-	-	-	-	-	-	-	3	-	-

TECHNICAL ENGLISH

II B.Tech – III Semester (Code: 20EE305/EL02)

Lectures	2	Tutorial	0	Practical	0	Self-study	0	Credits	2
Continuous Internal Assessment			30	Semester End Examination (3 Hours)					70

Prerequisites: NIL

Course Objectives: The course aims

CO1: At enhancing the vocabulary competency of the students

CO2: To introduce corrective measures to eliminate grammatical errors in speaking and writing

CO3: To learn writing as a process, including various invention heuristics (such as Brainstorming), gathering evidence, considering audience, drafting, revising, editing, and proofreading

CO4: Use grammatical, stylistic, and mechanical formats and conventions appropriate for a variety of purposes

CO5: Produce coherent, organized, readable prose for a variety of rhetorical situations

Course Outcomes: By the end of the course the student would be able to

CLO1: Make use of contextual clues to infer meanings of unfamiliar words from context

CLO2: Understand how to apply technical information and knowledge in practical documents for a variety of purposes

CLO3: Use grammatical, stylistic, and mechanical formats and conventions appropriate to various audiences and disciplines

CLO4: Build confidence to participate actively in writing activities (individually and in collaboration) that model effective technical communication in the workplace

UNIT-I

1.1 Vocabulary Development: Familiarizing 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: Transco ding (Channel conversion 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

REFERENCE BOOKS:

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

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

CLO, PO and PSO Mapping:

Technical English (20EE305/EL02)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Make use of contextual clues to infer meanings of unfamiliar words from context	-	-	-	-	-	-	-	-	3	3	2	-	-	-	-
CLO2	Understand how to apply technical information and knowledge in practical documents for a variety of purposes	-	-	-	-	-	-	-	-	3	3	2	-	-	-	-
CLO3	Use grammatical, stylistic, and mechanical formats and conventions appropriate to various audiences and disciplines	-	-	-	-	-	-	-	2	3	3	2	-	-	-	-
CLO4	Build confidence to participate actively in writing activities (individually and in collaboration) that model effective technical communication in the workplace	-	-	-	-	-	-	-	2	3	3	2	-	-	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

SOFTWARE TOOL TO ELECTRICAL ENGINEERING

II B.Tech – III Semester (Code: 20EEL301/SO01)

Lectures	1	Tutorial	0	Practical	2	Self-study	0	Credits	2
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Course Objectives: This course enables the students to

CO1: Create awareness about MATLAB software and basic mathematical function and MATRIX operations representation

CO2: Learn the fundamental of M-file script and Simulink writing concepts and Plot function

CO3: Understand the basics of SCILAB Software with programming

CO4: Develop the Input and Output Functions with graphic applications using SCILAB

Course Learning Outcomes (COs): By the end of the course the student would be able to

CLO1: Explain awareness about MATLAB software and basic mathematical function and MATRIX operations representation

CLO2: Write the code in MATLAB Script files and Simulink for solving the problems

CLO3: Develop modelling and design of engineering systems using SCILAB

CLO4: Solve and analyze the problems with the Input and Output Functions with graphic applications using SCILAB

UNIT-I

Introduction to MATLAB software-The MATLAB Environment, Basic commands, Assigning variables, Operations with variables, Data files and Data Types-Character and string, Arrays and vectors, Column vectors, Row vectors,

Basic Mathematics- Arithmetic operations, Operators and special characters, logical operators, solving arithmetic equations, Matrix Operations-Finding transpose, determinant and inverse Solving matrix; Other operations -Trigonometric functions, Complex numbers, fractions Real numbers, Complex numbers.

UNIT-II

M files- Working with scri~~pt~~ tools, Writing Script file, executing script ~~fil~~es, The MATLAB Editor, saving m files; Loops and Conditional Statements- Control Flow onditional Control if, else, switch Loop Control for, while, continue, break Program Termination return; Functions- Writing user defined functions, built in Function, Function calling, Return Value.

MATLAB Simulink-Introduction of Simulink, Simulink Environment & Interface, Study of Library, Circuit Oriented Design, Equation Oriented Design, Model, Subsystem Design.

UNIT-III

Introduction to SCILAB software- Scilab Objects -Matrix Construction and Manipulation, Strings, Boolean Matrices, Polynomial Matrices, Sparse Matrices, Lists, Functions.

SCILAB Programming –Branching, Iterations, Scilab Functions, Debugging Programs,

UNIT-IV

Input and Output Functions-Display of Variables, Formatted Input and Output, Input Output in Binary Mode

SCILAB Graphics- Basic Graphing, Graphics Objects, Graphic Tour, Basic Graphics Functions, Mathematical functions-continuous linear system,

List of Experiments:

1. Tapping some Array Operations on Marks earned by students
2. Find first 10 terms of Fibonacci series.
3. Find factorial of a number n
4. Find the Rank, transpose, inverse of the given matrix.
5. Create a script file for two or more polynomial functions.
6. Solving System of Equations in MATLAB and scilab.
7. Compute the solution of differential equations.
7. Find the solution of linear equations using Gauss and Gauss Seidel.
8. Find the solution of nonlinear equations using Bisection method and Newton – Raphson
9. Implements bisection method for finding a root f(x) = 0 using SCILAB

10. Find the solution of nonlinear equations using Newton –Raphson method.
11. Find a least-squares fit of the model of given quadratic equation using SCILAB.
12. Find Numerical Integration using trapezoidal rule using Scilab.
13. Draw the plot for Eleven data samples in the interval 0≤x≤1 of the function y=2cos(6 x+0.5) using SCILAB.
14. Find the solution of Ordinary differential equations using SCILAB.
15. Draw the 3D plots using basic techniques using SCILAB

TEXT BOOKS:

1. StephenJ. Chapman "MATLAB Programming for Engineers" 4th Edition, Cengage Learning, 2014.
2. S. Nagar, "Introduction to Scilab For Engineers and Scientists", 1st Edition, Apress, 2017.

REFENCE BOOKS:

1. Shawna Lockhart, Eric Tilleson, Introduction to Programming with MATLAB, SDC publications, 2019.
2. Stephen L. Campbell, Jean-Philippe Chancelier and Ramine Nikoukha "Modeling and Simulation in Scilab/Scicos, Springer, 2nd edition ,2010.
3. Introduction to Scilab, consortium Scilab

ONLINE COURSE LINKS:

1. Matlab Programming for Numerical Computation - Course (nptel.ac.in)
2. Scientific Computing using Matlab - Course (nptel.ac.in)
3. Numerical computing for Engineers-Scilab –scilab.org
4. https://spoken-tutorial.org(nptel.ac.in)

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

CO-PO Mapping

Software Tools to Electrical Engineering (20EEL301/SO01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	POll	PO12	PSO1	PSO2	PSO3
CLO1	Explain awareness about MATLAB software and basic mathematical function and MATRIX operations representation	1	1	1		2				3	2			1		
CLO2	Write the code in MATLAB Script files and Simulink for solving the problems		1	1		2				3	2		1	1		
CLO3	Develop modelling and design of engineering systems using SCILAB	2	2	1	1	1				3	2		1	1		
CLO4	Solve and analyze the problems with the Input and Output Functions with graphic applications using SCILAB	2	2	1	1	1				3	2		1	2		

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

MEASUREMENT AND INSTRUMENTATION LAB

II B.Tech – III Semester (Code: 20EEL302)

Lectures	1	Tutorial	0	Practical	2	Self-study	0	Credits	2
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Mathematics, Basic Electrical Engineering.

Course Objectives: To make the students

CO1: To learn about characteristics of measuring instruments.
CO2: To have an adequate knowledge in Calibration of measuring instruments.
CO3: To have an adequate knowledge in errors in Bridges.
CO4: To have an adequate knowledge in Sensors and Transducers.

Course Learning Outcomes: Students will be able to

CLO1: Explain various measurement devices, their characteristics, their operation and their limitations.

CLO2: Illustrate the dynamic response and the calibration of few instruments.

CLO3: Design and validate DC and AC bridges.

CLO4: Demonstrate the Function of Various types of Sensors and Transducers.

Lectures/Demonstrations:

1. **Concepts relating to measurements:** True value, Absolute error, Accuracy, Precision, Resolution, Drift, Hysteresis, Dead band, Sensitivity.
2. **Instruments:** Classification of Instruments – Construction and principle of Permanent magnet moving coil – Moving iron – Extension range – Energy meter.
3. **Bridges:** Measurement of R, L & C by using DC Bridges – AC Bridges.
4. **Transducers and thermal actuators:** Principle of operation of various types of Transducers and thermal actuators.
5. **Sensors:** Principle of operation of various types of Sensors and its usage to measure various electrical quantities.

List of Experiments

1) Measurement of a batch of resistors and estimating statistical parameters.
2) Measurement of Medium resistance using Wheatstone bridge.
3) Measurement of Inductance using an Anderson’s bridge technique as well as LCR meter.
4) Measurement of Capacitance using Schering bridge technique as well as LCR meter.
5) Measurement of Low Resistance using Kelvin’s double bridge.
6) Measurement of High resistance and Insulation resistance using Megger.
7) Measurement of dielectric strength of oil using oil testing kit.
8) Calibration of 1-phase energy meter using direct loading/ Phantom loading method.
9) Current Measurement using CT.

10) Current Measurement using Hall Sensor.
11) Study of the characteristics of Capacitor Level Sensor for Level Measurement of a Liquid in a Tank.
12) Study of the characteristics of a Piezo resistive Sensor for Pressure Measurement of a Liquid in a Tank Tracing of BH Curve using CRO.
13) Study of the characteristics of Resistance Temperature Detector (RTD)
14) Study of the characteristics of a Thermistor
15) Study of the characteristics of a Thermocouple
16) Study of the characteristics of a Photo reflective sensor for Speed Measurement
17) Study of the characteristics of Linear and Rotary Potentiometer

Note: Minimum 10 experiments should be carried.

CLO PO and PSO mapping:

Measurements and Instrumentation Laboratory (20EEL302)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	Explain about characteristics of measuring instruments.	3	2	3	-	-	-	-	-	1	-	-	-	3	2	-	-
CLO2	Illustrate the dynamic response and the calibration of few instruments	3	2	2	-	-	-	-	-	1	-	-	-	3	2	-	-
CLO3	Design and validate DC and AC bridges.	3	1	-	-	-	-	-	-	1	-	-	-	3	1	-	-
CLO4	Demonstrate the Function of Various types of Sensors and Transducers	3	2	3	-	-	-	-	-	1	-	-	-	3	3	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

DATA STRUCTURES AND ALGORITHMS LAB

II B.Tech – III Semester (Code: 20EEL303/ITL01)

Lectures	1	Tutorial	0	Practical	2	Self-study	0	Credits	2
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Problem Solving with Programming.

Course Objectives: To make the students

CO1: To impart the basic concepts of data structures and algorithms.

CO2: To understand concepts about searching and sorting techniques

CO3: To understand basic concepts about stacks, queues, lists, trees and graphs.

CO4: To enable them to write algorithms for solving problems with the help of fundamental data structures.

Course Outcomes: Students will be able to

CLO1: Implement ADTs of different types of linked lists and applications.

CLO2: Implement stack and queue ADT's using arrays and their applications.

CLO3: Construct and implement different tree algorithms.

CLO4: Implement various hashing techniques and Graph traversal methods.

UNIT - I

Introduction: Importance of Data Structures, Classification of Data Structures.

Stacks and Queues: Stack ADT and its operations, Stack Applications: Evaluation of Postfix. Queue ADT, Operations on Queue ADT.

UNIT - II

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion, Deletion from linked list. Double Linked List-Operations.

Sorting Techniques: Quick sort, Merge Sort.

UNIT - III

Trees: Preliminaries, Binary Trees, Expression trees, The Search Tree ADT-implementations.

UNIT - IV

Graphs: Basic Terminologies and Representations, Graph search and traversal algorithms: BFS and DFS.

LIST OF EXPERIMENTS:

1. Write a program to perform the following operations on Array List.

   a) Creation b) Insertion c) Deletion d) Search e) Display.

2. Write a program to implement the following

   a) stack using array b) queue using array

3. Write a program to implement the following using stack.

   a) infix to postfix conversion b) postfix evaluation

4. Write a program to implement circular queue and perform the following

   a) enqueue b) dequeue

5. Write a program to perform the following operations on Single Linked List.

   a) Creation b) Insertion c) Deletion d) Search e) Display

6. Write a program to perform the following operations on Circular Single Linked List.

   a) Creation b) Insertion c) Deletion d) Search e) Display

7. Write a program to perform the following operations on Doubly Linked List.

   a) Creation b) Insertion c) Deletion d) Search e) Display

8. Write a program to implement the following sorting techniques

   a) Quick Sort b) Merge Sort c) Shell Sort

9. Write a program to demonstrate Binary Expression tree.

10. Write a program to create Binary tree and display their traversals.

NPTEL COURSE LINKS:

1. NPTEL :: Computer Science and Engineering - NOC:Programming, Data Structures and Algorithms
2. NPTEL :: Computer Science and Engineering - Data Structures And Algorithms

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CLO PO and PSO mapping:

Data Structures and Algorithms Lab (20EEL303/ITL01)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Implement ADT's of different types of linked lists and applications.	2	3	2		2				3	2			3	2	
CO2	Implement stack and queue ADT's using arrays and their applications.	3	3	3		2				3	2			3	2	
CO3	Construct and implement different tree algorithms.	1	3	2		2				3	2			2	1	
CO4	Implement various hashing techniques and Graph traversal methods.	1	2	3		2				3	2			2	1	

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Professional Ethics & Human Values
B.Tech – III Semester (Code: 20EE306/20MC01)

Lectures	2	Tutorial	0	Practical	0	Self-study	0	Credits	0
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				00

Prerequisites: NIL

Course Objectives (COs): To make the student

CO1: Understand the importance of ethics and human values in life and society, moral awareness.
CO2: Apply ethics to engineering profession, understood moral development, and importance of ethical theories.
CO3: Understand the Engineers as responsible experimenters, assessment of safety and risk, employee rights and professional rights.
CO4: Shape themselves into valuable professionals, follow ethics and are able to solve their ethical dilemmas.

Course Learning Outcomes (CLOs):

Course outcomes: At the end of this course, students will be able to
CLO1: Understand objectives of ethics and human values that ought to guide the engineering profession.
CLO2: Apply work ethics in the profession and in society and Resolves the moral issues in the profession and moral development.
CLO3: Understand the Engineers as responsible experimenters, assessment of safety and risk, employee rights and professional rights.
CLO4: Shape themselves into valuable professionals, follow ethics and are able to solve their ethical dilemmas

UNIT – 1

Morals, values and Ethics: Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT -II

Senses of Engineering Ethics: Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan"s theory – Consensus and Controversy – Models of professional roles – 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, 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, Conflicts Of Interest, Occupational Crime, Professional Rights Employee Rights,

UNIT – IV

Global Issues: Multinational Corporations, Environmental Ethics, Computer Ethics, Engineers as Managers, Consulting Engineering, Engineering as Expert Witnesses and Advisors. Intellectual Property Rights (IPR) – Discrimination.

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, Introduction to Engineering Ethics, Mc Graw Hill, 2nd Edition, 2010.
2. M. Govindarajan, S. Natarajan, V. S. Senthil kumar, “Professional Ethics and Human Values”, PHI Learning Pvt Ltd., 2013.
3. Charles E Harris, Michael S Pritchard and Michael J Robins, “Engineering Ethics”, 6th edition, 2017.

REFERENCE BOOKS:

1. Charles D Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, 2008.
2. John R Boatright, “Ethics and The Conduct of Business”, Pearson, 8th Edition, 2016.
3. Edmund G Seebauer And Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, 2000

NPTEL VIDEO LINKS:

1. https://nptel.ac.in/courses/109/106/109106117/
2. https://nptel.ac.in/courses/110/105/110105097/

CLO PO and PSO mapping:

Professional Ethics and Human Values (20EE306)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Understand objectives of ethics and human values that ought to guide the engineering profession.	-	1		1	-	-	-	-	-	-	-	3	-	-	-
CLO2	Apply work ethics in the profession and in society and Resolves the moral issues in the profession and moral development	-	1	2	3	2	1	2	-	-	-	-	3	-	-	2
CLO3	Understand the Engineers as Responsible experimenters, assessment of safety and risk, employee rights and professional rights.	-	1	-	3	-	-	3	-	-	-	-	2	-	-	3
CLO4	Shape themselves into valuable professionals, follow ethics and are able to solve their ethical dilemmas.	-	2	2	3	2	2	3	-	-	-	-	3	-	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ANALOG ELECTRONICS

II B.Tech – III Semester (Code: 20EE401)

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

Prerequisites: Basic Physics

Course Objectives: To make the students

CO1: Understand formation of PN junction Diode and applications of diode like Rectifiers, clippers and clampers.

CO2: Understand the design and working of BJT / FET amplifiers.

CO3: Analyze different feedback and oscillating circuits.

CO4: Understand about basics of Differential, Multi-stage and operational amplifiers**.**

CO5: Gain knowledge about Linear and Nonlinear applications of Op-amp.

Course Learning Outcomes: Students will be able to

CLO1: Explain the formation of PN junction Diode and applications of diode like Rectifiers, clippers and clampers.

CLO2: Design and working of BJT / FET amplifiers.

CLO3: Analyze different feedback and oscillating circuits

CLO4: Explain about basics of Differential, Multi-stage and operational amplifiers.

CLO5: Describe about Linear and Nonlinear applications of Op-amp.

UNIT – I

Diode circuits: Open-circuited P-N Junction, Current Components in a p-n diode, I-V characteristics, temperature Dependence of the I-V characteristic, Zener Diode.
Rectifiers: Half wave, full wave and Bridge Rectifiers without filter and with inductor filter capacitor filter, L section & Π- section filters.
Clippers, Clampers: Positive and negative clippers - Positive and negative clampers.

UNIT – II

BJT circuits: NPN & PNP junction transistors, Transistor current components, CB Configuration, CE Configurations, CC configuration, BJT as a switch, BJT as an amplifier, BJT biasing circuits, Small signal equivalent circuits.
FET circuits: JFET, Pinch-off Voltage , volt-ampere characteristics, MOSFET structure and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier, FET small signal model, CS / CD / CG configurations at low frequencies.

UNIT – III

Feedback Amplifiers: Feedback concept, Transfer Gain with Feedback, Negative feedback amplifiers and their characteristics.

Oscillators: Barkhausen criterion for sinusoidal oscillators, RC phase shift oscillator using BJT, General Form of Oscillator, Wien Bridge, Hartley, Colpitt's oscillators using BJT. **Differential, Multi-stage and operational amplifiers:** Differential amplifier, multi-stage amplifiers, internal structure of an operational amplifier, deal op-amp, non-idealities in an op-amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

UNIT – IV

Linear applications of Op-amp: Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, instrumentation amplifier, integrator, differentiator, Voltage to current and current to voltage conversion.

Nonlinear applications of Op-amp: Basic comparator , Zero-crossing detector , Schmitt Trigger, Square-wave and triangular-wave generators, Absolute value output circuit, Peak detector , Sample and hold circuit, Precision rectifier.

TEXT BOOKS:

1. Jacob Millman and Christos C Halkias, "Integrated Electronics Analog and Digital Circuits and Systems", 2nd Edition,TMH, 2017.
2. Robert L Boylested and Louis Nashelsky , "Electronic Devices and Circuit Theory", 11th Edition, PHI, 2015.

REFERENCE BOOKS:

1. Theodore F Bogart Jr., Jeffrey S Beasley and Guillermo Rico, "Electronic Devices and Circuits", 6th Edition, Pearson Education, 2004.
2. David A Bell, "Electronic Devices and Circuits", 5th Edition, PHI, 2018.
3. D.Roy and Choudhury, ShailB.Jain, "Linear Integrated Circuits", 4th Edition, New Age International, 2017.
4. Rama Kant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th Edition, Pearson education, 2015.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Analog Electronic Circuits, https://nptel.ac.in/courses/108/102/108102112/
2. NPTEL :: Electrical Engineering - ANALOG ELECTRONIC CIRCUITS, https://nptel.ac.in/courses/108/102/108102095/

CLO, PO and PSO Mapping:

Analog Electronics (20EE401)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the formation of PN junction Diode and applications of diode like Rectifiers, clippers and clampers.	3	-	2	-	2	-	-	-	-	-	-	-	3	1	2
CLO2	Design and working of BJT / FET amplifiers.	3	-	2	-	-	-	-	-	-	-	-	-	3	1	2
CLO3	Demonstrate different feedback and oscillating circuits	3	-	-	-	2	-	-	-	-	-	-	-	3	2	2
CLO4	Explain about basics of Differential, Multi-stage and operational amplifiers.	3	2	-	-	2	-	-	-	-	-	-	-	2	1	2
CLO5	Describe about Linear and Nonlinear applications of Op-amp.	3	2	-	-	2	-	-	-	-	-	-	-	2	1	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

DIGITAL ELECTRONICS
II B.Tech – IV Semester (Code: 20EE402)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment				30		Semester End Examination (3 Hours)			70

Prerequisites: Basic Physics, Basic Mathematics

Course Objectives: In this course students are able to

CO1: Have a thorough understanding of the fundamental concepts and techniques used in digital electronics, and Number conversions.

CO2: Understand Boolean Algebra and able to minimize boolean expressions by applying boolean algebra, K-Map method and Tabulation Method with "don't care" conditions.

CO3: Analyze and design various combinational logic circuits.

CO4: Use basic flip-flops SR, JK, D and T; analyze and design synchronous sequential circuits.

CO5: Have a understanding of the fundamental concepts about various terms and circuits of A/D and D/A converters

CO6: Understand Registers and Counters and Memories and design Programmable Logic Devices.

Learning Outcomes: After the completion of this course the students are expected to be able to:

CLO1: Describe fundamental concepts and techniques used in digital electronics, and able to perform Number conversions, Complements; able to describe various Boolean algebraic rules and laws.

CLO2: Simplify Boolean function using Boolean algebraic rules and laws, K-Map and Tabulation Method.

CLO3: Design of various Combinational logic circuits.

CLO4: Illuistrate functionalities of Latches and Flip-Flops and design of Sequential logic circuits.

CLO5: Explain about various terms of A/D and D/A converters

CLO6: Design of Registers, Counters, types of memories and PLD’s.

UNIT-I

Fundamentals of Digital Systems and Logic families: Digital signals, digital Circuits, A N D , OR, NOT, NAND, NOR a n d Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, Octal, hexa decimal number, binary arithmetic, one’s and two’s complements arithmetic, codes: Excess-3 and gray code, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

UNIT-II

Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, don't care conditions, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, Multiplexer, De-Multiplexer, digital comparator, parity checker/ generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT-III

Sequential circuits and systems : A1-bitmemory,thecircuit properties of Bi stable latch, the clocked SR flip flop, J-K, T and D- type flip flops, applications of flip flops, shift registers, applications of shift registers, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, applications of counters.

UNIT-IV

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, sample and Hold Circuit, a n a l o g t o digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage of frequency and voltage to time conversion, specifications of A/D converters.

Semi-conductor memories and Programmable logic devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, r ead only memory (ROM), read and write memory (RAM), ROM as a PLD, Programmable logic array, Programmable array logic.

TEXT BOOKS:

1. R.P. Jain, "Modern Digital Electronics", Mc Graw Hill India, 4th edition, 2012.
2. M. Morris Mano, "Digital logic and Computer design", Pearson India, 6th edition, 2018.

REFERENCE BOOKS:

1. Anil K. Maini, “Digital Electronics: Principles and Integrated Circuits”, Wiley, 2007.
2. S.S. Bhatti Rahul Malhotra, “A Textbook of Digital Electronics”, I K International Publishing House, 2011.
3. A.Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits, https://nptel.ac.in/courses/108/105/108105132/
2. NPTEL :: Electrical Engineering - NOC:Digital Circuits, https://nptel.ac.in/courses/108/105/108105113/

CLO, PO and PSO Mapping:

	Digital Electronics (20EE402)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Describe fundamental concepts and techniques used in digital electronics, and able to perform Number conversions, Complements; able to describe various Boolean algebraic rules and laws.	3	3	2	-	-	-	-	-	-	-	-	-	3	1	-
CLO2	Simplify Boolean function using Boolean algebraic rules and laws, K-Map and Tabulation Method.	3	3	2	-	-	-	-	-	-	-	-	-	3	1	-
CLO3	Design of various Combinational logic circuits.	3	2	3	-	-	-	-	-	-	-	-	-	3	1	-
CLO4	Illustrate functionalities of Latches and Flip-Flops and design of Sequential logic circuits.	3	3	2	-	-	-	-	-	-	-	-	-	3	1	-
CLO5	Explain about various terms of A/D and D/A converters	3	3	2	-	-	-	-	-	-	-	-	-	3	1	-
CLO6	Design of Registers, Counters, types of memories and PLD's.	3	2	3	-	-	-	-	-	-	-	-	-	3	1	-

INDUCTION MOTORS AND SYNCHRONOUS MACHINES

II B.Tech – IV Semester (Code: 20EE403)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Basic Physics, Basic Mathematics

Course objectives: To make the students

CO1: Understand the construction, operation and performance of three phase induction machines.

CO2: Gain knowledge about construction, operation and application of single phase induction machines.

CO3: Understand the construction, operation and performance of Alternators

CO4: Gain knowledge about construction, operation and performance of synchronous motors.

Course Learning Outcomes: At the end of this course, students will be able to

CLO1: Demonstrate construction, operation and performance of three phase induction machines.

CLO2: Explain construction, operation and application of single phase induction machines.

CLO3: Analyze operation and performance of Alternators

CLO4: Analyze operation and performance of synchronous motors.

UNIT-I

Induction machines: Construction-Types (squirrel cage and slip ring)-rotating magnetic field in two phase & three phase systems-Torque equation-torque slip characteristics-equivalent circuit-phasor diagram-losses and efficiency- circle diagrams-starting methods and speed control-Induction generator.

UNIT-II

Single- phase Induction motors: Constructional features-double revolving field theory-equivalent circuit-determination of parameters-split phase-capacitor start and run-shaded pole motors-characteristics and their applications.

UNIT-III

Synchronous Generators: Construction-EMF equation with winding factors-equivalent circuit and phasor diagram-armature reaction-synchronous impedance-voltage regulation-methods of determining regulation –EMF and ZPF methods-salient pole machine-two reaction theory-power angle characteristics-parallel operation of alternators-synchronization of alternators.

UNIT-IV

Synchronous Motors: Theory of operation-starting methods-phasor diagrams-variation of current and power factor with excitation-Power circles-V and inverted V curves-hunting and its prevention-synchronous condenser and its applications.

TEXT BOOKS:

1. P.S.Bimbhra,” Electrical Machinery”, Khanna Publishers,2011.
2. I.J.Nagrath and D.P.Kothari,”Electric Machines”, McGraw Hill Education,2010.

REFERENCES BOOKS:

1. A.E. Fitzgerald and C.Kingsley, ”Electric Machinery”, McGraw Hill Education, 2013.
2. M.G.Say, ”Performance and design of AC machines”, CBS Publishers, 2002.
3. A.S.Langsdorf, ”Alternating current machines”, McGraw Hill Education,1984.
4. P.C.Sen,”Principles of Electric Machines and Power Electronics”, John Wiley & Sons, 2007.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Electrical Machines II, https://nptel.ac.in/courses/108/106/108106072/
2. NPTEL :: Electrical Engineering - NOC:Electrical Machines - II, https://nptel.ac.in/courses/108/105/108105131/

CLO, PO and PSO Mapping:

Induction Motors and Synchronous Machine (20EE403)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Demonstrate construction, operation and performance of three phase induction machines.	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO2	Explain construction, operation and application of single phase induction machines.	3	3	2	3	-	-	-	-	-	-	-	-	3	2	-
CO3	Analyze operation and performance of Alternators	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO4	Analyze operation and performance of synchronous motors.	3	3	3	2	-	-	-	-	-	-	-	-	3	2	-

SIGNALS AND SYSTEMS

II B.Tech – IV Semester (Code: 20EE404)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Basic Physics, Basic Mathematics

Course objectives: To make the students

CO1: Understand the concepts of continuous time and discrete time systems.

CO2: Gain knowledge about LTI systems

CO3: Know about the concepts of systems in frequency domain.

CO4: Understand sampling theorem and its implications.

Course Learning Outcomes: At the end of this course, students will be able to

CLO1: Explain the concepts of continuous time and discrete time systems.

CLO2: Describe the behavior of continuous and discrete time LTI systems.

CLO3: Solve systems in frequency domain.

CLO4: Demonstrate sampling theorem and its implications.

UNIT-I

INTRODUCTION TO SIGNALS AND SYSTEMS: Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

UNIT-II

BEHAVIOR OF CONTINUOUS AND DISCRETE-TIME LTI SYSTEMS: Impulse response and step response, convolution, input-output behavior with a periodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations .State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT-III

FOURIER AND Z - TRANSFORMS: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

UNIT-IV

SAMPLING AND RECONSTRUCTION: The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

TEXT BOOKS:

1. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and Systems", Prentice Hall India, 2007.
2. Anand Kumar, "Signals and Systems", Prentice Hall India Learning Private Limited, 3rd Edition, 2016..

REFERENCE BOOKS:

1. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2007.
2. H. P. Hsu, "Signals and Systems" , Schaum's Series, McGraw Hill Education, 3rd Edition 2013.
3. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2nd Edition, 2007.
4. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
5. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 3rd Edition, 2017.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Signals and Systems, https://nptel.ac.in/courses/108/106/108106163/
2. NPTEL :: Electronics & Communication Engineering - Signals and Systems, https://nptel.ac.in/courses/117/101/117101055/

CLO, PO and PSO Mapping:

SIGNALS & SYSTEMS (20EE404)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of continuous time and discrete time systems.	3	3	2	2	1	-	-	-	-	-	-	-	3	2	-
CLO2	Describe the behavior of continuous and discrete time LTI systems.	3	3	1	2	-	-	-	-	-	-	-	-	3	2	-
CLO3	Solve systems in frequency domain.	3	3	1	2	-	-	-	-	-	-	-	-	3	2	-
CLO4	Demonstrate sampling theorem and its implications.	3	3	2	-	1	-	-	-	-	-	-	-	3	2	-

GENERATION AND TRANSMISSION
II B.Tech-IV Semester (20EE405)

Lectures	3	Tutorial	0	Practical	0	Self-study	1	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Course Objectives: To make the students

CO1: Understand the economical aspects and choice of power stations and units
CO2: Understand the significance of conventional and non-conventional energy resources and their operation
CO3: Calculate transmission line parameters.
CO4: Discuss the theory and mechanical design of transmission lines and introduce various types of insulators and their testing.

Course Learning Outcomes: Students will be able to
CLO1: Explain the economical aspects and choice of power stations and units
CLO2: Demonstrate the significance of conventional and non-conventional energy resources and their operation.
CLO3: Describe the performance of short, medium and long transmission lines and identify the transmission system which requires minimum volume of conductor materials.
CLO4: Summarize the types of insulators, testing of insulators and calculation of string efficiency.

Course Syllabus:

UNIT – I

Economical Aspects: Economics of generation - factors affecting cost of generation - Definitions: load factor – diversity factor – plant use factor - reduction of cost by inter connected stations. Power factor considerations – causes of low power factor – methods of improving power factor – phase advancing and generation of reactive KVAR – most economical power factor for constant KW load and constant KVA type loads. Tariff: Characteristics of Tariff – types of Tariff.

Choice of power stations and units: Types of power stations – choice of generation - size of generator units – load duration curve – effect of variable load on plant operation and design.

UNIT-II

Thermal Power: Block Diagram of Thermal Power Station (TPS), Brief Description of Thermal Power system Components
Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.
Nuclear Power: Nuclear Fission and Chain Reaction-Principle of Operation of Nuclear Reactor.- Description of Main Components.

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.

Wind Power Generation: Role and potential of Wind Energy Options, Horizontal and Vertical Axis Wind Mills- Performance Characteristics-Pitch & Yaw Controls – Economic Aspects.

UNIT-III

Transmission Line Parameters: Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines.

Modeling of Transmission Lines: Classification of Transmission Lines - Short, medium and long line and their model - representations - Nominal-T, Nominal-Pie and A, B, C, D Constants. Mathematical Solutions to estimate regulation and efficiency of all types of lines- Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations – Representation of Long lines – Equivalent T and Equivalent – π, Numerical Problems. – Surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation – Ferranti effect, Charging current, Need of Shunt Compensation.

UNIT-IV:

Insulators, Corona: Types of Insulators- String efficiency and Methods for improvement– Voltage Distribution, Calculation of string efficiency- Capacitance grading and Static shielding. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

Mechanical Design of Lines: Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor - Stringing chart and sag template and its applications.

Travelling waves on Transmission lines and over voltages: Wave equation, Surge impedance and wave velocity, Reflection and Refraction of waves, Typical cases of line terminations, forked line, successive Reflection, Bewley Lattice diagram, Attenuation and Distortion, Arcing grounds, Capacitance switching and Current chopping. **Over Voltages**: Lightning Phenomenon, Over voltages due to lightning, Switching Over voltages, Protection of systems against surges and Surge Arresters.

TEXT BOOKS:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.
2. C.L.Wadhwa, Electrical power systems, New Age International (P) Limited, 6th Edition, 2014.

REFERENCE BOOKS:

1. John Twidell and Tony Weir, Renewable Energy Resources, Second Edition, Taylor and Francis Group, 2006.
2. S.N.Singh., Electrical Power Generation, Transmission and Distribution, PHI, 2003.
3. V.K Mehta and Rohit Mehta, Principles of Power Systems, S.CHAND & COMPANY

LTD., New Delhi 2004.
4. S. N. Bhadra, D. Kastha& S. Banerjee, Wind Electrical Systems, Oxford University Press, 2013.
5. D. P. Kothari and I. J. Nagrath, Power System Engineering, Mc Graw Hill Education (India) Pvt. Ltd., 2nd Edition, 2008, 23rd Reprint 2015.

NPTEL Course Links:

1. **NPTEL :: Electrical Engineering - Power System Generation, Transmission and Distribution (Encapsulated from earlier Video), https://nptel.ac.in/courses/108/102/108102047/**
2. **NPTEL :: Electrical Engineering - NOC:Power System Engineering, https://nptel.ac.in/courses/108/105/108105104/**
3. **NPTEL :: Introduction to power system analysis, https://nptel.ac.in/courses/108/105/108105067/**

CLO, PO and PSO Mapping:

GENERATION & TRANSMISSION (20EE405)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the economic aspects and choice of power stations and units	2	2	1	1	-	-	-	-	-	-	-	-	2	1	1
CLO2	Demonstrate the significance of conventional and non-conventional energy resources and their operation.	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-
CLO3	Describe the performance of short, medium and long transmission lines and identify the transmission system which requires minimum volume of Conductor materials.	3	3	3	-	-	-	2	-	-	-	-	-	3	2	-
CLO4	Summarize the types of insulators, testing of insulators and calculation of string efficiency.	2	2	2	-	-	-	2	-	-	-	-	-	3	2	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

PYTHON

II B.Tech – IV Semester (Code: 20EEL401/SŌ02/IT02)

Lectures	1	Tutorial	0	Practical	2	Self-study	0	Credits	2
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Course Objectives:

The course aims

CO1: to enable the students to identify the syntax and semantics of Python.

CO2: to enable students to write python scripts for solving real time problems.

CO3: to enhance the object oriented programming skills of the students.

Course Learning Outcomes:

After completing the course the students would be able to

CLO1 : write programs using basic Python constructs

CLO2: write programs using sequences in Python

CLO3: write programs using object oriented programming concepts

CLO4: write programs that handle exceptional conditions

UNIT I

Introduction: Overview, History of Python, Python Features, Environment Setup. Variables, expressions, and statements: values and types, variables, names and keywords, statements, operators and operands, expressions, order of operations, modulus operator, string operations, asking the user for input, comments, choosing mnemonic variable names. **Conditional execution:** Boolean expressions, logical operators, conditional execution, alternative execution, chained conditionals, nested conditionals, catching exceptions using try and except, shortcircuit evaluation of logical expressions. **Iteration:** updating variables, the while statement, infinite loops and break, finishing iterations with continue, definite loops using for, loop patterns. **Functions:** function calls, builtin functions, type conversion functions, random numbers, math functions, adding new functions, definitions and uses, flow of execution, parameters and arguments, fruitful functions and void functions.

UNIT II

Strings: A string is a sequence, getting the length of a string using len, traversal through a string with a loop, string slices, strings are immutable, looping and counting, the in operator, string comparison, string methods, parsing strings, format operator. **Files I/O:** persistence, opening files, text files and lines, reading files, searching through a file, letting the user choose the file name, using try except and open, writing files. **Lists:** a list is a sequence, lists are mutable, traversing, operations, slices, methods, deleting elements, functions, strings, parsing lines, objects and values, aliasing, arguments. **Dictionaries:** dictionary as a set of counters, dictionaries and files, looping and dictionaries, advanced text parsing.

Tuples: tuples are immutable, comparing tuples, tuple assignment, dictionaries and tuples, multiple assignment with dictionaries, the most common words, using tuples as keys in dictionaries, sequences.

UNIT III

Object Oriented Programming: Managing Larger Programs, Using Objects, starting with Programs, Subdividing a Problem: Encapsulation, First Python Object, Classes as Types, Object Lifecycle, Many Instances, Inheritance.

UNIT IV

Exception Handling: Errors and Exceptions(From Web References text 1).

LIST OF EXPERIMENTS

1. Write a script to print some Pythagorean triples.
2. Write a script that demonstrates string handling capabilities of Python.
3. Write a script that demonstrates associated arrays support in Python.
4. Write a script to print Fibonacci numbers up to and including the first command line argument.
5. Write a simple script that reads from a file detail of students in a section and finds top ten meritorious students in the section.
6. Write a script to Implement Stack.
7. Write a script to Implement Queue.

Textbooks

1. Charles R Severance. Python for Everybody: Exploring Data in Python 3. 4 2016. ISBN 978 1530051120. doi: https://www.py4e.com/book.

2. Ljubomir Perkovic. Introduction to Computing Using Python: An Application Development Focus. Wiley, 2 edition, 8 2015. ISBN 9781118890943.

3. Guido van Rossum and Jr Fred L. Drake. Python Tutorial. Python Software Foundation. doi: https: //docs.python.org/3/.

References

1. Kenneth A. Lambert. Fundamentals of Python: First Programs. Cengage, 2nd edition, 2019. ISBN 9781337560092

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CLO, PO and PSO Mapping:

PYTHON (20EEL401/SO02/IT02)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Write programs using basic Python construct	2	2	1	1	-	-	-	-	3	2	-	-	2	1	1
CLO2	Write programs using sequences in Python	3	3	3	-	-	-	-	-	3	2	-	-	3	2	-
CLO3	Write programs using object oriented programming concepts	3	2	3	-	-	-	2	-	3	2	-	-	3	2	-
CLO4	Write programs that handle exceptional conditions	3	2	2	-	-	-	2	-	3	2	-	-	3	2	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ANALOG AND DIGITAL ELECTRONICS LAB

II B.Tech – IV Semester (Code: 20EEL402)

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

Course Objectives: To make the students

CO1: To analyse the characteristics of Diodes, Transistors and FET in different biasing conditions.

CO2: To design feedback amplifiers, oscillators using transistors and wave form generating using op-amp.

CO3: To design and verify different types of logic gates using universal gates, combinational logic circuits and code converters.

CO4: To design multiplexers, demultiplexers and counter circuits using logic gates.

CO5: To design and test applications of 555 timer circuits and D/A converters.

Course Learning Outcomes: Students will be able to

CLO1: Analyse the characteristics of Diodes, Transistors and FET in different biasing conditions.

CLO2: Design feedback amplifiers, oscillators using transistors and wave form generating using op-amp. amplifiers.

CLO3: Design different types of logic gates using universal gates, combinational logic circuits and code converters.

CLO4: Understand the design methods of multiplexers, demultiplexers and counter circuits using logic gates.

CLO5: Design and test applications of 555 timer circuits and D/A converters

LIST OF EXPERIMENTS

1. Characteristics of PN Junction and Zener diode
2. Characteristics of Transistor in Common Emitter configuration
3. Verification of Transistor Self Bias Circuit
4. Characteristics of Junction Field Effect Transistor
5. Design of voltage shunt feedback amplifier.
6. Design of RC phase shift oscillator.

7. Waveform generation using OP-AMP
8. Realization of Logic Gates using Discrete Components & Universal Building Blocks.
9. Design of Combinational Logic Circuits like half-adder, Full adder, Half-subtractor and Full-subtractor
10. Design of Code converters.
11. Design of 4X1 Multiplexer and 1x4 Demultiplexer.
12. Realization of RS-JK & D flip-flop using logic gates.
13. Design of Synchronous Counter, Mod Counter, Up counter, Down counter and Up/Down counter using Flip Flops.
14. Design and testing of mono stable and astable Multivibrators using 555 timers.
15. Design a 4-bit R-2R ladder type of digital to analog converter.

Note: Minimum 10 experiments should be conducted.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CLO, PO and PSO Mapping:

Analog and digital Electronics lab (20EEL402)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	Analyse the characteristics of Diodes, Transistors and FET in different biasing conditions.	2	2	1	1	-	-	-	-	3	2	-	-	1	2	-	-
CLO2	Design feedback amplifiers, oscillators using transistors and wave form generating using op-amp.	2	2	1	1	-	-	-	-	3	2	-	-	1	2	-	-
CLO3	Design and verify different types of logic gates using universal gates, combinational logic circuits and code converters.	2	2	1	1	-	-	-	-	3	2	-	-	1	2	-	-
CLO4	Design multiplexers, demultiplexers and counter circuits using logic gates.	2	2	1	1	-	-	-	-	3	2	-	-	1	2	-	-
CLO5	To design and test applications of 555 timer circuits and D/A converters.	2	2	1	1	-	-	-	-	3	2	-	-	1	2	-	-

DC MACHINES & TRANSFORMERS LAB

II B.Tech – IV Semester (Code: 20EEL403)

<table>
<tr><td>Lectures</td><td>0</td><td>Tutorial</td><td>0</td><td colspan="2">Practical</td><td>3</td><td>Self-study</td><td>0</td><td>Credits</td><td>1.5</td></tr>
<tr><td colspan="4">Continuous Internal Assessment</td><td>30</td><td colspan="5">Semester End Examination (3 Hours)</td><td>70</td></tr>
</table>

Course Objectives: To make the students

CO1: To develop experimental setups for studying the performance and operation of DC Generators and DC motors.

CO2: To perform Direct and Indirect tests of various DC motors.

CO3: Acquire hands on experience of conducting various tests on Transformers and obtaining their Performance indices using standard analytical as well as graphical methods.

CO4: To develop experimental setups for studying the performance and operation of Transformers.

Course Learning Outcomes: Students will be able to

CLO1: Draw the performance characteristics of DC Generators.

CLO2: Asses the performance of the given DC motors

CLO3: Explain the principle of operation and performance of transformer.

CLO4: Calculate load of transformer for a given application and then select the suitable specification of electrical machine

LIST OF EXPERIMENTS

1. Open circuit characteristics of separately excited / self-excited D.C shunt generator
2. Load test on D.C Shunt Generator
3. Load test on D.C series generator
4. Load test on D.C Compound Generator
5. Brake test on D.C Shunt Motor
6. Speed control of DC Shunt motor
7. Swinburne's Test on a D.C Shunt Machine.
8. Retardation test on D.C. Machine.
9. Field test on two identical DC series machine
10. Hopkinson's test on Two Identical D.C Machines

11. OC & SC tests on single - phase transformer
12. Load test on single - phase transformer
13. Scott Connection of Transformers
14. Parallel Operation of Two Single - Phase Transformers
15. Sumpner’s test on two single-phase Transformers
16. Separation of losses in single – phase transformer

Note: Minimum 10 experiments should be carried out.

CLO PO and PSO mapping:

DC Machines & Transformers lab (20EEL403)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Draw the performance characteristics of DC Generators.	2	2	1	1	-	-	-	-	3	2	-	-	1	3	-
CLO2	Asses the performance of the given DC motors	2	3	1	1	-	-	-	-	3	2	-	-	1	2	-
CLO3	Explain the principle of operation of transformers	1	2	2	1	-	-	-	-	3	2	-	-	2	2	-
CLO4	Know the performance of Transformers	2	1	2	1	-	-	-	-	3	2	-	-	1	2	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SOFT SKILLS LAB

II B.Tech – IV Semester (Code: 20EE404/ELL02)

Lectures	0	Tutorial	0	Practical	2	Self-study	0	Credits	1.5
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: NIL

Course Objectives: To make the students

CO1: To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.

CO2: To know the importance of interpersonal and intrapersonal skills in an employability setting.

CO3: Actively participate in group discussions / interviews and prepare & deliver Presentations.

CO4: Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, stress management and leadership quality.

Course Outcomes: Students will be able to

CLO1: Use appropriate body language in social and professional contexts.

CLO2: Demonstrate different strategies in presenting themselves in professional contexts.

CLO3: Analyze and develop their own strategies of facing the interviews successfully.

CLO4: Develop team coordinating skills as well 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

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.

3. Business Presentations

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

4. Employability Skills

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

Reference Books:

- Personality Development and Soft skills (Second Edition), Barun K. Mithra. Oxford University Press: 2016
- The Definitive Book of Body Language, Allan & Barbara. Pease International:2004
- Working with Emotional Intelligence, Daniel Goleman. Bloomsbury:1998
- English for Jobseekers, Lina Mukhopadhyay. Cambridge University Press:2013
- The 7 Habits of Highly Effective People, Stephen R.Covey. St. Martin’s Press:2014

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CLO PO and PSO mapping:

Soft Skills Lab (20EEL404/ELL02)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Use appropriate body language in social and professional contexts	-	-	-	-	-	-	-	1	2	3	1	2	2	1	1
CLO2	Demonstrate different strategies in presenting themselves in professional contexts.	-	-	-	-	-	-	-	1	1	3	1	2	2	1	1
CLO3	Analyze and develop their own strategies of facing the interviews successfully.	-	-	-	-	-	-	-	1	1	3	1	2	2	1	1
CLO4	Develop team coordinating skills as well leadership qualities	-	-	-	-	-	-	-	1	3	3	1	3	2	1	1

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Third Year B.Tech (SEMESTER – V)

for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Hours per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	S	Total	CIE	SEE	Total Marks	
20EE501	ES	Micro Processor and Microcontroller	3	0	0	0	3	30	70	100	3
20EE502	PC	Power System Analysis	3	0	0	1	4	30	70	100	3
20EE503	PC	Control Systems	3	0	0	1	4	30	70	100	3
20EE504	PC	Power Electronics	3	0	0	1	4	30	70	100	3
20EE505/ PE_ _	PE	Professional Elective Course -I	3	0	0	0	3	30	70	100	3
20EEL501/SO03	SO	Application of IOT in Electrical Engineering	1	0	2	0	3	30	70	100	2
20EEL502	ES	Micro Processor and Microcontroller Lab	0	0	2	0	2	30	70	100	1
20EEL503	PC	Induction Motors and Synchronous machines Lab	0	0	3	0	3	30	70	100	1.5
20EEL504	PC	Control Systems Lab	0	0	3	0	3	30	70	100	1.5
20EEL505/ INT01	INT	Internship	0	0	0	0	0	30	70	100	1.5
20EE506/ MC03	MC	Constitution of India	2	0	0	0	2	30	0	30	0
TOTAL			**18**	**0**	**10**	**3**	**31**	**330**	**700**	**1030**	**22.5**
20EEM52_/ 20EEH52_	**Minor/Honor Course**		**4/3**	**0/1**	**0**	**0**	**4**	**30**	**70**	**100**	**4**
Grand Total			**21**	**1**	**10**	**3**	**35**	**360**	**770**	**1130**	**26.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture T: Tutorial P: Practical S: Self-study
BS: Basic Science Courses HS: Humanities and Social science ES: Engineering Science Courses
MC: Mandatory Course PC: Professional Core Course SO: Skill Oriented Course PE: Professional Elective Courses
JE: Job oriented elective courses

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

MICROPROCESSORS & MICROCONTROLLERS

III B.Tech – V Semester (Code: 20EE501)

Lectures	03	Tutorial	0	Practical	0	Self-study	0	Credits	03
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Digital Electronics

Course Objectives: To make the students

CO1: Understand the Architecture of 8085 and 8086microprocessor.

CO2: Learn the detail aspects of I/O and Memory Interfacing circuits.

CO3: Study the Architecture of 8051microcontroller.

CO4: Study about 8051 micro controller interfacing with various applications.

Course Outcomes: At the end of this course students will be able to

CLO1: Write programs in 8086 microprocessor using assembly language Programing.

CLO2: Design various applications by interfacing programmable I/O devices.

CLO3: Describe the architecture of 8051 microcontroller and write assembly language programs.

CLO4: Develop various applications using 8051 microcontrollers.

UNIT – I

8086 Microprocessor: Introduction to 8085 Microprocessor and its Architecture, 8086Microprocessor Family, 8086 Internal Architecture, Pins and Signals, Instruction set and Assembler directives. Introduction to Programming: 8086Assembly Language Programming, Implementing standard Program Structures, Strings, Procedures and Macros.

UNIT – II

Interfacing Devices & Applications: 8255 Programmable Peripheral Interface, keyboard interfacing and 7-segment display interfacing, 8279 Programmable Keyboard Display Interface 8253 Programmable Interval Timer, 8259 Programmable Interrupt Controller, Direct Memory Access (DMA) and 8257DMA Controller, 8251 and serial I/O and Data Communication.

UNIT – III

8051 Microcontroller: Architecture of 8051, Special Function Registers, I/O Ports, Memory Organization, Addressing modes, Instruction set, Assembly Language Programming, Assembly Code for Arithmetic and Logic Operations.

UNIT – IV

Microcontroller Interfacing & Applications: Programming 8051 Timers, Timer programming, Serial Port Program_ming, Interrupts Programming, LCD and Keyboard Interfacing, ADC, DAC and Sensor Interfacing, External Memory Interface, Stepper Motor and Waveform generation.

TEXT BOOKS:

1. Ramesh Goankar, “Microprocessor Architecture, Programming, and Applications with the 8085”,Penram International Publishing, 6th Edition, 2013.
2. D. V. Hall, “Microprocessors & Interfacing”, McGraw Hill Higher Education, 3rd Edition, 2017.

REFERENCE BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088Family - Architecture, Programming and Design”, 2nd Edition, Prentice Hallof India, 2007.
2. K. J. Ayala, “8051 Microcontroller”, Delmar Cengage Learning, 3rd Edition, 2007.
3. K. M. Bhurchandi and A K Ray, “Advanced Microprocessors and Peripherals”, McGraw Hill, 3rd edition, 2017.
4. M. A.Mazidi, J. G. Mazidi and R. D. McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, 2nd Edition, Pearson Education, 2011.

NPTEL COUIRSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Microprocessors And Microcontrollers
2. NPTEL :: Electronics & Communication Engineering - Microcontrollers and Applications
3. NPTEL :: Computer Science and Engineering - Microprocessors and Microcontrollers

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CLO, PO and PSO Mapping:

Microprocessors and Microcontrollers (20EE501)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Write programs in 8086 microprocessor using assembly language Programming.	2	-	3	-	2	-	-	-	2	-	-	2	2	-	-
CLO2	Design various applications by interfacing programmable I/O devices.	2	2	3	-	2	-	-	-	2	-	-	2	-	2	-
CLO3	Describe the architecture of 8051 microcontroller and write assembly language programs.	2	-	3	-	2	-	-	-	2	-	-	2	2	-	-
CLO4	Develop various applications using 8051 microcontrollers.	2	2	3	-	2	-	-	-	2	-	-	2	-	2	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

POWER SYSTEMS ANALYSIS

III B.Tech – V Semester (Code: 20EE502)

Lectures	03	Tutorial	0	Practical		0	Self-study	01	Credits	03
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Circuit Theory, Network Analysis
Course Objectives: To make the students

CO1: Describe types of underground cables and explains the representation of power system components.

CO2: Explain the various Symmetrical faults in the power system networks.

CO3: Understand the symmetrical components and networks and analysis Of Unsymmetrical faults.

CO4: Analyze copper efficiencies of various supply systems and substation practice.

Course outcomes: At the end of this course, students will be able to

CLO1: Explain performance of underground cables and solve all power system problems using per unit system.

CLO2: Assess Power flow control of a synchronous machine and Analyze the power system networks Symmetrical faults.

CLO3: Describe all the power system networks with symmetrical and asymmetrical fault analysis.

CLO4: Demonstrate all types of DC and AC distribution systems, classification of substations.

UNIT – I

Underground Cables: Types of cables, laying of cables, insulation resistance, electric stress and capacitance of single core cable, use of inter sheath, capacitance grading, capacitance of three core belted type cable, stress in a three-core cable, sheath effects,currents in bonded sheaths, electrical equivalent of sheath circuit, thermal characteristics of cables.

Representation of power system Components: Modeling of power system components for system studies: transmission lines, two-winding transformers with nominal & off-nominal ratio tap settings, three-winding transformers, phase shifting transformers. One line diagram, Impedance and Reactance diagrams, advantages of Per Unit Computations, per unit quantities, changing the base, selection of base, per-unit impedances of three winding transformers. Formation of Y-Bus.

UNIT – II

Power flow control: Power angle equation of a synchronous machine- effect of synchronous machine excitation - power angle equation for power system with single and multi-machines.

Symmetrical Faults: Transients in RL series circuit, –short-circuit currents and reactance's of synchronous machines, internal voltages of loaded machines under transient conditions, selection of circuit breakers. Formation of Bus Impedance matrix by using Z-Bus building algorithm. Analysis of symmetrical faults using bus impedance matrix.

UNIT-III

Symmetrical components and Networks: Introduction – operator 'a', resolution of three unbalanced phasor into symmetrical components, power in terms of symmetrical components. Unsymmetrical series impedance - sequence impedances and sequence networks of unloaded generators, circuit elements. Positive, negative and zero sequence networks.

Unsymmetrical Faults: Single line to ground, line to line and double line to ground faults on an unloaded alternator and on power systems.

UNIT-IV

Distribution: Comparison of copper efficiencies between DC, AC Single phase, 3-phase, 3- wire & 4-wire systems, calculation of voltage regulation in case of non-uniform and uniformly distributed loads on feeders, feeders fed at one end and both ends, ring feeders without and with interconnections, choice of voltage and frequency, Kelvin's law for most economical cross section and most economical current density and its limitations.

Substation Practice: Classification of substations, indoor and outdoor substations, bus-bar arrangements – single bus-bar, sectionalized single bus-bar, main and transfer bus-bar system, sectionalized double bus-bar system, ring mains, group switching.

TEXT BOOKS:

1. John J. Grainer, W D Stevenson Jr, "Power System Analysis", McGraw Hill Education, 1st edition, 2017
2. D P Kothari, I J Nagrath, "Power System Engineering", McGraw-Hill Education, 3rd Edition, 2019

REFERENCE BOOKS:

1. Pradip Kumar Sadhu, Soumya Das, “Elements of Power Systems”, CRC Press, 1st Edition, 2015.
2. S.N.Singh., “Electrical Power Generation, Transmission and Distribution”, PHI, 2nd Edition, 2008.
3. C.L. Wadhwa, “Electrical Power Systems”, New age International (P) Limited, 7th edition,2016.

NPTEL COURSE Links:

1. Electrical Engineering - Power System Analysis - NPTEL https://nptel.ac.in/courses/108/105/108105067/
2. NPTEL :: Electrical Engineering - Power System Generation, Transmission and Distribution (Encapsulated from earlier Video), https://nptel.ac.in/courses/108/102/108102047/
3. Electrical Engineering - NOC:Power System ... - NPTEL https://nptel.ac.in/courses/108/105/108105104/
4. Electrical Engineering - NOC:Electrical Distribution ... - NPTEL, https://nptel.ac.in/courses/108/107/108107112/

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CLO, PO and PSO Mapping:

POWER SYSTEM ANALYSIS (20EE502)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain performance of underground cables and solve all power system problems using per unit system.	3	3	-	2	1	-	1	-	-	1	1	3	3	-	-
CLO2	Assess the Power flow control of a synchronous machine and Analyze the power system networks Symmetrical faults.	3	3	2	3	3	-	-	-	1	1	-	2	3	-	-
CLO3	Describe all the power system networks with symmetrical and asymmetrical fault analysis.	3	3	2	3	2	-	-	-	1	1	-	2	3	-	-
CLO4	Demonstrate all types of DC and AC distribution systems, classification of substations.	3	3	-	1	2	-	1	-	-	1	1	1	3	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CONTROL SYSTEMS

III B.Tech-V Semester (Code: 20EE503)

Lectures	03	Tutorial	01	Practical	0	Self-study	00	Credits	04
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Mathematics, Physics, Network Theory

Course Objectives: To make the students

CO1: To make the students interpret different physical systems, construct mathematical models and reduce a block diagram of multiple subsystems to a signal block.

CO2: To make the students employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.

CO3: To make the students analyze the system stability using complex domain.

CO4: To make the students formulate different types of analysis in time and frequency domain.

CO5: To make the students Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.

CO6: To make the students assess controllability and observability of control systems.

Course Outcomes: Students will be able

CLO1: Explain the concepts of classification of control systems, develop of mathematical models from schematics of physical system and reduce a block diagram of multiple subsystems to a signal block

CLO2: Describe time domain analysis and predict the performance parameters of the system for standard input functions.

CLO3: Compute stability of the system in complex domain.

CLO4: Demonstrate stability of the system in time and frequency domain.

CLO5: Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.

CLO6: Assess controllability and observability of control systems.

Course Syllabus:

UNIT – I

Introduction: Basic concept of control system. Types of feedback control systems and its effect on overall gain – Liner time invariant, time variant systems and nonlinear control systems

Modeling of LTI Systems: Mathematical models and Transfer functions of Physical systems. Block diagram representation of control systems – signal flow graph.

UNIT – II

Time Domain Analysis: Standard test signals – step, ramp, parabolic and impulse response function –Time response of first order and second order systems to standard test signals - steady state response – error Constants.
Stability Analysis in the Complex Plane: Absolute, relative, conditional, bounded input – bounded output, zero input stability, conditions for stability, Routh –Hurwitz criterion.

UNIT – III

Root Locus Technique: Introduction - Construction of Root Locus, Introduction to Controller Design using Root-loci method of feedback controller design,
Frequency Domain Analysis: Introduction – correlation between time and frequency responses – Polar plots – Bode plots – Nyquist plots.

UNIT – IV

Design of controllers and compensator: Effect of adding poles and zeros on overshoot, rise time, band width. Introduction to Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs.
State space analysis: Concepts of state variables and state models – diagonalization – solution of state equations – Concepts of controllability and Observability

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Pvt Ltd, 6^{th} Edition 2018.
2. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 5^{th} Edition, 2015.

REFERENCE BOOKS:

1. A. Anand Kumar, "Control Systems", Prentice Hall India Learning Private Limited, 2^{nd} Edition, 2014.
2. A. NagoorKani, "Control Systems", RBA publications, 1^{st} Edition, 2014.
3. Joseph Distefano, Allen Stubberud, Ivan Williams & Sanjoy Mandal, "Control Systems (Schaum's Outline Series)", McGraw Hill Education, 3^{rd} Edition, 2017.
4. Control Systems Engineering by SK Bhattacharya, Pearson Education India,3^{rd} Edition, 2013.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

NPTEL COURSE LINKS:

1. NPTEL: Electrical Engineering - NOC:Control,engineering https://nptel.ac.in/courses/108/106/108106098/
2. NPTEL :: Electrical Engineering - Control Engineering https://nptel.ac.in/courses/108/102/108102043/
3. NPTEL :: Electrical Engineering - Control Engineering https://nptel.ac.in/courses/108/102/108102044/
4. NPTEL :: Engineering Design - NOC:Control systems https://nptel.ac.in/courses/107/106/107106081/

CLO, PO and PSO Mapping:

Control Systems (20EE503)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of classification of control systems, develop of mathematical models from schematics of physical system	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CLO2	Describe time domain analysis and predict the performance parameters of the system for standard input functions.	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CLO3	Compute stability of the system in complex domain.	3	3	2	2	2	-	2	-	-	-	-	-	3	3	2
CLO4	Demonstrate Stability of the system in time and frequency domain.	3	3	3	2	2	-	-	-	-	-	-	-	3	3	-
CLO5	Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system	3	3	3	2	2	-	2	-	-	-	-	-	3	3	2
CLO6	Assess controllability and observability of control systems.	**3**	**3**	2	**2**	2	-		-	-	-	-	-	3	3	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

POWER ELECTRONICS

III B.Tech-V Semester (Code: 20EE504)

Lectures	03	Tutorial	01	Practical	0	Self-study	00	Credits	04
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Basic Electric Engineering, Semiconductor Physics and Nano Materials

Course Objectives: To make the students

CO1: Understand the Power Electronics devices its protection.

CO2: Analyze AC to DC Conversion circuits.

CO3: Analyze the operation of DC-DC choppers and AC Voltage controllers.

CO4: Analyze the operation of inverters PWM techniques.

Course outcomes: At the end of this course, students will be able to

CLO1: Describe the transistor, thyristor devices its protection.

CLO2: Design and analyze AC to DC Conversion circuits.

CLO3: Design and analyze the operation of DC-DC choppers and AC Voltage controllers.

CLO4: Design and analyze the operation of inverters PWM techniques.

UNIT-I

Introduction to Power Electronics devices and protection: Thyristor family devices, principle of operation, Snubber designs, selection and protection, Firing circuits, Commutation, MOSFET, IGBT operation, principles and ratings.

UNIT-II

AC to DC conversion: Uncontrolled, semi-controlled, fully controlled and dual converters in single-phase and three phase configurations operation with R, R-L, back emf load, Issues of line current harmonics, Power factor, Distortion factor of ac to dc converters and effect of source inductance.

UNIT-III

Inverters: Basics of dc to ac conversion, inverter circuit configurations and principle of operation, VSI and CSI, single and three-phase configurations, Single, Multiple, Square wave and sinusoidal PWM control methods and harmonic control.

UNIT-IV

DC-DC Converters and AC-AC Converters: Introduction to dc-dc conversion, various topologies, buck, boost, buck-boost converters. Introduction to ac to ac conversion, single- phase and three-phase ac voltage controller circuit configuration with R load Analysis. Cyclo-converters: single-phase, three-phase to single-phase circuit configuration.

TEXT BOOKS:

1. M. H. Rashid, Pearson, "Power electronics: circuits, devices, and applications", education India, 4th edition, 2017.
2. M.D.Singh and Khanchandani, "Power Electronics", TMH, 2nd Edition, 2017.

REFERENCE BOOKS:

1. R.W.Erickson and D.Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2009.
2. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.
3. P.S. Bhimbra, "Power Electronics", Khanna publications, International Edition, 2012.
4. N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 3rd Edition, 2007.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Power Electronics
2. NPTEL :: Electrical Engineering - NOC:Power Electronics

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CLO, PO and PSO Mapping:

POWER ELECTRONICS (20EE504)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Describe the transistor, thyristor devices its protection.	2	3	3	2	2	2	2	-	-	-	-	-	2	2	2
CLO2	Design and analyze AC to DC Conversion circuits.	3	3	2	3	3	2	2	-	-	-	-	-	3	3	3
CLO3	Design and analyze the operation of DC-DC choppers and AC Voltage controllers.	3	3	3	3	3	2	3	-	-	-	-	-	3	3	3
CLO4	Design and analyze the operation of inverters PWM techniques.	3	3	3	3	3	2	3	-	-	-	-	-	3	3	3

Bapatla Engineering College::Bapatla

Professional Elective Course-I

1. ELECTRICAL POWER DISTRIBUTION SYSTEM

III B.Tech-V Semester (Code: 20EE505/PE51)

Lectures	03	Tutorial	00	Practical	0	Self-study	00	Credits	03
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Course Objectives: To make the students

CO1: Analyze distribution system planning models and study different load characteristics

CO2: Classify different types of distribution transformers and sub-transmission systems

CO3: Analyze primary and secondary distribution systems

CO4: Calculate voltage drop and power loss for non-three phase primary lines

Course outcomes: At the end of this course, students will be able to

CLO1: Explain various factors affecting distribution system and also about distribution system planning.

CLO2: Describe Distribution Transformers, voltage regulation and Efficiency calculations. Design considerations of sub-transmission lines.

CLO3: Design the substation, feeders, primary and secondary distribution systems. Apply Various protective devices and its coordination techniques to distribution system.

CLO4: Evaluate voltage drop & line loss calculations and design of capacitors &voltage regulating equipment and to understand the effect of compensation on power factor improvement.

UNIT – I

Distribution systems planning and automation: Planning and forecast techniques - Present and future role of computers in distribution system planning –automation - Methods of improvement - Load characteristics – Definitions load growth – tariffs - Diversified demand method.

UNIT – II

Distribution transformers: Types - Regulation and Efficiency- distribution factors – KW KVA Method of determining regulation. Design of sub transmission lines and distribution substations: Introduction – sub transmission systems - distribution substation – Substation bus schemes - description and comparison of switching schemes – substation location and rating - Application of network flow techniques in rural distribution networks to determine optimum location of sub-station.

UNIT – III

Design considerations on primary systems: Introduction, types of feeders, - voltage levels Radial type feeders, feeders with uniformly distributed load and non-uniformly distributed loads. Design considerations of secondary systems: Introduction, secondary voltage levels,-Secondary banking , existing systems improvement. Distribution system Protection: Basic definitions, over current protection devices, fuses, automatic circuit reclosures, automatic line sectionalizers, objectives of distribution system protection ,coordination of protective devices, Fuse to Fuse co-ordination, Fuse to circuit breaker coordination, Reclosure to circuit breaker co-ordination.

UNIT-IV

Voltage drop and power loss calculations: Three phase primary lines, non 3 phase primary lines, 4 wire multi grounded primary lines , copper loss , Distribution feeder costs , loss reduction and voltage improvement in rural distribution networks. Applications of Capacitors to distribution systems: Effect of series and shunt capacitors, Power factor correction, economic justification for capacitors, a computerized method to determine the economic power factor , Procedure to determine the best and optimum capacitor location Distribution System Voltage Regulation: Basic definitions , Quality of service , voltage control , line drop compensation.

TEXT BOOKS:

1. Turan Gonen, Electric Power Distribution System Engineering ,CRC Press, 3rd Edition.

2. Dr. V. Kamaraju,Electrical distribution systems McGraw hill, 2017.

REFERENCE BOOK:

1. A.S. Pabla, Electric Power Distribution TMH, 7th Edition. 2019.

2. G. Ramamurthy, Hand Book of Electric Power Distribution 2nd Edition, Universitie Press

CLO, PO and PSO Mapping:

Electrical Power Distribution System (20EE505/PE51)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain various factors affecting distribution system and also about distribution system planning.															
CLO2	Describe Distribution Transformers, voltage regulation and Efficiency calculations. Design considerations of sub-transmission lines.	3	2	-	2	1	2	-	-	-	-	-	-	3	3	-
CLO3	Design the substation, feeders, primary and secondary distribution systems. Apply Various protective devices and its coordination techniques to distribution system.	3	3	-	-	2	2	-	-	-	-	-	-	3	2	-
CLO4	Evaluate voltage drop & line loss calculations and design of capacitors &voltage regulating equipment and to understand the effect of compensation on power factor improvement.	3	2	-	2	-	-	-	-	-	-	-	-	3	-	-

Professional Elective Course-I

2. RENEWABLE ENERGY SOURCES

III B.Tech-V Semester (Code: 20EE~~5~~05/PE52)

<table>
<tr><td>Lectures</td><td>03</td><td>Tutorial</td><td>00</td><td>Practical</td><td>0</td><td>Self-study</td><td>00</td><td>Credits</td><td>03</td></tr>
<tr><td colspan="4">Continuous Internal Assessment</td><td>30</td><td colspan="4">Semester End Examination (3 Hours)</td><td>70</td></tr>
</table>

Course Objectives: To make the students

CO1: To understand concepts of Non-renewable and renewable energy systems

CO2: To explore concept of solar thermal systems

CO3: Gain knowledge about wind energy conversion.

CO4: Understand concept of grid connectivity

Course Outcomes: Students will be able to

CLO1: Explain about renewable energy sources

CLO2: Solve problems involving in PV system.

CLO3: Ability to analyse the viability of wind conversion systems.

CLO4: Capability to integrate the RES to grid connectivity.

UNIT – I

Principles of Solar Radiation: Comparison of renewable and conventional energy sources – Role and potential of new and renewable source – Environmental impact of solar power - extraterrestrial and terrestrial solar radiation – The solar constant – solar radiation on tilted surface – instruments for measuring solar radiation.

Solar energy collection: Flat plate and concentrating collectors and classification - Operation of solar thermal power plant – Applications of solar power – solar pond.

UNIT – II

Solar PV systems: Fundamentals of solar cell, semiconductors as basis for solar cells, P-N junction, sources of losses and prevention, types of solar cells, **PV plant design** - estimating power and energy demand, site selection, land requirements, choice of modules, Array design, balance of systems, off grid systems, grid interface, supporting structures, mounting and installation.

UNIT – III

Wind Energy Basics: Status, Advantages and disadvantages of wind energy systems, Types of wind energy converters, local Effects on wind, site selection: roughness length, wind shear, Wind Speed Variability, Obstacles to wind flow.

Components of a wind energy converter: Rotor Blades, Gearboxes, Synchronous or Asynchronous Generators, Towers, Miscellaneous components, Turbine Selection.

Working principles of wind energy: Energy content in wind, Energy Conversion at the Blade, Wind variations: Weibull distribution.

UNIT – IV

Grid connectivity and Smart grid: Introduction to grid connectivity of RE systems, smart grid and energy technologies, operating principles and models of smart grid components, key technologies for generation and their control capabilities.

TEXT BOOKS:

1. B H Khan: Non-Conventional Energy Resources - McGraw Hill Education; 2 edition ISBN 13: 978-93-5260-188-2.
2. G D Rai: Non-Conventional Energy Resources, 6th edition: ISBN: 978-81-7409-073-7. Khanna Pub.

REFERENCE BOOKS:

1. John Twidell & Toney Weir: Renewable Energy Resources 3rd Edition ISBN-13: 978-0415584388 ISBN-10: 0415584388.
2. Buchholz, Bernd M., Styczynski, Zbigniew: Smart Grids – Fundamentals and Technologies in Electricity Networks: ISBN 978-3-642-45119-5.
3. Chetan Singh Solanki Solar Photovoltaic: Fundamentals, Technologies and applications, 3rd edition: ISBN: 9788120351110.
4. Krzysztof (Kris) Iniewski: Smart Grid Infrastructure & Networking: ISBN: 9780071787741 - The McGraw-Hill Companies.

CLO, PO and PSO Mapping:

Renewable Energy Sources (20EE602/PE61)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PS02**	**PS03**
CLO1	Explain about renewable energy sources	3	2	1	2	-	-	-	-	-	-	-	-	3	2	-
CLO2	Solve problems involving in PV system.	3	2	1	2	1	2	-	-	-	-	-	-	3	3	-
CLO3	Ability to analyse the viability of wind conversion systems.	3	3	2	-	2	2	-	-	-	-	-	-	3	2	-
CLO4	Capability to integrate the RES to grid connectivity.	3	2	1	2	-	-	-	-	-	-	-	-	3	-	2

Bapatla Engineering College::Bapatla

Professional Elective Course-I

3. ELECTRICAL MACHINE DESIGN

III B.Tech-V Semester (Code: 20EE505/PE53)

Lectures	03	Tutorial	00	Practical	0	Self-study	00	Credits	03
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Course Objectives: To make the students

CO1: To develop knowledge on principles of design of rotating machines

CO2: To design main dimensions & cooling systems of transformers

CO3: To develop knowledge on main dimensions of induction motor and its classification

CO4: Illustrate about design of stator and rotor of salient pole and cylindrical rotor Alternators.

Course Outcomes: Students will be able to

CLO1: Design of a dc machine and provide the information required for the fabrication of the same along with an estimate of various performance indices.

CLO2: Design of a transformer and provide the information required for the fabrication of the same.

CLO3: Design of stator and rotor of induction machines.

CLO4: Design stator and rotor of synchronous machines and study their behaviour.

UNIT-I

D.C.MACHINES: E.M.F generated from full pitch - fractional pitch with and without distributed windings - distribution factor. Design of main dimensions from output equation - Design of Armature windings - Design of field system - Design of inters pole and commentator.

UNIT-II

TRANSFORMERS: Derivation of output equation - volt per turn importance and calculation of main dimensions for three phase and single phase transformers - window dimensions - Yoke design and coil design - Design of tank with tubes. Basic design aspects of dry transformer and high frequency transformers

UNIT-III

INDUCTION MOTOR: Derivation of output equation - calculation of main dimensions – Stator design - number of slots - shape and area of slots - Rotor design for squirrel cage and slip ring types.

UNIT-IV

SYNCHRONOUS MACHINES: Derivation of output equation - Calculations of Main Dimensions for salient pole and cylindrical rotor alternators - Stator design - number of stator slots and slot dimensions - Pole design for salient pole generators - pole winding calculations. Design of rotor for cylindrical rotor alternator - Design of rotor windings.

COMPUTER AIDED DESIGN: Advantage of computer aided design - Flow chart for computer aided design.

TEXT BOOKS:

1. A.K. Sawhney, Dhanpatrai & Sons, "A Course in Electrical machine Design", 2016.
2. M.G. Say, PB, "Performance and Design of AC Machines", 2002.

REFERENCE BOOKS:

1. V S Nagarajan, V Rajini, Electrical Machine Design, Pearson; First edition, 2018.

2 V.N.Mittle, "Design of Electrical Machines", Standard Publishers Distributors, 2005

CLO, PO and PSO Mapping:

Electrical Machine Design (20EE505/PE53)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Acquire knowledge to carry out a detailed design of a dc machine and provide the information required for the fabrication of the same along with an estimate of various performance indices.	3	2	-	2	-	-	-	-	-	-	-	-	3	2	-
CLO2	Acquire knowledge to carry out a detailed design of a transformer and provide the information required for the fabrication of	3	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CLO3	Construct the design of stator and rotor of induction machines.	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CLO4	Design stator and rotor of synchronous machines and study their behaviour.	3	2	-	2	-	-	-	-	-	-	-	-	3	-	-

Bapatla Engineering College::Bapatla

(Autonomous)

Professional Elective Course-I
DIGITAL SIGNAL PROCESSING
III B.Tech – VI Semester (Code: 20EEL505/PE54)

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

Course Objective:

CO1.To acquire knowledge in LTI signals and systems and the concept of Z-transform.

CO2.To implement DFT and IDFT using different algorithms.

CO3.Able to design Digital IIR filters from Analog filters using various techniques .

CO4.Able to design Digital FIR filters using window techniques

Learning Outcomes

After the completion of this course, the students will be able to:

CLO1. Explain the LTI signals and systems and concept of Z-transform.

CLO2. Implement DFT and IDFT using DIT-FFT and DIF-FFT algorithms.

CLO3. Design the Butter worth and Chebyshev digital IIR filters and their realization.

CLO4. Implement the appropriate type of design method for FIR filters and their realization.

UNIT – I

Discrete Signals and Systems: Introduction to digital signal processing, advantages and applications, discrete time signals, LTI system, stability and causality. Frequency domain representation of discrete time signals and systems.

Z-Transforms: Introduction to Z-transform, Z-transform theorems and properties, Inverse Z transform, causality and stability, solution of difference equations.MATLAB programming to generate discrete time sequence , plot the frequency response of system and to find partial fraction of H(Z).

UNIT – II

Discrete Fourier Transform (DFT): Introduction, Properties of DFT, Linear convolution using DFT, computations for evaluating DFT and IDFT.
Fast Fourier Transform (FFT): Introduction, advantages of FFT, Decimation in time FFT algorithms - Decimation in frequency FFT algorithm, IDFT using FFT algorithm.MATLAB programming to compute the DFT of sequence x(n) and comparison of circular and linear convolution of two sequences.

UNIT – III

IIR Filter Design Techniques: Introduction, Properties of IIR filters, Design of analog proto type of digital filters, Digital Butterworth and Chebyshev filters using bilinear transformation, Impulse invariance transformation methods.

Realization of IIR Filters: Direct form, Canonic form, Cascade form, Parallel form and

Lattice- Ladder form of realizationsMATLAB programming on design of Butterworth and Chebyshev filters

UNIT – IV

FIR Filter Design Techniques: Introduction to characteristics of linear phase FIR filters, Frequency response. Comparison of IIR and FIR filters. Designing of FIR filters using windowing techniques.

Realization of FIR Filters: Transversal structure, cascade realization, Linear phase
realization, Lattice structure.
MATLAB programming to design digital FIR filters using windowing method

TEXT BOOK:

1.John G. Proakis, Dimitris G Manolakis, digital Signal Processing: Principles, Algorithms andApplications, Pearson Education / PHI,4thEdition, 2014

2.P. Ramesh Babu, Digital Signal Processing, SciTech Publications (India) Pvt Ltd, 7thEdition, 2017.

REFERENCE BOOKS:

1. Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley & Sons, 2017.
2. S K Mitra, Digital Signal Processing: A Computer Based Approach, 4th Edition, TMH,2013.
3. Johnny R. Johnson, Introduction to Digital Signal Processing, PHI, 2015.
4. Alan V Oppenheim and Ronald W Schafer, Digital Signal Processing, Pearson Education PHI, 2015.

Bapatla Engineering College::Bapatla

(Autonomous)

CLO-PO and PSO Mapping:

Digital Signal Processing (20EE505/PE54)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Explain the LTI signals and systems and concept of Z- transform.	3	3	2	3	2	-	-	-	-	-	-	-	3	2	
CLO2	Implement DFT and IDFT using DIT-FFT and DIF-FFT algorithms.	3	3	-	-	2	-	-	-	-	-	-	-	3	2	-
CLO3	Design the Butter worth and Chebyshev digital IIR filters and their realization.	3	3	-	-	2	-	-	-	-	-	-	-	3	-	-
CLO4	Implement the appropriate type o f design method for FIR filters and their realization.	3	2	-	-	2	-	-	-	-	-	-	-	3	2	-

Bapatla Engineering College::Bapatla

(Autonomous)

APPLICATIONS OF IOT IN ELECTRICAL ENGINEERING

III B.Tech-V Semester (Code: 20EEL501/SO03)

<table>
<tr><td>Lectures</td><td>01</td><td>Tutorial</td><td>00</td><td>Practical</td><td>02</td><td>Self-study</td><td>00</td><td>Credits</td><td>02</td></tr>
<tr><td colspan="4">Continuous Internal Assessment</td><td>30</td><td colspan="4">Semester End Examination (3 Hours)</td><td>70</td></tr>
</table>

Course Objective: The objective of this course is to impart necessary and practical knowledge of components of Internet of Things and develop skills required to build real-life IOT based projects. To make the students

CO1: Understand the concepts of Internet of Things and its hardware and software components.

CO2: Interface Sensor and Actuators with Arduino/Raspberry Pi.

CO3: Understand the Basic Networking with ESP8266 WiFi module.

CO4: Analyze basic IOT applications using Cloud Platforms.

Course Learning Outcomes: After the completion of this course, the students will be able to

CLO1: Explain internet of Things and its hardware and software components.

CLO2: Apply device interfacing with Arduino Board/Raspberry Pi and implement small application.

CLO3: Demonstrate and monitor the sensing data remotely.

CLO4: Develop IOT applications using Cloud Platforms.

UNIT I

Introduction to IOT, Arduino and Raspberry Pi Simulation Environment: Understanding IoT fundamentals, IOT Architecture and protocols, Difference between IOT & M2M,Various Platforms for IOT, Real time Examples of IOT, Overview of IoT components and IOT Communication Technologies, Challenges in IOT. Arduino and Raspberry PiArchitecture, hardware setup and software installation for Arduino and Raspberry Pi, Basics of Embedded C programming for Arduino, Interfacing LED and push button with Arduino and Raspberry Pi

UNIT II

Sensor and Actuators with Arduino: Overview of Sensors working, Analog and Digital Sensors, Interfacing of Temperature, Humidity, Motion, Light and Gas Sensor with Arduino, Interfacing of Actuators with Arduino, Interfacing of Relay Switch and Servo Motor with Arduino.

UNIT III

Basic Networking with ESP8266 WiFi module: Basics of Wireless Networking, Introduction to ESP8266 Wi-Fi Module, Various Wi-Fi library, Web server- introduction, installation, configuration, Posting sensor(s) data to web server

UNIT IV

Cloud Platforms for IOT: Virtualization concepts and Cloud Architecture, Cloud computing, benefits, Cloud services -- SaaS, PaaS, IaaS, Cloud providers & offerings, Study of IOT Cloud platforms, Thing Speak API and MQTT, Interfacing ESP8266 with Web services

List of Experiments

Mandatory Experiments:

1. a) Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
   b) Study the fundamental IOT Software & Components.
2. a) Interface LED & Buzzer with Arduino and write a program to turn ON LED for 1 sec with a delay of 2seec.
   b) Interface LED & Buzzer with Raspberry Pi and write a program to turn ON LED for 1 sec with a delay of 2seec.
3. a) Implement two-way traffic control using Arduino.
   b) Implement two-way traffic control using Raspberry Pi
4. a) To interface DHT11 sensor with Arduino and write a program to print temperature and humidity readings.
   b) To interface PIR sensor with Arduino and write a program to turn ON LED at sensor detection.
5. Interface Stepper motor with Arduino and write a program to control stepper motor**.**
6. Interface OLED with Arduino and write a program to print temperature and humidity readings on it**.**

Application Oriented Experiments:

7. Interface servo motor using with Raspberry Pi and write a program to control servo motor.
8. Servo Motor control With Esp32.
9. Design of digital dc voltmeter and ammeter using Arduino uno.
10. Measurement of Power and Energy using Arduino.

11. Over/Under Voltage Protection of Home Appliances using Arduino uno & NODE MCU.
12. Write a program for weather monitoring station and handling temperature & humidity values on cloud platform.
13. Design home automation using mobile app.
14. Design smart irrigation system and analyse data using cloud platform.
15. Detection of induction motor fault using IOT.

TEXT BOOK:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “Internet of Things: Technologies and Applications for a New Age of Intelligence”, 2nd Edition, Academic Press, 2018.
2. Raj Kamal, “ Internet of Things: Architecture and Design ”, McGraw HillEducation; 1st Edition, 2017.

REFERENCE BOOKS:

1. Jeeva Jose, “Internet of Things”, Khanna Publishing, 1st edition, 2018.
2. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-approach)”, Orient Blackswan Private Limited , 1st Edition, 2015.
3. Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things: key applications and Protocols”, Wiley, 1st Edition, 2015.
4. Michael Miller, “ The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities are Changing the World”, Que Publishing, 1st Edition, 2015.

Swayam Portal link:

https://onlinecourses.nptel.ac.in/noc19_cs65/preview

Bapatla Engineering College::Bapatla

(Autonomous)

CLO, PO and PSO Mapping:

Application of IOT in Electrical Engineering (20EEL501/SO03)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain internet of Things and its hardware and software components.	2	-	-	-	3	1	-	-	3	2	-	-	3	2	-
CLO2	Apply device interfacing with Arduino Board/Raspberry Pi and implement small applications.	2	2	2	-	3	2	-	-	3	2	-	-	3	2	-
CLO3	Demonstrate and monitor the sensing data remotely	3	3	3	2	3	2	-	-	3	2	-	-	3	2	2
CLO4	Develop IOT applications using Cloud Platforms	3	3	3	2	3	3	-	2	3	2	-	-	3	2	2

Bapatla Engineering College::Bapatla

(Autonomous)

MICROPROCESSOR & MICROCONTROLLER LAB

III B.Tech-V Semester (Code: 20EEL502)

Lectures	00	Tutorial	00	Practical	02	Self-study	00	Credits	01
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Course Objectives: To make the students

CO1: Understand the working of TASM to write assembly language programs for 8086 microprocessors.

CO2: Understand the operation of 8086 development board.

CO3: Understand the operation of 8051 development board.

CO4: Understand the working of different programmable i/o devices

Course Learning Outcomes: At the end of this course, students will showcase the ability to

CLO1: Write basic programs in assembly language for 8086 microprocessors using TASM

CLO2: Write complex programs in assembly language for 8086 microprocessors using TASM.

CLO3: Interface programmable i/o devices using 8086 development board to develop various applications.

CLO4: Interface programmable i/o devices using 8051 development board to develop various applications.

Program execution with Assembler

1. Programs on 16-bit arithmetic and logical operations for 8086 microprocessors. (using various addressing modes)
2. Programs on conditional and unconditional branching instructions for 8086 microprocessors
3. Programs to implement procedures for 8086 microprocessors.
4. Programs to sort given data using 8086 microprocessors.
5. Programs to implement string manipulations using 8086 microprocessors.
6. Programs to implement interrupt handling using 8086 microprocessors.

Program execution with 8086 Development boards

7. Study of Programmable peripheral interface 8255.
8. Study of Programmable interval timer 8254.

9. Study of Programmable Keyboard Display Interface 8279
10. Elevator Simulator interfacing with 8086 microprocessors.
11. Traffic light controller interfacing with 8086 microprocessors.
12. Stepper motor control using 8086 microprocessors.

Program execution with 8051 Development boards

13. Programming arithmetic, logical and bit manipulation instructions using 8051 microcontrollers.
14. Program and verify timer/counter in 8051 microcontrollers.
15. Program and verify interrupt handling in 8051 microcontrollers.
16. UART operation in 8051 microcontrollers.
17. Interfacing DAC and ADC to 805l microcontroller.
18. Interfacing stepper motor using 8051 microcontrollers.

Note: Minimum 10 experiments should be conducted

.

Bapatla Engineering College::Bapatla

(Autonomous)

CLO, PO and PSO Mapping:

Microprocessor & Microcontroller Lab (20EEL502)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Write basic programs in assembly language for 8086 microprocessors using TASM	2	1	3	-	3	-	-	-	3	2	-	-	2	-	-
CLO2	Write complex programs in assembly language for 8086 microprocessors using TASM.	2	2	3	-	3	-	-	-	3	2	-	-	2	-	-
CLO3	Interface programmable i/o devices using 8086 development board to develop various applications.	2	2	3	-	3	-	-	-	3	2	-	-	2	2	-
CLO4	Interface programmable i/o devices using 8051 development board to develop various applications.	2	2	3	-	3	-	-	-	3	2	-	-	2	2	-

Bapatla Engineering College::Bapatla

(Autonomous)

INDUCTION MOTORS & SYNCHRONOUS MACHINES LAB

III B.Tech – V Semester (Code: 20EEL503)

Lectures	00	Tutorial	00	Practical	03	Self-study	00	Credits	1.5
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Course Objective: To make the students

CO1: To develop experimental setups for studying the performance and operation of squirrel cage and slip ring induction motors.

CO2: To perform Direct and Indirect tests of various induction motors.

CO3: Acquire hands on experience of conducting various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods.

CO4: To develop experimental setups for studying the performance and operation of synchronous Motors.

Course Outcomes: After completion of this lab course, the student is able to

CLO1. Analyze the performance characteristics of Induction motors.

CLO2. Asses the performance of the given Induction motors.

CLO3. Know the performance of synchronous generators.

CLO4. Know the performance of synchronous motors.

List of Experiments:

1. Load test on Squirrel-Cage Induction motor.
2. Load test on Slip-Ring Induction motor.
3. No-load and Blocked rotor test on 3-phase induction motor.
4. Separation of losses of 3-phase Induction motor.
5. Brake test on single - phase induction motor.
6. Determination of Equivalent circuit of single - phase induction motor.
7. Real Power flow Control of 3-Phase Induction Generator.
8. Regulation of alternator by EMF &MMF method.
9. Regulation of alternator by ZPF method.
10. Synchronization of alternator with infinite bus with P & Q control.
11. Load test on Alternator.
12. Measurement of X_d and X_q of a three phase alternator.
13. V and inverted V curves of synchronous motor.
14. Synchronous Motor performance with constant excitation.
15. Load test on Universal Motor.

Note: Minimum 10 experiments should be conducted.

CLO, PO and PSO Mapping:

Induction Motors and Synchronous Machines Lab (20EEL503)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Analyze the performance characteristics of Induction motors.	2	1	3	-	3	-	-	-	3	2	-	-	2	-	-
CLO2	Asses the performance of the given Induction motors.	2	2	3	-	3	-	-	-	3	2	-	-	2	-	-
CLO3	Know the performance of synchronous generators.	2	2	3	-	3	-	-	-	3	2	-	-	2	2	-
CLO4	Know the performance of synchronous motors.	2	2	3	-	3	-	-	-	3	2	-	-	2	2	-

Bapatla Engineering College::Bapatla

(Autonomous)

CONTROL SYSTEMS LAB

III B.Tech – V Semester (Code: 20EEL504)

Lectures	00	Tutorial	00	Practical	03	Self-study	00	Credits	1.5
Continuous Internal Assessment				30		Semester End Examination (3 Hours)			70

Prerequisites: Mathematics, Network Theory

Course Objectives: To make the students

CO1: Able to analyze characteristics of various types of systems.

CO2: To familiarize with the modelling of dynamical systems.

CO3: Able to design Lag, Lead, Lead-Lag compensators theoretically & experimentally.

CO4: To familiarize to observe the effect of P, PI, PD and PID controllers on system.

CO5: Able to find the closed loop stability of the system with different approaches.

Course Outcomes: Students will be able

CLO1: Deduce characteristics of various types of systems.

CLO2: Derive a Mathematical model for Various Systems with various methods.

CLO3: Design and verify Lag, Lead, Lead-Lag compensators experimentally.

CLO4: Illustrate the effect of P, PI, PD and PID controllers on a control system.

CLO5: Interpret stability of the system through Frequency Response Method.

LIST OF EXPERIMENTS:

1. Characteristics of magnetic amplifier.
2. Characteristics of A.C servo motor
3. Characteristics of synchros.
4. Effect of feedback on D.C servomotor.
5. Transfer function of D.C motor
6. Transfer function of D.C generator.
7. Time response of second order systems
8. Simulation of transfer functions using operational amplifier
9. Stepper motor control.
10. D.C. position control System.
11. Lag and lead compensation – Magnitude and phase plot
12. Temperature controller using PID
13. Effect of P, PD, PID controller on a second order system
14. P, PI, PD, PID control using Op-Amps.
15. Frequency response of first and second order systems.

Note: Minimum 10 experiments should be conducted.

CLO, PO and PSO Mapping:

Control Systems Lab (20EEL504)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Deduce characteristics of various types of systems.	3	3	-	2	-	-	-	-	3	2	-	2	2	3	-
CLO2	Derive a Mathematical model for Various Systems with various methods.	3	2	2	1	-	-	-	-	3	2	-	2	2	3	-
CLO3	Design and verify Lag, Lead, Lead-Lag compensators experimentally.	2	2	3	2	-	-	-	-	3	2	-	2	2	3	-
CLO4	Illustrate the effect of P, PI, PD and PID controllers on a control system.	3	3	-	2	-	-	-	-	3	2	-	2	2	3	-
CLO5	**I**nterpret stability of the system through Frequency Response Method.	3	3	-	2	-	-	-	-	3	2	-	2	2	3	-

Bapatla Engineering College::Bapatla

(Autonomous)

Internship

III B.Tech – V Semester (Code: 20EEL505/INT01)

Lectures	00	Tutorial	00	Practical	00	Self-study	00	Credits	1.5
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

GUIDELINES AND EVALUATION OF INTERNSHIP PROGRAM

- The Internship is planned in an organization of student choice for a minimum of 4 weeks and maximum of 8 weeks for all the students who are eligible to write their 6th semester end examinations.
- There will be two supervisors for the student, i.e., internal faculty supervisor allotted by the HOD and company/industry supervisor allotted by the chosen industry/company.
- The HOD will issue the recommendation letter to the students in the first week of every April for the students who are eligible to write their 6th semester end examinations. The students should submit the acceptance letter from the company to the HOD in the first week of May. Exceptions, if any, will be subject to approval by the HOD. HOD shall accept such late registration only if it is a genuine case.
- Hundred per cent attendance is expected from the student intern. However, student intern is permitted to avail a maximum of five days leave during the IP (Internship Program) period with prior approval from the Company/Industry Supervisor. Absence without prior intimation will be considered a serious offense and even lead to the Internship Program's termination based on the severity of the problem. Beyond five days, there will be a penalty of 2 marks per day of leave from the aggregate Internship Program marks.
- Student intern should maintain high professional and social standards at their respective internship company. It is expected that the student should be regular, punctual, obedient, and honest at work. The unprofessional behaviour, irregularity, misconduct, indiscipline at work, and unsatisfactory performance will lead to the cancellation of the concerned student's Internship.
- Student should submit their presentation to the department for final assessment.
  Non-submission of any reports or not attending the presentation should be treated as absence for the evaluation component which will lead to "FAIL" grade.
- The evaluation shall be carried out at different stages viz. First, Second and Final Assessment. The weekly report to be submitted by a student intern to respective faculty guide. IP is evaluated for a maximum of 100 marks.
- The student intern shall submit the Internship Completion Certificate duly signed by the Company Supervisor upon completion of Internship.
- **Weightage for Evaluation:**
  The various stages of evaluation and weightage at each stage are given below:

Stage	Marks	Remarks
First Assessment-End of 1st week for 4 weeks Internship/ End of 2nd week for 8 weeks of internship	20 M	Company Supervisor will assess the interns in the internship company premises. Company supervisor assesses the intern for 20 marks. The guide will go through the Regularity, Technical competencies; Analysis & Understandings and Designing of the concern project and assess the interns.
Second Assessment- End of 3rd week for 4 weeks Internship/ End of 6th week for 8 weeks of internship	40 M	Company Supervisor will assess the interns in the internship company premises. Company Supervisor assesses the intern for 40 marks. The guides will go through the Regularity, Technical competencies; Analysis & Understandings and Designing of the concern project and assess the interns.
Final Assessment- In the college premises	40 M	An External examiner and the HOD of the concern department acts as the committee to assess the intern’s performance. Assessment will be for 40 Marks

Bapatla Engineering College::Bapatla

(Autonomous)

CONSTITUTION OF INDIA

III B.Tech – V Semester (Code: 20EE506/MC03)

Lectures	02	Tutorial	00	Practical	00	Self-study		00	Credits	00
Continuous Internal Assessment				30		Semester End Examination (3 Hours)				00

Course Objectives: To make the students

CO1: To understand the importance of constitution

CO2: To understand philosophy of fundamental rights and duties

CO3: To understand the central and state relation, financial and administrative.

CO4: To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India.

Course Outcomes: Students will be able to

CLO1: Explain the Fundamental rights.

CLO2: Describe the Fundamental duties and its importance.

CLO3: Explain about the uses of Panchayath Raj system in India and its duties.

CLO4: Demonstrate the System of Election Commission and its functions.

UNIT-I

1. Meaning of the constitutional law and constitutionalism.
2. Historical perceptive of the constitution of India
3. Salient features and characteristics of the constitution of India.
4. Preamble, union and its territory and citizenship.

UNIT – II

5. Fundamental rights principles.
6. Directive principles of state policy.
7. Fundamental Duties.
8. The government of the union, the president, The Prime Minister, and the council of ministers, The parliament of India, The supreme court, the union judiciary

UNIT – III

9. The Machinery of Government in the states, The Governor, The Chief Minister and council of Ministers, The State legislature, High court, Judiciary in the states
10. Union territories.
11. The Federal System, Division of powers between centre and states, Legislative Administration and Financial relation.
12. Emergency Provisions, President Rule, National Emergency, Financial Emerging
13. Local self Government, Panchayat Raj, Municipalities and municipal Corporation.

UNIT IV

14. Miscellaneous Provisions, The comptroller and Auditor general of India, The Public Service Commission, Special Provisions relating to certain classes, Elections – Political parties.
15. Amendment of the Constitution.

TEXT BOOKS:

1. M V Pylee – Constitutional Government in India – Asia Publishing House
2. D C Dasgupta – Indian Government and Politics. Vikas Publishing house.

REFERENCE BOOKS:

1. Sujit Chowdary, Madhav Khosla, Pratapabhem Mehla. The Oxford Hand Book of the Indian Constitution
2. Noorani A G Constitutional question in India ; The President , Parliament and the States — Oxford.
3. Astoush – Kumar Indian Constitution and its features, Anmol Publishers
4. Bakshi P M — The Constitution of India , Universal Law Publishers
5. Ramnarain Yadav – Legelect's the constitution of India, K K Legelest Publication

Bapatla Engineering College::Bapatla

(Autonomous)

CLO, PO and PSO Mapping:

Constitution of India (20EE506/MC03)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the Fundamental rights.		1			1			3							
CLO2	Describe the Fundamental duties and its importance.			3						1						
CLO3	Explain about the uses of Panchayath Raj system in India and its duties.	2					3	2	2		1					
CLO4	Demonstrate the System of Election Commission and its functions.		2				2		3							

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Third Year B.Tech (SEMESTER – VI)

for the Academic Year 2020-21

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	S	Total	CIE	SEE	Total Marks	
20EE601	PC	Power System Protection	3	0	0	0	3	30	70	100	3
20EE602/ PE_ _	PE	Professional Elective Course -II	3	0	0	0	3	30	70	100	3
20EE603/ PE_ _	PE	Professional Elective Course -III	3	0	0	0	3	30	70	100	3
20EE604/ JO_ _	JO	Job Oriented Elective - I	2	0	2	0	4	30	70	100	3
20EE605/ JO_ _	JO	Job Oriented Elective - II	2	0	2	0	4	30	70	100	3
20EEL601/ SO04	SO	Quantitative Aptitude	1	0	2	0	3	30	70	100	2
20EEL602	PC	Power Electronics Lab	0	0	3	0	3	30	70	100	1.5
20EEL603	PC	Power Systems Lab	0	0	3	0	3	30	70	100	1.5
20EEL604	PC	Electronics Design Lab	0	0	3	0	3	30	70	100	1.5
20EE606/ MC04	MC	Indian Traditional Knowledge	2	0	0	0	2	30	0	30	0
Internship during summer (2 months)											
TOTAL			**16**	**0**	**15**	**0**	**31**	**300**	**630**	**930**	**21.5**
20EEM63_/ 20EEH63_	**Minor/Honor Course**		**4/3**	**0/1**	**0**	**0**	**4**	**30**	**70**	**100**	**4**
Grand Total			**19**	**1**	**15**	**0**	**35**	**330**	**700**	**1030**	**25.5**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

Professional Elective – II & III:

PE61: Switched Mode Power Supply
PE62: Electrical Drives
PE63: HVDC & FACTS
PE64: Machine Modelling and Analysis
PE65: Digital Control Systems
PE66: Optimization Techniques
PE67: Power Quality

Job Oriented Elective Courses-I:

JO61: Analog VLSI
JO63: Operations Research
JO64: PIC Microcontrollers and ARM Processors
JO65: Solar PV and Wind Plant Design

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

Power System Protection

III B.Tech-VI Semester (Code: 20EE601)

Lectures	03	Tutorial	00	Practical	00	Self-study		00	Credits	03
Continuous Internal Assessment				30		Semester End Examination (3 Hours)				70

Prerequisites: Power systems, Basics of circuit theory.

Course Objectives: To make the students

CO1: Develop adequate knowledge of requirement of protective relaying and about all types of protective relays.

CO2: Provide the knowledge of static relays and numerical relays.

CO3: Understand Protection of alternators, transformers and transmission lines.

CO4: Capable of understanding about microprocessor relays and computer-based relays.

CO5: Develop basic knowledge of switch gear and principles of operations of various types of circuit breakers.

Course Outcomes: After completion of this course, students will be able to

CLO1: Explain requirement of protective relaying and classification of relays.

CLO2: Describe basic components of static relays, types of comparators, types of over current relays and types of numerical relays.

CLO3: Describe differential protection for generators, transformers and transmission lines and feeders.

CLO4: Explain microprocessor and computer-based relays.

CLO5: Identify and differentiate various types of circuit breakers.

UNIT – I

Protective Relays: Introduction, basic requirement of protective relaying, zones of protection, primary and backup protection, classification of relays, attracted armature, balanced beam, induction disc, thermal relays, Buchholz's relay, Over current, under voltage, directional and non-directional relays. Distance relays, impedance, reactance, mho and off set mho relays. Differential relays, circulating current and opposite voltage differential scheme. Negative sequence relays.

UNIT – II

Static Relays: Introduction, basic component of static relays. Comparators, amplitude and phase comparators. Over current relays, instantaneous over current relay, inverse time over current relays, differential relays. Introduction to numerical relays, Introduction to Microprocessor and PC based Relaying.

UNIT – III

Protection of alternators, transformers and transmission lines: Differential protection for generators, transformers and transmission lines, field suppression of alternator, over current and distance protection for feeders, carrier protection.

.

UNIT – IV

Switchgear: Elementary principles of arc phenomenon, arc quenching, interruption of capacitive currents and low current chopping, resistance switching, recovery and restriking voltages. Principles of operations of various types of circuit breakers, air break, oil filled, air blast, vacuum and SF6 circuit breakers. Rating and specifications of circuit breaker.

TEXT BOOKS:

1. Badri Ram, D. N. Vishwakarma, “Power System Protection and Switchgear”, Tata Mc-Graw Hill, 2nd Edition, 2017.
2. Y.G. Paithankar & S.R.Bhide, “Fundamentals of Power System Protection”, PHI, 2nd Edition, 2013.

REFERENCE BOOKS:

1. T.S. Madhava Rao, “Power system protection Static relays”, Tata Mc-Graw Hill, 2nd Edition, 2017
2. Sunil S Rao, “Switchgear Protection and Power Systems (Theory, Practice & Solved Problems)”, Khanna Publishers, 14th Edition, 2019.
3. Ravindranath B and M Chander, “Power system protection and switchgear” ,New Age International,2nd Edition, 2018.
4. Bhuvanesh Oza, Nirmal-Kumar Nair, Rashesh Mehta and Vijay Makwana, “Power system protection & switchgear” Mc-Graw Hill, 1st Edition, 2017.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Power System Protection
2. NPTEL :: Electrical Engineering - NOC:Power System Protection

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

CLO, PO and PSO Mapping:

Power System Protection (20EE601)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain requirement of protective relaying and classification of relays.	3	2	-	2	-	-	-	-	-	-	-	2	-	2	-
CLO2	Describe basic components of static relays, types of comparators, types of over current relays and types of numerical relays.	3	3	-	2	-	-	-	-	2	-	-	3	-	-	-
CLO3	Describe differential protection for generators, transformers and transmission lines and feeders.	3	3	3	3	2	2	3	-	-	-	-	2	-	-	-
CLO4	Explain microprocessor and computer-based relays.	3	3	-	3	-	3	-	-	-	2	-	2	-	3	-
CLO5	Identify and differentiate various types of circuit breakers.	2	3	3	2	2	3	-	-	-	-	2	-	-	-	3

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

Professional Elective Course-II&III
SWITCHED MODE POWER SUPPLY
III B.Tech – VI Semester (Code: 20EE602/PE61)

Lectures	03	Tutorial	00	Practical	00	Self-study		00	Credits	03
Continuous Internal Assessment				30		Semester End Examination (3 Hours)				70

Prerequisites: Power Electronics, Electronic Devices and Circuits.

Course Objectives: To make the students

CO1: To design various Switched Mode Power Supply components

CO2: To analyze The Modeling and control aspects of converter.

CO3: To understand various Soft-switching DC - DC Converters

CO4: To Get Awareness on Pulse Width Modulated Rectifiers

Course Outcomes: Students will be able to

CLO1: Design various components of dc-dc converter

CLO2: Describe different controllers for converter

CLO3: Illustrate various modes of operation of Dc-Dc converter

CLO4: Explain the Pulse Width Modulated Rectifiers.

UNIT-I

Design constraints of reactive elements in Power Electronic Systems: Design of inductor, transformer and capacitors for power electronic applications, Input filter design. Basic concepts and steady-state analysis of second and higher order Switched Mode power converters.

UNIT – II

Dynamic Modeling and control of second and higher order switched Mode power converters: Analysis of converter transfer functions, Design of feedback compensators, current programmed, frequency programmed and critical conduction mode control.

UNIT – III

Soft-switching DC - DC Converters: Zero-Voltage-switching converters, Zero-Current switching converters, Multi resonant converters and Load resonant converters.

UNIT – IV

Pulse Width Modulated Rectifiers: Properties of ideal rectifier, realization of near ideal rectifier, control of the current waveform, single phase and three-phase converter systems incorporating ideal rectifiers and design examples. Nonlinear phenomena in switched mode power converters.

TEXT BOOKS:

1. Robert. W. Erickson, D. Maksimovic **;** Fundamentals of Power Electronics., Springer International Edition, 2020

2. H. W. Whittington, B. W. Flynn and D. E. MacPherson," Switched Mode Power Supplies Design and Construction" , Universities Press, 2009 Edition.

REFERENCE BOOKS:

1. Krein P.T .Elements of Power Electronics., Oxford University Press. Second Edition,2014

2. M. H. Rashid, Power Electronics. Prentice-Hall of India,Third Edition,2014

3**.** Umanand L., Bhat S.R., Design of magnetic components for switched Mode Power Converters. New Age International (P) Ltd., 2009.

4. Mohan N. Undeland . T & Robbins W., Power Electronics Converters, Application and Design. John Wiley, 3rd edition, 2007

NPTEL COURSE LINKS:

1. L.Umanand, "Fundamental of Power Electronics" **NPTEL** Course ; https://onlinecourses.nptel.ac.in/noc22_ee03/preview.

2. Dr. Robert Erickson," Power Electronics Specialization", **COURSERA**, https://www.coursera.org/specializations/power-electronics.

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

CLO, PO and PSO Mapping:

SWITCHED MODE POWER SUPPLY (20EE602/PE61)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PS02**	**PS03**	**PS04**
CLO1	Design various components of dc-dc converter	2		3													
CLO2	Describe different controllers for converter	3				3									2		
CLO3	Illustrate various modes of operation of DC-DC converter	2		2												3	
CLO4	Explain the Pulse Width Modulated Rectifiers.	3		2			2										

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

Professional Elective Course-II&III
Electrical Drives

III B.Tech – VI Semester (Code: 20EE602/PE62)

Lectures	03	Tutorial	00	Practical	00	Self-study		00	Credits	03
Continuous Internal Assessment				30		Semester End Examination (3 Hours)				70

Prerequisites: Electrical machines –I(18EE304), Electrical machines-II(18EE403) & Power Electronics (18EE503).

Course Objectives: To make the students

CO1: Describe the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric drives an enabling technology

CO2: Describe the operation of dc motor drives to satisfy four-quadrant operation to meet Mechanical load requirements.

CO3: Describe the operation of induction machines in an energy efficient manner using Power electronics.

CO4: Learn the basic operation of stepper motors and switched-reluctance motor drives.

Course Outcomes:

After completion of this course, the student will be able to

CLO1: Explain different types of drives and applications in various industries & To know the characteristics of various motors and loads.

CLO2: Describe about operation of d.c motor speed control using converters and choppers

CLO3: Illustrate different speed control methods in induction motors using thyristors based control schemes.

CLO4: Demonstrate the basic operation of stepper motors and switched-reluctance motor drives.

UNIT – I

Introduction: Electric drives - advantages of electric drive - Type of electric drives - components of electric drives - Status of dc and ac drives. **Dynamics of Electric Drives:** Speed torque conventions and multi quadrant operation - Equivalent values of drive parameters. **Control of Electric Drives:** Modes of operation - Speed control and drive classification - closed-loop control of drives.

UNIT – II

DC motor Drives: DC motors and their performance — Starting - methods of braking - speed control -Methods of armature voltage control - Transformer and uncontrolled rectifier ontrol. **Controlled Rectifier fed DC Drives:** Single phase fully and half controlled rectifier control of separately excited dc motor - Three phase fully and half controlled rectifier control of separately excited dc motor - Dual converter control of separately excited dc motor - comparison of conventio~~n~~al and **Chopper fed DC Drives:** Control of separately excited dc motors - Chopper control of series motor.

UNIT – III

Induction motor drives: Three phase induction motors - Operation with unbalanced source voltages and single phasing - Operation with unbalanced rotor impedances – Starting – braking - transient analysis - Speed control - pole amplitude modulation - stator voltage control - Variable frequency control from voltage and current sources - Eddy current drives - rotor resistance control - slip power recovery - Variable speed constant frequency generation.

UNIT – IV

Synchronous motor drives: Synchronous motors - Operation and fixed frequency supply - Synchronous variable speed drives - braking of synchronous motor. Switched reluctance motor drives - brush less dc motors - stepper motors – variable reluctance motor. Vector controls- Space vector modulation.

Text Books:

1. G.K. Dubey, “Fundamentals of Electric drives’’, Narosa, 2nd Edition,2010.
2. S.B. Dewan, G.R. Selmon & Straughen, “Power semiconductor drives” John Wiley,2009.

Reference Books:

1. G.K. Dubey, “Power Semiconductor controlled drives”, PH,.2nd Edition 2010.

3. GK Dubey SR Doradla, ‘Thyristorised power controllers’ New Age,2nd edition,2012.

E-resources and other digital material

https://nptel.ac.in/courses/108108077

CLO, PO and PSO Mapping:

ELECTRIAL DRIVES (20EE602/PE62)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Understand different types of drives and applications in various industries & To know the characteristics of various motors and loads.	2	2	3	2	-		2	-	-	-	2	-	2	2	-
CLO2	Gain the knowledge about operation of d.c motor speed control using converters and choppers	1	2	1	2	-	2	-	-	-	-	-	2	2	1	-
CLO3	Acquire the knowledge of different speed control methods in induction motors using thyristors based control schemes.	2	2	3	2	-	2	-	-	-	-	2	2	2	1	-
CLO4	Learn the basic operation of stepper motors and switched-reluctance motor drives.	3	1	2	2	2	-	3	-	-	-	-	-	-	1	1

Professional Elective Course-II &III

HVDC &FACTS

III B.Tech – VI Semester (Code: 20EE602/PE63)

Lectures	03	Tutorial	00	Practical	00	Self-study		00	Credits	03
Continuous Internal Assessment				30		Semester End Examination (3 Hours)				70

Prerequisites: Power Electronics, Power Systems.

Course Objectives: To make the students

CO1: Study comparison of AC and DC Transmission systems and components of HVDC.

CO2: Understand the control aspects of HVDC System and harmonics introduction.

CO3: Understand the fundamentals of FACTS Controllers and basic types of FACTS Controllers

CO4: Study objectives of shunt, series and combined compensators and their control structure

Course Outcomes: After completion of the course the student will be able to

CLO1: Compare HVAC and HVDC system and to describe various types of DC links HVDC converter and inverter operation.

CLO2: Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems.

CLO3: Explain concept of FACTS controller for the specific application based on system requirements and types of facts controllers.

CLO4: Illustrate the objectives of Shunt Controllers, Series controllers & combined controllers for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping.

UNIT – I

HVDC transmission: HVDC Transmission system: Introduction, comparison of AC and DC systems, applications of DC transmission, types of DC links, Layout of HVDC Converter station and components of HVDC system. Line commutated converter and voltage source converter based systems.

UNIT – II

Control of HVDC system: Principles of control, desired features of control, converter control characteristics, power reversal, Ignition angle control, current and extinction angle control. Harmonics introduction, generation, ac filters and dc filters. Introduction to multi terminal DC systems and applications, comparison of series and parallel MTDC systems.

UNIT – III

FACTS concepts: Reactive power control in electrical power transmission, principles of conventional reactive power compensators. Introduction to FACTS, flow of power in AC parallel paths and meshed systems, basic types of FACTS controllers, definitions of FACTS controllers, brief description of FACTS controllers.

UNIT – IV

Static Shunt, Series and Combined Compensators: Shunt compensation – objectives of shunt compensation, static VAR compensators – SVC, STATCOM, SVC and STATCOM comparison. Series compensation – objectives of series compensation, thyristor switched series capacitors (TCSC), static series synchronous compensator (SSSC), power angle characteristics. Unified power flow controller (UPFC) – Introduction, operating principle, independent real and reactive power flow controller and control structure. Interline power flow controller (IPFC) – Introduction, operating principle.

TEXT BOOKS:

1. Narain G. Hingorani , Laszlo Gyugyi, "Understanding Facts: Concepts and Technology of Flexible AC Transmission Systems, Wiley India Pvt Ltd (2011).

2. K R Padiyar, "Hvdc Power Transmission Systems" New Age Publishers; Third edition (2017)

REFERENCES:

1. Facts Controllers In Power Transmission And Distribution, by K.R. Padiyar New Age International Pvt Ltd; Second edition (2016).
2. HVDC Transmission | by S Kamakshaiah , V Kamaraju , McGraw Hill; Second edition (2020)
3. HVDC and FACTS Controllers: Applications of Static Converters in Power Systems (Power Electronics and Power Systems) by Vijay K. Sood , Springer; 2004th edition (2004)
4. HVDC Transmission by SIA, SIA Publishers & Distributors Pvt Ltd (2021)

NPTEL links:

1. https://nptel.ac.in/courses/108107114
2. https://nptel.ac.in/courses/108104013
3. https://archive.nptel.ac.in/courses/108/107/108107114/
4. https://nptel.ac.in/courses/108106160

CLO, PO, PSO Mapping:

HVDC & FACTS (20EE602/PE63)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Compare HVAC and HVDC system and to describe various types of DC links HVDC converter and inverter operation.	3	3	2	3	-	-	2	-	-	2	-	2	3	3	2
CLO2	Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems.	3	3	3	3	-	-	2	-	-	1	-	3	3	3	2
CLO3	Explain concept of FACTS controller for the specific application based on system requirements and types of facts controllers.	3	2	2	3	2	-	2	-	-	2	-	2	3	3	2
CLO4	Illustrate the objectives of Shunt Controllers, Series controllers & combined controllers for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping.	3	3	3	3	2	-	2	-	-	3	-	3	3	3	2

Professional Elective Course-II &III

MACHINE MODELLING & ANALYSIS

III B.Tech – VI Semester (Code: 20EE602/PE64)

Lectures	03	Tutorial	00	Practical	00	Self-study		00	Credits	03
Continuous Internal Assessment				30		Semester End Examination (3 Hours)				70

Prerequisites: NIL

Course Objectives (COs):

After completion of this course, students will be able to

CO1: Understand the concepts of 2-axis representation of an electric machine

CO2: Know the concepts of representing transfer function model of Dc machine

CO3: Acknowledge the importance of Voltage and current Equations in stator reference frame

CO4:Develop the modeling Voltage and current Equations in state – space variable form of 3-ph synchronous motor

Course Learning Outcomes (CLOs):

After completion of this course, students will be able to

CLO1: Explain the basic two-pole machine and identify the methods and assumptions in modelling of machines

CLO2: Recognize the different frames for modelling of different AC machines and phase transformations

CLO3: Deduce voltage, current and torque equations for different machines.

CLO4: Illustrate Circuits model of a 3ph Synchronous motor and Voltage and current Equations in state – space variable form.

UNIT-I

Basic Two-pole DC machine – primitive 2-axis machine – Voltage and Current relationship –Torque equation. Mathematical model of separately excited DC motor and DC Series motor in state variable form – Transfer function of the motor – Numerical problems.Mathematical model of D.C. shunt motor D.C. Compound motor in state variable form – Transfer function of the motor – Numerical Problems

UNIT-II

Liner transformation – Phase transformation (a, b, c to α, β, o) – Active transformation (α .β, o tod, q). Circuit model of a 3 phase Induction motor – Linear transformation – Phase Transformation– Transformation to a Reference frame – Two axis models for induction motor. dq model basedDOL starting of Induction Motors.

UNIT-III

Voltage and current Equations in stator reference frame – equation in Rotor reference frame –equations in a synchronously rotating frame – Torque equation – Equations I state – space form.

UNIT-IV

Circuits model of a 3ph Synchronous motor – Two axis representation of Syn. Motor. Voltage and current Equations in state – space variable form – Torque equation. dq model based short circuit fault analysis- emphasis on voltage, frequency and recovery time.

TEXT BOOKS:

1. Analysis of electric machinery and Drive systems- Paul C. Krause , Oleg Wasynezuk, Scott D. Sudhoff, third edition, IEEE press,2013
2. Generalized Machine theory P.S. Bimbhra, Khanna Publishers, 2002

REFERENCE BOOKS:

1. Thyristor control of Electric Drives – Vedam Subramanyam, Tata McGraw-Hill Education, 1988
2. Power System Stability and Control – Prabha Kundur, EPRI.2006.

CLO, PO and PSO Mapping:

Machine Modeling and Analysis (20EE602/PE64)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the basic two-pole machine and identify the methods and assumptions in modelling of machines	3	3	3	3	--	-	-	-	-	-	-	-	1	-	-
CLO2	Recognize the different frames for modelling of different AC machines and phase transformations	3	3	3	3	-	-	-	-	-	-	-	-	2	-	1
CLO3	Deduce voltage, current and torque equations for different machines.	3	3	3	3	-	-	-	-	-	-	-	-	2	-	-
CLO4	Illustrate Circuits model of a 3ph Synchronous motor and Voltage and current Equations in state – space variable form.	3	3	3	3	--	-	-	-	-	-	-	-	-	-	-

Bapatla Engineering College::Bapatla

Professional Elective Course-II &III
Digital Control Systems
III B.Tech – VI Semester (Code: 20EE602/PE65)

Lectures	03	Tutorial	00	Practical	00	Self-study		00	Credits	03
Continuous Internal Assessment				30		Semester End Examination (3 Hours)				70

Prerequisites: Mathematics, Physics, Control Systems

Course Objectives: To make the students

CO1: Describe the concepts of digital control systems and assemble various components associated with it and usage of Z-transformations.

CO2: Calculate the difference equations in Discrete-Time control system and representation of discrete time control system using state space analysis

CO3: Assess controllability, observability and stability of control systems.

CO4: Create discrete time control systems by conventional methods and state feedback controllers

Course Outcomes: Students will be able to

CLO1: Describe z–transformations and their role in the mathematical analysis of different systems.

CLO2: Explain state space models of discrete time systems.

CLO3: Evaluate stability analysis after determine the controllability and Observability of discrete time systems

CLO4: Design controller for discrete systems in conventional methods as well as state variable analysis methods.

UNIT – I

Sampling and Reconstruction: Introduction, Examples of Data Control Systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.

The Z– Transforms: Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms

UNIT – II

Z-Plane Analysis of Discrete-Time Control System: Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.**State Space Analysis of Discrete time systems:** State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix,Discretization of continuous time state – space equations.

UNIT – III

Controllability and Observability: Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

Stability Analysis: Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stablility test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

UNIT – IV

Design of Discrete Time Control System by Conventional Methods: Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

State Feedback Controllers and Observers: Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

TEXT BOOKS:

1. K. Ogata, Discrete-Time Control systems, Pearson Education/PHI, 2nd Edition, 2015.
2. M. Gopal, Digital Control Engineering, New Age Int. Pvt. Ltd., 2014.

REFERENCE BOOKS:

1. Kuo, Digital Control Systems, Oxford University Press, 2nd Edition, 2007.
2. M. Gopal, Digital Control and State Variable Methods, 2nd Edition, TMH, 2011.
3. Ioan D. Landau and Gianluca Zito ,Digital Control Systems Identification, design and implementation , GIPSA – Lab,2020.
4. M. Sami Fadali Antonio Visioli, Digital Control Engineering Analysis and Design, Academic Press, 2013.
5. Dr. Indranikar, Prof Somanath majhi , Digital Control Systems.
6. V. I. George, C. P. Kurian, Digital Control Systems, Cengage Learning, 2012.

NPTEL Course ; https://archive.nptel.ac.in/courses/108/103/108103008/

CLO, PO and PSO Mapping:

Digital Control Systems (20EE602/PE65)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3\
CLO1	Describe z–transformations and their role in the mathematical analysis of different systems.	3	1	-	-	-	-	-	-	1	-	-	-	3	1	-
CLO2	Explain state space models of discrete time systems.	3	2	2	-	-	-	-	-	1	-	-	-	3	2	-
CLO3	Evaluate stability analysis after determine the controllability and Observability of discrete time systems	3	2	3	-	-	-	-	-	1	-	-	-	3	2	-
CLO4	Design controller for discrete systems in conventional methods as well as state variable analysis methods.	3	2	3	-	-	-	-	-	1	-	-	-	3	3	-

Professional Elective Course-II &III

Optimization Techniques

III B.Tech – VI Semester (Code: 20EE602/PE66)

Lectures	03	Tutorial	00	Practical	00	Self-study		00	Credits	03
Continuous Internal Assessment				30		Semester End Examination (3 Hours)				70

Course Objectives (COs): To make the students

CO1: Understand the Concepts to solve linear programming problems arise in real life situations involving several parameters using various methods and their advantages.

CO2: Discuss the applications of linear programming namely transportation, assignment and travelling salesman problem which arise in different situations in all engineering branches.

CO3: Explain the non-linearity in optimization problems, direct search techniques and iterative methods.

CO4: Discuss the applications of optimization techniques in the problem Dynamic programming in optimization and solve certain integer linear programming problems.

Course Learning Outcomes (CLOs):

After completion of this course, students will be able to

CLO1: Develop the mathematical model of an optimization problem and identify particular case of activities among the several alternatives and solve a given linear programming problem using suitable method.

CLO2: Obtain solution for a special type linear programming problem namely transportation, assignment & travelling salesman problem and infer their practical relevance.

CLO3: Describe the characteristics of non-linearity in optimization and solve certain NLPP using searching and iterative techniques.

CLO4: Describe the characteristics of Dynamic programming in optimization and solve certain integer linear programming problems.

UNIT-I

Linear Programming Problems (LPP): Mathematical models and basic concepts of linear programming problem; Solution of linear programming problems - Graphical method, Analytical method, Simplex method, Artificial variable technique (Big-M and Two-phase methods), Duality principle and dual simplex method.

UNIT-II

Special type of LPPs: Mathematical model of transportation problem, Methods of finding initial basic feasible solution to find the optimal solution of transportation problem, Exceptional cases in transportation problem, Degenerate solution of transportation problem, Assignment problem as a special case of transportation problem, Hungarian algorithm to solve an assignment problem, Special cases in assignment problem. The salesman problem, Formulation of travelling salesman problem as an assignment problem.

UNIT-III

Non-linear Programming Problems (NLPP): Classical method of optimization using Hessian matrix, Iterative methods - Random search methods, Steepest decent method and Conjugate gradient method; Direct methods - Lagrange‘s method, Kuhn-Tucker conditions, Penalty function approach.

UNIT – IV

Dynamic Programming:

Principle of optimality – recursive relations – solution of LPP – simple examples.
Integer Linear Programming: Gomory’s cutting plane method – Branch and bound algorithm – Knapsack problem – linear 0–1 problem.

TEXT BOOKS:

1. Kantiswarp,P.K.Gupta, Man Mohan, ―Operations Research‖, S. Chand & Sons, NewDelhi. 16/e., 2013. (Unit I,II)

2. S.S. Rao, ―Optimization Techniques‖, New Age International, New Delhi, 3/e., 2013.

REFERENCE BOOKS:

1. Hamdy. A. Taha, Operations Research, Prentice Hall of India Ltd, New Delhi, 7/e., 2002.

2. J.C. Pant, ―Introduction to Optimization‖, Jain Brothers, New Delhi, 7/e., 2012.

3. K.V.Mittal : Optimization Methods, Wiley Eastern Ltd. 005

CLO, PO and PSO Mapping:

Optimization Techniques (20EE602/PE66)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Develop the mathematical model of an optimization problem and identify particular case of activities among the several alternatives and solve a given linear programming problem using suitable method.	3	3	1	1	-	-	-	-	-	-	-	-	2	2	1
CLO2	Obtain solution for a special type linear programming problem namely transportation, assignment & travelling salesman problem and infer their practical relevance	3	3	1	1		-	-	-	-	-	-	-	2	1	2
CLO3	Describe the characteristics of non-linearity in optimization and solve certain NLPP using searching and iterative techniques.	3	3	1	1		-	-	-	-	-	-	-	1	2	1
CLO4	Describe the characteristics of Dynamic programming in optimization and solve certain integer linear programming problems.	3	3	1	1		-	-	-	-		-	-	2	2	2

Professional Elective Course-II &III

Power Quality

III B.Tech – VI Semester (Code: 20EE602/PE67)

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

Prerequisites: Basic Electrical and Electronics Engineering, Power Generation and Transmission

Course Objectives: To make the students

CO1: Classify the power quality problems.

CO2: Analyze voltage sag and voltage swell problems and suggest preventive techniques.

CO3: Identify the harmonic sources and the effects of harmonic distortion.

CO4: Analyze the Power Quality Conditioners.

Course Learning Outcomes: Students will be able to

CLO1: Summarize different types of power quality problems with their source of generation

CLO2: Design different methodologies for detection, classification and mitigation of power quality problems.

CLO3: Design active & passive filters for harmonic elimination.

CLO4: Explain the Power Quality Conditioners

UNIT – I

INTRODUCTION

Electric power quality phenomena - IEC and IEEE definitions - power quality disturbances - voltage fluctuations-transients-unbalance-waveform distortion-power frequency variations. Voltage variations - Voltage sags and short interruptions – flicker -longer duration variations.

UNIT – II

VOLTAGE SAGS AND INTERRUPTIONS

Sources of sagas and interruptions, Estimating voltage sag performance, fundamental principles of protection, solutions at the end-use level, Motor-starting sags, utility system fault-clearing Issues.

TRANSIENT OVER VOLTAGES

Sources of over voltages, principles of over voltage protection, devices for over voltage Protection, utility capacitor-switching transients, utility system lightning protection.

UNIT – III

FUNDAMENTALS OF HARMONICS

Harmonics – sources – definitions & standards – impacts - calculation and simulation –harmonic power flow - mitigation and control techniques – filtering – passive and active

UNIT – IV

POWER QUALITY CONDITIONERS

Power Quality conditioners – shunt and series compensators - DStatcom - Dynamic voltage restorer - unified power quality conditioners - case studies

TEXT BOOKS:

1. Electrical Power Systems Quality, Roger C. Dugan, Mark F.McGranaghan, Surya Santoso, H.Wayne Beaty, 2nd Edition, TMH Education Pvt. Ptd.
2. Power quality by C. Sankaran, CRC Press.

REFERENCE BOOKS:

1. Electrical systems quality Assessment by J. Arrillaga, N.R. Watson,S. Chen, John Wiley & Sons.
2. Understanding Power quality problems by Math H. J. Bollen IEEE Press.

Bapatla Engineering College::Bapatla

CLO, PO& PSO Mapping:

POWER QUALITY (20EE602/PE67)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Summarize different types of power quality problems with their source of generation	2	3	2	2									2		
CLO2	Design different methodologies for detection, classification and mitigation of power quality problems	2	2	2	3									3	3	2
CLO3	Design active & passive filters for harmonic elimination.	3	2	3	3									2	2	3
CLO4	Explain the Power Quality Conditioners	2	2	3	2									2		

Job oriented Elective courses

JAVA PROGRAMMING

III B.Tech – VI Semester (Code: 20EEL604/JO61)

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

Prerequisites: NIL

Course Objectives: To make the students

CO1: Understand advantages of OO programming over procedural oriented programming; learn the basics of variables, operators, control statements, arrays, strings, classes and objects.

CO2: Understand and write programs on Inheritance, polymorphism.

CO3: Understand and write programs on Exception Handling, Multithreading, I/O.

CO4: Understand and write programs on Event Handling, Applets, AWT and Swings.

Course Learning Outcomes:

By the end of the course the student will be able to

CLO-1: Demonstrate OOP concepts, its advantages over structured programming.

CLO-2: Develop and implement Inheritance, polymorphism.

CLO-3: Explain Exception Handling, Multithreading, I/O.

CLO-4: Create code for Event Handling, Applets, AWT and Swings.

.**Course Syllabus**

UNIT – I **(14 Periods)**

The History and Evolution of Java, An Overview of Java, Data Types, Variables and Arrays, Operators, Control Statements, Introducing Classes, A Closer Look at Methods and Classes

UNIT – II **(15 Periods)**

Inheritance, Packages and Interfaces Strings:

String Constructors, Any10 String class methods, String Buffer class, Any10 String Buffer classmethods,IntroducingStringBuilderclass.**TypeWrappers:**Autoboxing/unboxing.**Collections:**CollectionsOverview,NamesofCollectionInterfaces,**CollectionClasses**:LinkedList<String>,ArrayList<String>

UNIT – III **(15 Periods)**

Exception Handling, Multithreaded Programming, **I/O:** I/O Basics, Reading Console Input, Writing Console Output, Print Writer class, Reading and Writing Files, Automatically Closing a File.

UNIT – IV **(16 Periods)**

The Applet Class: Applet Architecture, An Applet Skeleton, Applet program to draw shapes, setting Color, Font using Graphics class.

Event Handling

Introducing the AWT: Window Fundamentals, Program using AWT components Label, Text Field, Text Area, Checkbox, Checkbox Group, Button, Program using Flow Layout, Grid Layout, Border Layout.

GUI Programming with Swing: The Origins of Swing, Advantages of Swing over AWT, The MVC Connection, Program using Swing Components JLabel, JTextField, JTextArea, Checkbox, JButton,JTabbedPane,JTable, JTree, JComboBox.

TEXT BOOK:
1. “Java The Complete Reference”, 9th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.

2. “Big Java”, 2nd Edition, Cay Horstmann, John Wiley and Sons,PearsonEdu(UNIT–IV).

REFERENCE BOOKS:

1. “Java How to Program”, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. “Core Java 2”, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
3. “Core Java 2”, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
4. “Beginning in Java 2”, Iver Horton, Wrox Publications.
5. “Java”, Somasundaram, Jaico.
6. “Introduction to Java programming”, By Y.DanielLiang,Pearson Publication.

NPTEL Course Links:
1. https://www.youtube.com/watch?v=e7Yj6vLyYOI
2. https://www.youtube.com/watch?v=J_d1fJy90GY&t=6s

Bapatla Engineering College::Bapatla

CLO, PO and PSO Mapping:

JAVA PROGRAMMING (20EE604/JO61)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Demonstrate OOP concepts, its advantages over structured programming	3	2	3	2									3	3	2
CLO2	Develop and implement Inheritance, polymorphism.	3	2	3	2									3	3	2
CLO3	Explain Exception Handling, Multithreading, I/O.	3	2	3	3									3	3	2
CLO4	Create code for Event Handling, Applets, AWT and Swings	3	2	3	2									3	3	2

Job oriented Elective courses

DATA ANALYTICS

III B.Tech – VI Semester (Code: 20EEL604/JO62)

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

Prerequisites: NIL

Course Objectives: To make the students

CO1: Reproduce Big data, characteristics of Big Data, sources and applications of Big Data, Industry examples and Big Data technologies.

CO2: Describes basic concepts of Hadoop, architecture and design of Hadoop Distributed File System(HDFS), commands of HDFS.

CO3: Demonstrate how classic Map Reduce works (v1) and anatomy of Map Reduce (v2) along with their failures. Deploying map reduce programs on to HDFS.YARN (Yet Another Resource Node) and its failures, scheduling in YARN.

CO4: Describes different Big Data tools like PIG, HIVE, & SQOOP.

Course Outcomes:

By the end of the course the student will be able to

CLO1: Summarize the different methodologies of Big data tools and characteristics.

CLO2: Describes the Hadoop distributed file system with respect to Hadoop.

CLO3: Recognizes the Map Reduce mechanism is effective than YARN in Hadoop.

CLO4: Describe the configuration of HIVE component and meta-store, SQL on Hadoop alternatives transactions.

Course Syllabus:

UNIT-I (15 Periods)

UNDERSTANDING BIG DATA: What is big data? Why big data? Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System, Grid Computing, Volunteer Computing, convergence of key trends, Unstructured Data.

INDUSTRY EXAMPLES OF BIG DATA: Web Analytics, Big Data and Marketing, Fraud and Big Data, Risk and Big Data – Credit risk management, Big Data and Algorithmic Trading, Big Data and Healthcare – Big data in medicine, Advertising and big data.

BIG DATA TECHNOLOGIES: Introduction to Hadoop, Open Source Technologies – Cloud and Big Data, Mobile Business Intelligence, Crowd sourcing analytics, Inter and Trans firewall analytics.

UNIT-II (15 Periods)

BASICS OF HADOOP: Introduction to Hadoop, hadoop components, Configuration of Hadoop, Data format, Analyzing data with Hadoop, Scaling out, Hadoop streaming.

Hadoop Distributed File System: Design of HDFS, HDFS concepts, Command line interpreter, Basic File system operations, Hadoop File System Interface, Data Flow, Parallel copying with distcp, Java interface.

UNIT-III **(15 Periods)**

How MapReduce Works: Classic Map Reduce, Anatomy of Map Reduce job run, Failure in Map Reduce, Shuffle and sort, Task execution.

MapReduce Features: Counters, Sorting, Writing mapreduce programs, Deploying mapreduce programs on Hadoop Cluster.

YARN-Anatomy of YARN application run, YARN compared to Mapreduce 1, Scheduling in YARN, Failures In YARN.

UNIT-IV **(15 Periods)**

Hadoop Related Tools: Pig- Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts, User-Defined Functions-A Filter UDF, An Eval UDF.

Hive: Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

Sqoop: Getting Sqoop, Sqoop Connectors, A Sample Import, Text and Binary File Formats, Generated Code, Additional Serialization Systems, Imports: A Deeper Look, Controlling the Import, Imports and Consistency

TEXT BOOK:

1. **“**HADOOP “The Definitive Guide”, Tom White, O’Reilly Publications, 4th Edition.

2. Black Book on Big Data, Dreamtech Publications.

REFERENCE BOOKS:

1. “Hadoop in Action, Hadoop Beginner’s Guide,Optimizing Hadoop for MapReduce, Scaling Big Data with Hadoop and Solr

Journals/Journal Articles:

1. https://hadoopjournal.wordpress.com/

2 A Review Paper on Big Data and Hadoop.

Bapatla Engineering College::Bapatla

CLO, PO and PSO Mapping:

DATA ANALYTICS (20EE604/JO62)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Summarize the different methodologies o Big data tools and characteristics.	2	2	3	2									3	2	2
CLO2	Describes the Hadoop distributed file system with respect to Hadoop.	2	2	2	3									2	3	2
CLO3	Recognizes the Map Reduce mechanism is effective than YARN in Hadoop.	3	2	3	2									3	3	2
CLO4	Describe the configuration of HIVE component and meta-store, SQL on Hadoop	2	2	3	3									3	2	2

Job oriented Elective courses

OPERATIONS RESEARCH

III B.Tech – VI Semester (Code: 20EEL604/JO63)

Lectures	2	Tutorial	0	Practical	2	Credits	4
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Prerequisites: NIL

Course Objectives: To make the students

CO1: Concepts to solve linear programming problems which arise in real life using various methods and their advantages.

CO2: Applications of linear programming namely transportation and assignment problems which arise in different engineering fields.

CO3: Understand the Inventory control and Queuing theory.

CO4: Develop the Project Scheduling and PERT-CPM and competitive strategies.

Course Outcomes:

By the end of the course the student will be able to

CLO1: Concepts to solve linear programming problems which arise in real life using various methods and their advantages.

CLO2: Write applications of linear programming namely transportation and assignment problems which arise in different engineering fields.

CLO3: Develop the Inventory control and Queuing theory models.

CLO4: Solve and analyze the Project Scheduling and PERT-CPM and competitive strategies.

Course Syllabus:

UNIT-I

Linear Programming Problem (LPP): Mathematical models and basic concepts of linear programming problem; Solution of linear programming problem - Graphical method, Simplex method, Artificial variable techniques (Big-M and Two-phase method), Duality in linear programming, dual simplex method.

UNIT-II

Special types of LPP: Mathematical model of transportation problem, Methods of finding initial basic feasible solution, optimal solution of transportation problem, Degeneracy in transportation problem; Exceptional cases in transportation problem- Unbalanced transportation problem, Maximization transportation problem;

Assignment problem- Mathematical formulation of the problem, Hungarian method to solve an assignment problem, Special cases in assignment problem- Maximization assignment problem.

UNIT-III

Inventory control - Introduction, types of inventories, costs associated with inventories, the concept of EOQ, deterministic inventory problems with no shortages, with shortages. **Queuing theory** - Introduction, queuing system, elements of queuing system operating characteristics of a queuing system, classification of queuing models.

UNIT-IV

Project Scheduling and PERT-CPM: Introduction, Basic Difference between PERT and CPM, PERT/CPM Network Components and Precedence Relationship, Project Management – PERT

Game Theory: Introduction, Competitive Situations, Characteristics of Competitive Games, Maximin – Minimax Principle, Dominance.

TEXT BOOK:

1. “Kanti swarup et.al, Operations Research, 16th ed., New Delhi: S. Chand & Sons, 2013
2. Hamdy. A. Taha, Operations Research, 7th ed., New Delhi: Prentice Hall of India Ltd, 2002.

REFERENCE BOOKS:

1. Singiresu S. Rao, Engineering Optimization Theory and Practice, 4th ed., Hoboken, New Jersey: John Wiley & Sons, Inc, 2009

ONLINE COURSES:

1. Operation Research NPTEL 1.

Bapatla Engineering College::Bapatla

CLO, PO and PSO Mapping:

Operations research (20EE604/JO63)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	POll	PO12	PSO1	PSO2	PSO3
CLO1	Concepts to solve linear programming problems which arise in real life using various methods and their advantages.	2	3	3	1	1								3	2	1
CLO2	Write applications of linear programming namely transportation and assignment problems which arise in different engineering fields.	1	1	1		2							1	1	2	1
CLO3	Develop the Inventory control and Queuing theory models.	2	2	1	1	1							3	1	2	
CLO4	Solve and analyze the Project Scheduling and PERT-CPM and competitive strategies.	2	3	2	1	1							1	2	1	

Job oriented Elective courses

PIC Microcontrollers and ARM Processors

III B.Tech – VI Semester (Code: 20EEL604/JO64)

Lectures	2	Tutorial	0	Practical	2	Credits	4
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Prerequisites: Microprocessor & Microcontrollers

Course Objectives: To make the students

CO1: To introduce the architecture of PIC microcontroller

CO2: To educate on use of interrupts and timers

CO3: To develop the peripheral devices for data communication and transfer

CO4: To introduce the functional blocks of ARM processor

Course Outcomes: **Students will be able**

CLO1: Explain PIC Microcontrollers Programming structure

CLO2: Illustrate about Controller interrupts and Timer programming

CLO3: Describe the hardware interfacing of peripherals

CLO4: Demonstrate about ARM Processors

UNIT I
INTRODUCTION TO PIC MICROCONTROLLER

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–PIC16cxx–- Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations

UNIT – II
INTERRUPTS AND TIMER

PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine - Timers-Timer Programming– Front panel I/O-Soft Keys– State machines and key switches– Display of Constant and Variable strings.

UNIT III
PERIPHERALS AND INTERFACING

I^2C Bus for Peripherals Chip Access– Bus operation-Bus subroutines– Serial EEPROM— Analog to Digital Converter–UART-Baud rate selection–Data handling circuit–Initialization - LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.

UNIT IV
INTRODUCTION TO ARM PROCESSOR

ARM Architecture –ARM programmer ‘s model –ARM Development tools- Memory Hierarchy – ARM Assembly Language Programming–Simple Examples–Architectural Support for Operating systems.

TEXTBOOKS:

1. Peatman,J.B., —Design with PIC Micro Controllers‖PearsonEducation,3rdEdition, 2004.
2. Martin Bates-PIC Microcontrollers An Introduction to Microelectronics, newness, Elsevier, 2004

REFERENCE:

1. Mazidi, M.A., —PIC Microcontroller‖ Rollin McKinlay, Danny causey Prentice Hall of India, 2007.

2. Furber,S., —ARM System on Chip Architecture‖ Addison Wesley trade Computer Publication, 2000.

Web References:

https://www.microcontrollerboard.com/pic_microcontroller.html

CLO, PO and PSO Mapping:

PIC Microcontrollers and ARM Processors(20EE604/JO64)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Explain PIC Microcontrollers Programming structure	3	2	2	2	2	-	-	-	3	-	-	-	3	-	3
CLO2	Illustrate about Controller interrupts and Timer programming	3	2	3	2	2	-	-	-	2	-	-	-	3	3	2
CLO3	Describe the hardware interfacing of peripherals	3	2	2	2	2	-	-	-	2	-	-	-	3	3	3
CLO4	Demonstrate about ARM Processors	3	2	2	2	2	-	-	-	2	-	-	-	3	3	3

Job oriented/ Elective courses

SOLAR PV AND WIND PLANT DESIGN

III B.Tech – VI Semester (Code: 20EEL605/JO65)

Lectures	2	Tutorial	0	Practical	2	Credits	4
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Course objectives:

CO1: To make the student understand solar cell and types, PV plant design, array design and inverter types, grid interface.
CO2: To make the students understand the principles of solar radiation, solar constant and various types of collectors
CO3: To make the student Explain the concept of various forms of wind energy systems, components of wind energy converters and working principles of wind energy.
CO4: To make the student analyze wind farm design, testing and standards, design procedure and technical specifications.
Course Outcomes: Upon the completion of this course, the student will be able to
CLO1: Explain solar radiation, solar constant and various types of Collectors.
CLO2: Describe solar cell and types, PV plant design, array design and inverter types, grid interface.
CLO3: Explain the concept of various forms of wind energy systems, components of wind energy converters and working principles of wind energy.
CLO4: Demonstrate wind farm design, testing and standards, design procedure and technical specifications.

Unit-I

Solar PV systems: Fundamentals of solar cell, semiconductors as basis for solar cells, P-N junction, sources of losses and prevention, types of solar cells, PV plant design - estimating power and energy demand, site selection, land requirements, choice of modules, Array design, , Supporting structures, mounting and installation, battery storage, inverter types and characteristics, power condition unit, selection of cables, Preparation of rooftop solar power (single line diagram) SLD, Preparation of Net Metering solar power (single line diagram) SLD

Unit-II

Types of Solar Power Plant: Grid connected solar Power Plant- Grid interactive solar power plant- Net Metering Solar Power Plant- Off-Grid / Hybrid solar power plant. Schemes of solar power plant-selection of site and shadow analysis -PV module structure inter row spacing calculation -Pitch analysis Selection of PV module tilt angle- Near shading object calculation -Site survey and plant assessment. Type of solar radiation -Irradiance assessment and comparison -Solar Radiation. Fill factor and Equivalent Solar cell Circuit.

Unit-III

Wind Energy Basics: Status, Advantages and disadvantages of wind energy systems, Types of wind energy converters, local Effects on wind, site selection: roughness length, wind shear, Wind Speed Variability, Obstacles to wind flow. Components of a wind energy converter: Rotor Blades, Gearboxes, Synchronous or Asynchronous Generators, Towers, Miscellaneous components, Turbine Selection. Working principles of wind energy: Energy content in wind, Energy Conversion at the Blade.

Unit-IV

Small and hybrid wind turbines: introduction of micro/small and hybrid wind turbines, siting small turbines in complex terrain, offshore wind turbines, operation and challenge of offshore wind farms. Aerodynamics of wind turbine, Betz limit, blade elemental theory, blade shape, effect of drag and blade number on performance. Airfoils and general concepts of aerodynamics. Wind farm design, testing and standards: design procedure, topologies, Wind turbine/farm simulation, wind turbine testing and standards, technical specifications, wind turbine component testing, safety aspects.

Text books:

1. B H Khan, Non-Conventional energy resources, 2nd edition,Tata McGrawHill Companies.
2. Chetan Singh Solanki, Solar Photovoltaic's: Fundamentals, Technologies and applications.

References:

1. John Twidell & Toney Weir: E&F.N. Spon, Renewable Energy Sources
2. B Khan, Non-Conventional Energy Resources - McGraw Hill Education; 2nd edition
3. Buchholz, Bernd M., Styczynski, Zbigniew, Smart Grids – Fundamentals and Technologies in Electricity Networks.
4. Krzysztof (Kris) Iniewski, Smart Grid Infrastructure & Networking - The McGraw-Hill Companies.

CLO-PO and PSO Mapping:

Solar PV and Wind Plant Design (20EE605/JO65)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Understand the principles of solar radiation, solar constant and various types of Collectors.	3	2	2	2									2		
CLO2	Understand solar cell and types, PV plant design, array design and inverter types, grid Interface.	1	2	3	3									3	3	2
CLO3	Explain the concept of various forms of wind energy systems components of wind energy converters and working principles of wind energy	2	2	3	3									2	2	3
CLO4	Analyze wind farm design procedure and technical specifications.	2	2	3	2									2		

Bapatla Engineering College::Bapatla

(Autonomous)

Quantitative Aptitude

III B.Tech – VI Semester (Code: 20EEL601/SO04)

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

Course Objectives:

Course Learning Outcomes: Upon successful completion of the course, the student will be able to:
CO1: Solve basic mathematics problems.
CO2: Apply strategies to simplify the problems.
CO3: Apply mathematical skills in solving analytical problems personal life.
CO4: Interpretation of data through graphs and charts.

UNIT I

Numerical Ability I: Number System, LCM & HCF, Ratio, Proportion & Variation, Partnership, Averages

Numerical Ability II: Mixtures & Allegations, Percentages, Profit & Loss.

UNIT-II

Arithmetical ability I: Problems on ages, time & work, pipes & cistern, chain rule.
Arithmetical ability II: Time & distance, problems on boats &steams, problems on trains.

UNIT-III

Arithmetical ability III: Allegation, simple interest and compound interest, races & games of skills, calendar and clock.

Reasoning: Alphabet Test, Alphanumeric Series, Analogy, Direction sense, Blood Relations, Coding & Decoding, Seating arrangements, Puzzles

Logical ability: Permutations, combination and probability.

UNIT-IV

Mensuration: 2-D : Area, perimeter, Triangles, Quadrilaterals, Polygons, circles, problems
3-D: Volumes, Surface Area, Cube, Cuboid, Cylinder, Cone, Frustrum, Sphere, Hemi-Sphere, tetrahedrane, Pyramid, Prism

Data interpretation: Tabulation, bar graphs, pie charts, line graphs

TEXT BOOK:

1. R S Aggarwal, Quantitative Aptitude for Competitive Examinations, S Chand Publishing, Revised edition, 2017.

REFERENCE BOOKS:

1. Arun Sharma, Quantitative Aptitude, McGraw Hill Education, 2019.
2. Abhijit Guha, Quantitative Aptitude for All Competitive Examinations, McGraw Hill Education, 6th Edition, 2016.

Bapatla Engineering College::Bapatla

(Autonomous)

POWER ELECTRONICS LAB

III B.Tech – VI Semester (Code: 20EEL602)

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

Prerequisites: Basic Electric Engineering**,** Semiconductor Physics and Nano Materials.

Course Objectives: To make the students

CO1: To Understand the Turning ON and OFF of Transistor and Power Electronics Devices.

CO2: To Analyze AC to DC Conversion circuits on R, RL, Back emf Loads.

CO3: To Analyze the operation of inverters PWM techniques on R, Motor Loads.

CO4: To Analyze the operation of DC-DC choppers and AC Voltage controllers on R Load.

Course Outcomes: Students will be able to

CLO1: Illustrate the ON and OFF of Transistor & Power Electronics Devices and its Protection.

CLO2: Design and analyze AC to DC Conversion circuits on R, RL, Back emf loads.

CLO3: Design and analyze the operation of inverters PWM techniques on R, Motor Loads.

CLO4: Design and analyze operation of DC-DC choppers and AC Voltage Controllers on R-Load.

LIST OF EXPERIMENTS:

A- Essential Experiments

1. Static characteristics of SCR, TRIAC.
2. Characteristics of MOSFET & IGBT.
3. Gate triggering methods for SCR (R, RC, UJT).
4. 1- phase Half & Full controlled rectifier with R, RL & RLE load.
5. Voltage commutated DC chopper with R load.
6. 1-phase modified series inverter with R load.
7. 1-phase parallel inverter with R & RL loads.

B- List of Optional Experiments:

(i) Chose one Experiment

8. 1-phase Cyclo-converter (Center tapped or Bridge) with R load.
9. 1- phase IGBT based inverter with R, RL loads.
10. 1-phase Dual converter with R, RL & RLE loads (Circulating and Non-circulating modes).

(ii) Chose one Experiment

11. 3-phase Half & Full controlled Rectifier with R, RL and RLE loads.

12. 3-phase IGBT based inverter with R, RL loads.

13. Buck Boost Converter with R load.

(iii) Chose one Experiment

14. DSP based speed control of BLDC motor.

15. DSP based speed control of 3-phae Induction motor.

16. Study of 1-phase full wave Mc-Murray Bedford Inverter with R, RLE load.

Note: Minimum 10 experiments should be conducted.

Bapatla Engineering College::Bapatla

(Autonomous)

CLO, PO and PSO Mapping:

POWER ELECTRONICS LAB (20EEL602)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Illustrate the ON and OFF of Transistor & Power Electronics Devices and its Protection.	-	-	-	-	-	-	-	-	2	2	1	1	1	1	1
CLO2	Design and analyze AC to DC Conversion circuits on R, RL, Back emf loads.	-	-	-	-	-	-	-	-	3	3	2	1	2	2	1
CLO3	Design and analyze the operation of inverters PWM techniques on R, Motor Loads.	-	-	-	-	-	-	-	-	3	3	3	3	2	3	3
CLO4	Design and analyze operation of DC-DC choppers and AC Voltage Controllers on R-Load.	-	-	-	-	-	-	-	-	3	3	3	3	2	3	3

Bapatla Engineering College::Bapatla

(Autonomous)

POWER SYSTEMS LAB

III B.Tech – VI Semester (Code: 20EEL603)

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

Prerequisites: Mathematics, PDS,RES**.**
Course Objectives: To make the students

CO1: Analyze the performance of transmission line

CO2: Able to do Experiment in various protection of generator, feeder and transmission line using relays and circuit breakers
CO3: Able to conduct testing about the various electromagnetic relays
CO4: Be competent in use of static and digital relays.

CO5: Develop simulation model for RES

Course Learning Outcomes: Students will be able to

CLO1: Explain the performance of transmission line

CLO2: Examine various protection of generator, feeder and transmission line using relays and circuit breakers
CLO3: Execute testing about the various electromagnetic relay

CLO4: Competent in use of static and digital relays.

CLO5: Demonstrate simulation model for RES

LIST OF EXPERIMENTS:

1. Determination of ABCD parameters/regulation and efficiency of transmission line model.

2. Characteristics of IDMT over current relay/ over voltage electromagnetic relay.

3. Finding the sequence impedances of 3-phase synchronous machine.

4. Reactive power compensation using tap changing transformer.

5. Surge impedance loading of transmission line model.

6. Find cable fault using cable fault locator/Find hotspots using thermal image camera.

7. To study characteristics of MCB & HRC Fuse.

8. Test to find out polarity, ratio and magnetization characteristics of CT and PT.

9. Study on (i) on load Time Delay Relay (ii) off load Time Delay Relay.

10. Characteristics of over current/earth fault using numerical relay.

11. Characteristics of numerical distance relay.

12. Characteristics of numerical differential relay.

13. Identifying and Measuring the parameters of solar PV module in the field.

14. Series and parallel connection of PV Modules

15. Study of Solar / wind turbine generator power plant.

Note: Minimum 10 experiments should be conducted.

CLO, PO and PSO Mapping:

POWER SYSTEMS LAB (20EEL603)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the performance of transmission line	3	3	-	2	1	-	-	-	2	-	-	2	2	3	-
CLO2	Examine various protection of generator, feeder and transmission line using relays and circuit breakers	3	2	2	3	-	-	-	-	2	-	-	2	2	3	-
CLO3	Execute testing about the various electromagnetic relay	3	2	2	2	2	-	-	-	2	-	2	2	2	3	2
CLO4	Competent in use of static and digital relays.	2	2	3	2	2	-	-	-	2	-	-	2	2	3	-
CLO5	Demonstrate simulation model for RES	3	3	-	2	2	-	-	-	2	-	2	2	2	3	3

Bapatla Engineering College::Bapatla

(Autonomous)

ELECTRONICS DESIGN LAB
III B.Tech-VI Semester (Code: 20EEL604)

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

Prerequisites: Basic Knowledge of C-programming, Basic of Electronics.

Course Objectives: To make the students

CO1: Able to get a basic knowledge on ARDUINO-UNO and it's various basic applications.

CO2: To familiarize on PCB design software and design basic Analog circuits.

CO3: Able to get basic knowledge on RASPBERRY-PI and its various basic Applications.

CO4: Able to learn to build various Electrical Applications using ARDUINO-UNO and RASPBERRY-PI.

Course Learning Outcomes: Students will be able to

CLO1: Design different projects using ARDUINO-UNO.

CLO2: Design of PCB for various applications.

CLO3: Design different projects using RASPBERRY-PI.

CLO4: Design of digital voltmeter and servo motor using ARDUINO-UNO and RASPBERRY-PI.

LIST OF EXPERIMENTS:

1. Arduino UNO based relay control.
2. Design of Digital Thermometer using Arduino UNO & LM35 Temperature sensor.
3. Vibration sensor using Arduino UNO.
4. Obstacle Detector using Arduino UNO.
5. WIFI based RASPBERRY control of Electrical appliances.
6. Design and control of a Servo motor.
7. Digital Arduino Voltmeter.
8. Smart Street light intensity control system.
9. Line follower Robot.
10. Design the PCB Layout for full wave rectifier circuit.
11. Design of single sided PCB Layout for Common Emitter Amplifier (CE).
12. Design of single sided PCB Layout for Full adder circuit.
13. Design and create single sided PCB Layout for Flashing LEDs using 555 IC.
14. Raspberry Pi controlled LED.
15. Raspberry Pi controlled stepper motor.

Note: Minimum 10 experiments should be conducted.

Bapatla Engineering College::Bapatla

(Autonomous)

CLO, PO and PSO Mapping:

Electronics Design Lab (20EEL604)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Design different projects using ARDUINO-UNO	3	2	3	-	-	-	-	-	2	-	-	2	-	-	-
CLO2	Design of PCB for various applications.	3	2	-	2	-	-	-	-	2	-	-	2	-	-	-
CLO3	Design different projects using RASPBERRY-PI.	3	2	3	-	-	-	-	-	2	-	-	2	-	-	-
CLO4	Design of digital voltmeter and servo motor using ARDUINO-UNO and RASPBERRY-PI.	3	3	2	-	-	-	-	-	2	-	-	2	-	-	-

Bapatla Engineering College::Bapatla

(Autonomous)

INDIAN TRAITIONAL KNOWLGE

III B.Tech-VI Semester (Code: 20EE606/MC04)

Lectures	02	Tutorial	0	Practical	00	Credits	00
Continuous Internal Assessment			30	Semester End Examination (3 Hours)			00

Pre Requisites: NIL

Course Outline: This Course is to facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

Course Objectives:

CO1. The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian traditional knowledge systems connecting society and nature.

CO2. Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.

CO3.The course focuses on introduction to Indian knowledge system, Indian perspective of modern scientific world-view and basic principles of yoga and holistic healthcare system.

Course Learning Outcomes: After completion of the course, students will be able to:

CLO1. Understand the concept of Indian Traditional knowledge and its importance

CLO2. Compare the Indian traditional knowledge Systems with Other Global systems. .

CLO3. Understand the concept of yoga and its correlations to science.

CLO4. Study various case studies related to traditional knowledge.

UNIT I

Basic Structure of Indian Knowledge System (i) वेद, (ii) उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थापत्य आदि) (iii) वेदांग (शिक्षा, कल्प, निरुत, व्याकरण, ज्योतिष छंद), (iv) उपाइग (धर्म शास्त्र, मीमांसा, पुराण, तर्कशास्त्र)

UNIT II

Modern Science and Indian Knowledge System 8 Periods

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Kn~~ow~~ledge (IK), characteristics, traditional knowledge Vs indigenous knowledge, traditional knowledge Vs western knowledge , traditional knowledge Vs ~~f~~ormal knowledge

UNIT III

Yoga and Holistic Health care 8 Periods

Science of Yoga , Yoga as a tool for healthy Life style , 8 limbs of Yoga (Yama , Niyama , Aasana , Pranayama , Pratyahara , Dharana , Dhyana , Samadhi).

UNIT IV

Case Studies 8 periods

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment.

TEXT BOOKS:

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
2. Swami jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan

REFERENCE BOOKS:

1. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
2. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

CO,PO&PSO Mapping:

Indian Traditional knowledge (20EE606/MC04)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Understand the concept of Indian Traditional knowledge and its importance.	-	-	-	-	-	2	2	1	-	-	-	1	-	-	-
CLO2	Compare the Indian traditional knowledge Systems with Other Global systems	-	-	-	-	-	2	2	-	-	-	-	1	-	-	-
CLO3	Understand the concept of yoga and its correlations to science.	-	-	-	-	-	1	1	-	-	-	-	1	-	-	-
CLO4	Study various case studies related to traditional knowledge	-	-	-	-	-	2	-	-	-	-	-	2	-	-	-

Minor Courses (20 Credits): Courses offered to non EEE branch B.Tech., students for obtaining Minor degree in Electrical and Electronics Engineering.

S.NO	Course Title	Prerequisite Course
	Level-I	
1	Linear Control System	Basic Electrical and Electronics Engineering
2	Basics of Signals and Systems	Basic Maths
3	Utilization of Electrical Energy	Basic Electrical and Electronics Engineering
	Level -II	
1	Power Generation and Transmission	Basic Electrical and Electronics Engineering
2	Principles of Power Electronics	Basic Electrical and Electronics Engineering
3	Digital Control Systems	Linear Control System
	Level -III	
1	Power Quality	Basic Electrical and Electronics Engineering, Power Generation and Transmission
2	Smart Grid	Power Generation and Transmission
3	Energy Management & Audit	Basic Electrical and Electronics Engineering, Power Generation and Transmission
	Level -IV	
1	Industrial Drives	Principles of Power Electronics
2	Solar & Fuel cell Energy Systems	Basic Electrical and Electronics Engineering
3	Hybrid Electrical Vehicles	Principles of Power Electronics, Industrial Drives

1. LINEAR CONTROL SYSTEMS

B.Tech II–IV Semester (Code: 20EEM_ _ _)

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

Prerequisites: Mathematics, Physics, BEEE

Course Objectives: To make the students

CO1: To make the students interpret different physical systems, construct mathematical models and reduce a block diagram of multiple subsystems to a signal block.

CO2: To make the students employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.

CO3: To make the students analyze the system stability using complex domain.

CO4: To make the students formulate different types of analysis in time and frequency domain.

CO5: To make the students Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.

CO6: To make the students assess controllability and observability of control systems.

Course Learning Outcomes: Students will be able

CLO1: Explain the concepts of classification of control systems, develop of mathematical models from schematics of physical system.

CLO2: Describe time domain analysis and predict the performance parameters of the system for standard input functions.

CLO3: Compute stability of the system in complex domain.

CLO4: Deduce stability of the system in time and frequency domain.

CLO5: Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.

CLO6: Assess controllability and observability of control systems.

Course Syllabus:

UNIT – I

Introduction: Basic concept of control system. Types of feedback control systems and its effect on overall gain – Liner time invariant, time variant systems and nonlinear control systems

Modeling of LTI Systems: Mathematical models and Transfer functions of Physical systems. Block diagram representation of control systems – signal flow graph.

UNIT – II

Time Domain Analysis: Standard test signals – step, ramp, parabolic and impulse response function –Time response of first order and second order systems to standard test signals - steady state response – error Constants.
Stability Analysis in the Complex Plane: Absolute, relative, conditional, bounded input – bounded output, zero input stability, conditions for stability, Routh –Hurwitz criterion.

UNIT – III

Root Locus Technique: Introduction - Construction of Root Locus, Introduction to Controller Design using Root-loci method of feedback controller design,
Frequency Domain Analysis: Introduction – correlation between time and frequency responses – Polar plots – Bode plots – Nyquist plots.

UNIT – IV

Design of controllers and compensator: Effect of adding poles and zeros on overshoot, rise time, band width. Introduction to Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs.
State space analysis: Concepts of state variables and state models – diagonalization – solution of state equations – Concepts of controllability and Observability

TEXT BOOKS:

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.

2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P)

Limited, Publishers, 3rd edition.

3. Digital control systems 2nd edition by KUO, oxford university press.

4. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.

REFERENCE BOOKS:

1. Modern Control Engineering by Katsuhiko Ogata Prentice Hall of India Pvt. Ltd.,3rd edition

2. Control Systems by A.Anand Kumar, PHI (p) limited-2007.

3. Control Systems by A.Nagoor Kani, RBA publications 1st edition.

4. Advanced Control theory by A. Nagoor Kani RBA publications 2nd edition.

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

CLO, PO& PSO Mapping:

Control Systems (20EE503)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of classification of control systems, develop of mathematical models from schematics of physical system.	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CLO2	Describe time domain analysis and predict the performance parameters of the system for standard input functions.	3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CLO3	Compute stability of the system in complex domain.	3	3	2	2	2	-	2	-	-	-	-	-	3	3	2
CLO4	Deduce stability of the system in time and frequency domain.	3	3	3	2	2	-	-	-	-	-	-	-	3	3	-
CLO5	Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.	3	3	3	2	2	-	2	-	-	-	-	-	3	3	2
CLO6	Assess controllability and observability of control systems.	**3**	**3**	2	**2**	2	-		-	-	-	-	-	3	3	

2. BASICS OF SIGNALS AND SYSTEMS

B. Tech II–IV Semester (Code: 20EEM_ _ _)

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

Prerequisites: Basic Mathematics

Course objectives: To make the students

CO1: Understand the concepts of continuous time and discrete time systems.
CO2: Gain knowledge about LTI systems

CO3: Analyze systems in frequency domain.

CO4: Understand sampling theorem and its implications.

Course Learning Outcomes: At the end of this course, students will be able to

CLO1: Explain the concepts of continuous time and discrete time systems.
CLO2: Describe the behavior of continuous and discrete time LTI systems.
CLO3: Compute the response of the systems in frequency domain.

CLO4: Demonstrate sampling theorem and its implications.

UNIT-I

I**NTRODUCTION TO SIGNALS AND SYSTEMS:** Introduction**,** Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

UNIT-II

BEHAVIOR OF CONTINUOUS AND DISCRETE-TIME LTI SYSTEMS: Impulse response and step response, convolution, input-output behavior with a periodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role.

UNIT-III

FOURIER AND LAPLACE–TRANSFORMS: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. Discrete- Time Fourier Transform (DTFT) and Inverse Discrete- Time Fourier Transform (IDTFT), properties of DTFT. Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behaviour.

UNIT-IV

SAMPLING AND RECONSTRUCTION: The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems.

TEXT BOOKS:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and Systems", Prentice Hall India, 2007.
2. A.Anand Kumar, "Signal and Systems", Phi Learning Private Limited, 3rd Edition, 2019.
3. H. P. Hsu, "Signals and Systems" , Schaum's series, McGraw Hill Education, 3rd Edition 2013.

REFERENCE BOOKS:

1. S. Haykin and B. V. Veen, " Signals and Systems", John Wiley and Sons, 2nd Edition, 2007.
2. A. V. Oppenheim and R. W. Schafer, "Discrete-Time Signal Processing", Prentice Hall, 3rd Edition, 2014.
3. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
4. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 3rd Edition, 2017.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Signals and Systems, https://nptel.ac.in/courses/108/106/108106163/
2. NPTEL :: Electronics & Communication Engineering - Signals and Systems, https://nptel.ac.in/courses/117/101/117101055/

CLO, PO& PSO Mapping:

SIGNALS AND SYSTEMS (Code: 20EEM_ _ _)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of continuous time and discrete time systems.	3	3	2	2	1	-	-	-	-	-	-	-	3	2	-
CLO2	Describe the behavior of continuous and discrete time LTI systems.	3	3	1	2	1	-	-	-	-	-	-	-	3	2	-
CLO3	Compute the response of the systems in frequency domain.	3	3	1	2	1	-	-	-	-	-	-	-	3	2	-
CLO4	Demonstrate sampling theorem and its implications.	3	3	2	2	1	-	-	-	-	-	-	-	3	2	-

3. Utilization of Electrical Energy

B.Tech II–IV Semester (Code: 20EEM_ _ _)

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

Prerequisites: Basic Electrical and Electronics Engineering

Course Objective:

The objective of this course is to train students on Selection of various Motors, Heating, Traction systems, Welding methodologies, Illumination methods and Electric Vehicles.

Course Objectives**:**
Make the student :

CO1. To understand the operating principles and characteristics of motors with respect to speed, temperature, loading condition.

CO2. To understand the basic principle of electric traction including speed– time curves of different traction services

CO3. To acquaint with the different types of heating and welding techniques.

CO4. To learn the basic principles of illumination its measurement & explain the working of electric vehicles

Learning Outcomes

After the completion of this course, the students will be able to:

CLO1. Illustrate working principle electric power utilization and their application in real life

CLO2. Choose proper traction systems depending upon application considering economic and technology up-gradation

CLO3. Able to identify most appropriate heating and welding techniques for suitable applications.

CLO4. Classify types of electric light sources based on nature of operation and their objectives, performance and reliability & working of electric vehicles

Unit – I

Electric Traction: Systems of electric traction -transmission of drive -mechanics of train movement, speed-time curves, effect of speed, acceleration and distance on schedule, Power and energy output from driving axles, specific energy output, series – parallel method of speed control shunt bridge transition –Overhead equipment-Electric braking for DC Machines.

.

Unit – II

Electric Heating: Elementary principles of heat transfer -electric furnaces -design of heating element -Construction and working of different types of induction furnaces -Dielectric heating -arc furnaces -Air Conditioning.

Unit – III

Electric Welding: Types of welding -resistance and arc welding -characteristics of Carbon and metallic arc welding - Modern Welding Techniques.

Unit – IV

Illumination: Light production by excitation -Gas discharge lamps -Fluorescent lamps – LEDS-Polar curves -Effect of voltage variation lighting calculations solid angle and square law methods of calculation -Factory lighting flood lighting and street lighting.

Text Books:

1. CL Wadhwa , "Generation, Distribution and Utilization of Electrical Energy by, New Age International Publications , Third edition, 2015.
2. E.Openshaw Taylor and V. V. L. Rao, " Utilization of Electric Energy", Universities Press, 2009

.

Reference Books:

1. H.Partab ,"Modern Electric traction" Dhanpati rai & co, 2017.
2. J.B Gupta ,"Utilization of Electric Power & Electric traction", S.K. Kataria & Sons,2013

CLO, PO& PSO Mapping:

Utilization of Electrical Energy (Code: 20EEM_ _ _)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	Illustrate working principle electric power utilization and their application in real life	3	2	2		3	2	2			2		2	3	3		
CLO2	Choose proper traction systems depending upon application considering economic and technology up-gradation.	2	2	2		2	2	2			2		2	3	2		
CLO3	Able to identify most appropriate heating and welding techniques for suitable applications	3	1			2	2							2	3		
CLO4	Classify types of electric light sources based on nature of operation and their objectives, performance and reliability & working of electric vehicles	3	2	2		2	2	2			2		2	3	3		

4.POWER GENERATION AND TRANSMISSION

II B.Tech – II Semester (Code: 20EEM---)

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

Prerequisites: Basic Electrical and Electronics Engineering

Course Objectives: To make the students

CO1: Understand the economical aspects and choice of power stations and units

CO2: Understand the significance of conventional and non-conventional energy resources and their operation

CO3: Calculate transmission line parameters.

CO4: Discuss the theory and mechanical design of transmission lines and introduce various types of insulators and their testing.

Course Outcomes: Students will be able to

CLO1: Explain the economical aspects and choice of power stations and units

CLO2: Summarize the significance of conventional and non-conventional energy resources and their operation.

CLO3: Compute the performance of short, medium and long transmission lines and identify the transmission system which requires minimum volume of conductor materials.

CLO4: Classify the types of insulators, testing of insulators and calculation of string efficiency.

Course Syllabus:

UNIT – I

Economical Aspects: Economics of generation - factors affecting cost of generation - Definitions: load factor – diversity factor – plant use factor - reduction of cost by inter connected stations. Power factor considerations – causes of low power factor – methods of improving power factor – phase advancing and generation of reactive KVAR – most economical power factor for constant KW load and constant KVA type loads. Tariff: Characteristics of Tariff – types of Tariff.

Choice of power stations and units: Types of power stations – choice of generation - size of generator units – load duration curve – effect of variable load on plant operation and design.

UNIT-II

Thermal Power: Block Diagram of Thermal Power Station (TPS), Brief Description of

Thermal Power system Components

Hydro Power: Selection of Site, Classification, Layout, Description of Main Components. **Nuclear Power**: Nuclear Fission and Chain Reaction-Principle of Operation of Nuclear Reactor.- Description of Main Components.**Solar Power Generation**: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.

Wind Power Generation: Role and potential of Wind Energy Options, Horizontal and Vertical Axis Wind Mills- Performance Characteristics-Pitch & Yaw Controls – Economic Aspects.

UNIT-III

Transmission Line Parameters: Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines.

Modeling of Transmission Lines: Classification of Transmission Lines - Short, medium and long line and their model - representations - Nominal-T, Nominal-Pie and A, B, C, D Constants. Mathematical Solutions to estimate regulation and efficiency of all types of lines- Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants.

UNIT-IV

Representation of power system Components: Modeling of power system components for system studies: transmission lines, two-winding transformers with nominal & off-nominal ratio tap settings, three-winding transformers, phase shifting transformers. One line diagram, Impedance and Reactance diagrams, advantages of Per Unit Computations, per unit quantities, changing the base, selection of base, per-unit impedances of three winding transformers.

TEXT BOOKS:

1. S.N.Singh “Electrical Power Generation, Transmission and Distribution”, PHI,Second Edition, 2008.

2. G.D. Rai “Non-Conventional Energy Sources”, Khanna Publishers, 2000.

3. C.L.Wadhwa “Electrical power systems”, New Age International (P) Limited , 6th Edition, 2010, Reprint 2014.

REFERENCE BOOKS:

1. John Twidell and Tony Weir “Renewable Energy Resources”, Taylor and Francis Group, Second Edition, 2006.

2. V.K Mehta and Rohit Mehta “Principles of Power Systems”, S.CHAND & COMPANY LTD., New Delhi 2004.

3. S. N. Bhadra, D. Kastha “Wind Electrical Systems” S. Banerjee , Oxford University Press, 2013.

4. D. P. Kothari and I. J. Nagrath ,”Power System Engineering”, 2nd Edition , Mc Graw Hill Education (India) Pvt. Ltd., , 2008, 23rd Reprint 2015.

5.C.L Wadhwa”“Electric Power Generation Distribution and Utilization”New Age International (P) Ltd., 2005.

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

CLO, PO& PSO Mapping:

POWER GENERATION and TRANSMISSION (Code: 20EEM_ _ _)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Explain the economical aspects and choice of power stations and units	2	2	1	1	-	-	-	-	-	-	-	-	2	3	1
CLO2	Summarize the significance of conventional and non-conventional energy resources and their operation.	3	3	3	1	-	-	1	-	-	-	-	-	3	3	1
CLO3	Compute the performance of short, medium and long transmission lines and identify the transmission system which requires minimum volume of conductor materials.	3	3	3	2	-	-	2	-	-	-	-	-	3	2	-
CLO4	Classify the types of insulators, testing of insulators and calculation of string efficiency.	2	2	2	1	-	-	2	-	-	-	-	-	3	2	2

5.PRINCIPLES OF POWER ELECTRONICS

II B.Tech – IV Semester (Code: 20EEM---)

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

Prerequisites: Basic Electrical and Electronics Engineering
Course Objectives: To make the students
CO1: To Understand the Power Electronics devices its protection.
CO2: To Analyze AC to DC Conversion circuits.
CO3: To Analyze the operation of inverters PWM techniques.
CO4: To Analyze the operation of DC-DC choppers and AC Voltage controllers.
Course Learning Outcomes: Students will be able to
CLO1: Illustrate characteristics of the transistor, thyristor devices and its protection.
CLO2: Design and analyze AC to DC Conversion circuits.
CLO3: Design and analyze the operation of inverters PWM techniques.
CLO4: Design and analyze the operation of DC-DC choppers and AC Voltage controllers.

UNIT-I

Introduction to Power Electronics devices protection and Power Transistors:

Thyristor family devices, principle of operation, Snubber designs, selection and protection, Firing circuits, Commutation, MOSFET, IGBT operation, principles and ratings.

UNIT-II

AC to DC Converters:

Uncontrolled, semi-controlled, fully controlled and dual converters in single-phase and three-phase configurations operation with R, R-L, back emf load, Issues of Power factor, Distortion factor of ac to dc converters and effect of source inductance.

UNIT-III

DC to AC Converters:

Basics of dc to ac conversion, inverter circuit configurations and principle of operation, VSI and CSI, single and three-phase configurations, Single, Multiple, Square wave and sinusoidal PWM control methods and harmonic control.

UNIT-IV

DC-DC Converters and AC-AC Converters:

Introduction to dc-dc conversion, various topologies, buck, boost, buck-boost converters.

Introduction to ac to ac conversion, single-phase and three-phase ac voltage controller circuit configuration with R load Analysis. Cyclo-converters: single-phase, three-phase to single-phase circuit configuration.

TEXT BOOKS:

1. M. H. Rashid, “Power electronics: circuits, devices, and applications”, Pearson Education India, 3rd Edition, 2014.
2. Power Electronics by M.D.Singh and Khanchandani TMH, 2nd Edition, 2017.
3. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 3rd Edition 2007.

REFERENCE BOOKS:

1. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 3rd Edition 2020.
2. L.Umanand,“Power Electronics:Essentials and Applications”, Wiley India, 1st Edition 2009.
3. Power Electronics by P.S. Bhimbra, Khanna publications, 6rd Edition 2019.

CLO, PO& PSO Mapping:

PRINCIPILES OF POWER ELECTRONICS (Code: 20EEM---)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Understand the transistor, thyristor devices its protection	2		3							2					
CLO2	Design and Analyze AC to DC Conversion circuits.	3				3									2	
CLO3	Design and Analyze the operation of inverters PWM techniques.	2		3				2								3
CLO4	Design and Analyze the operation of DC-DC choppers and AC Voltage controllers	3		3			2									

6. Digital Control Systems

B.Tech II–IV Semester (Code: 20EEM_ _ _)

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

Prerequisites: Mathematics, Physics, Linear Control Systems

Course Objectives: To make the students
CO1: To understand the concepts of digital control systems and to apply the knowledge state variable analysis in the design of discrete systems
CO2: To provide elaborate discussion about analysis of discrete time control systems.
CO3: To explain the concept of stability analysis of discrete time control systems.
CO4: To have an adequate knowledge to design of discrete time systems.

Course Outcomes: Students will be able to
CLO1: Explain z–transformations and their role in the mathematical analysis of different systems (like Laplace transforms in analog systems).
CLO2: Describe state space models of discrete time systems and the controllability and Observability of discrete time systems
CLO3: Illustrate the concepts of stability analysis and design of discrete time systems.
CLO4: Design of discrete systems in state variable analysis.

UNIT – I

Introduction to Sampling and Reconstruction: Introduction, Examples of Data Control Systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.
Z – Transforms: Introduction,Theory of Z-Transform,Inverse Z-Transforms , Modified Z-Transforms, Solutions of linear difference equations.
Z-Plane Analysis of Discrete-Time Control System: Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.

UNIT – II

State Space Analysis State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations.
Controllability and Observability: Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

UNIT – III

Stability Analysis: Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stablility test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

UNIT – IV

Design of Discrete Time Control System by Conventional Methods: Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

State Feedback Controllers and Observers: Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

TEXT BOOKS:

1. K. Ogata ,Discrete-Time Control systems, , Pearson Education/PHI, 2nd Edition.2003
2. V. I. George ,Digital Control Systems,., C. P. Kurian, Cengage Learning,2015
3. M. Gopal, ,Digital Control Engineering, New Age Int. Pvt. Ltd., 2014

REFERENCE BOOKS:

1., Kuo, Digital Control Systems Oxford University Press, 2nd Edition, 2003.
2. M. Gopal Digital Control and State Variable Methods, , TMH.
3. M. Sami Fadali Antonio Visioli Digital Control Engineering Analysis and Design, Academic Press.

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

CLO, PO& PSO Mapping:

Digital Control Systems (20EEM_ _ _)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Explain z–transformations and their role in the mathematical analysis of different systems (like Laplace transforms in analog systems).	3	2	-	2						-	1				
CLO2	Describe state space models of discrete time systems and the controllability and Observability of discrete time systems	2	3	2	2						1	1			2	
CLO3	Illustrate the concepts of stability analysis and design of discrete time systems.	2	2	1	2						1	-				2
CLO4	Design of discrete systems in state variable analysis.	3	3	2	2						-	1			2	

7.Power Quality

II B.Tech – II Semester (Code: 20EEM---)

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

Prerequisites: Basic Electrical and Electronics Engineering, Power Generation and Transmission

Course Objectives: To make the students

CO1: Classify the power quality problems.

CO2: Analyze voltage sag and voltage swell problems and suggest preventive techniques.

CO3: Identify the harmonic sources and the effects of harmonic distortion.

CO4: Analyze the Power Quality Conditioners.

Course Outcomes: Students will be able to

CLO1: Understand different types of power quality problems with their source of generation

CLO2: Understand To Design different methodologies for detection, classification and mitigation of power quality problems.

CLO3: Expected to practically design active & passive filters for harmonic elimination.

CLO4: Analyze the Power Quality Conditioners

UNIT – I

INTRODUCTION

Electric power quality phenomena - IEC and IEEE definitions - power quality disturbances - voltage fluctuations-transients-unbalance-waveform distortion-power frequency variations. Voltage variations - Voltage sags and short interruptions – flicker -longer duration variations.

UNIT – II

VOLTAGE SAGS AND INTERRUPTIONS

Sources of sagas and interruptions, Estimating voltage sag performance, fundamental principles of protection, solutions at the end-use level, Motor-starting sags, utility system fault-clearing Issues.

TRANSIENT OVER VOLTAGES

Sources of over voltages, principles of over voltage protection, devices for over voltage Protection, utility capacitor-switching transients, utility system lightning protection.

UNIT – III

FUNDAMENTALS OF HARMONICS

Harmonics – sources – definitions & standards – impacts - calculation and simulation –harmonic power flow - mitigation and control techniques – filtering – passive and active

UNIT – IV

POWER QUALITY CONDITIONERS

Power Quality conditioners – shunt and series compensators - DStatcom - Dynamic voltage restorer - unified power quality conditioners - case studies

TEXT BOOKS:

1. Roger C. Dugan, Mark F.McGranaghan, Surya Santoso, H.Wayne Beaty,Electrical Power Systems Quality, 2nd Edition, TMH Education Pvt. Ptd.

2. Power quality by C. Sankaran, CRC Press.

REFERENCE BOOKS:

1.J. Arrillaga, N.R. Watson,S. Chen ,"Electrical systems quality Assessment", John Wiley & Sons.

2. Math H. J. Bollen "Understanding Power quality problems" IEEE Press.

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

CLO, PO& PSO Mapping:

POWER QUALITY (20EEM----)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Understand different types of power quality problems with their source of generation	2	3	2	2											
CLO2	Understand To Design different methodologies for detection, classification and mitigation of power quality problems	2	2	2	3										3	2
CLO3	Expected to practically design active & passive filters for harmonic elimination.	3	2	3	3										2	3
CLO4	Analyze the Power Quality Conditioners	2	2	3	2											

8. SMART GRID

II B.Tech – II Semester (Code: **20EEM---**)

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

Prerequisites: Basic Electrical and Electronics Engineering, Power Generation and Transmission

Course Objectives: To make the students

CO1: Understand the Basic concept of Smart Grid.
CO2: Understand the Information & Communications Technology for The Smart Grid.
CO3: Acquire Knowledge about Smart Metering.
CO4: Know the operation of Demand Side Integration and Distribution Management Systems.

Course outcomes: At the end of this course, students will be able to
CLO1: Explain Basic concept of Smart Grid.
CLO2: Describe Suitable Communication Network.
CLO3: Demonstrate Operation of Smart Metering.
CLO4: Illustrate Operation of Demand Side Integration and Distribution Management systems.

Unit-I

The Smart Grid: Introduction, Ageing Assets and Lack of Circuit Capacity, Thermal Constraints, Operational Constraints, Security of Supply, National Initiatives, Early Smart Grid Initiatives, Active Distribution Networks, Virtual Power Plant, Other Initiatives and Demonstrations, Overview of The Technologies Required for The Smart Grid.

Unit-II

Information and Communications Technology for the Smart Grid

Data communication: Introduction, Dedicated and shared communication channels, Switching techniques, Communication channels, Layered architecture and protocols.
Communication technologies for the Smart Grid: Introduction- Communication technologies-IEEE 802 series, Mobile communications, Multi-protocol label switching, Power line communication. Standards for information exchange-Standards for smart metering Modbus, DNP3, IEC 61850.

Unit-III
Smart Metering

Introduction, smart metering – evolution of electricity metering, key components of smart metering, smart meters: an overview of the hardware used – signal acquisition, signal conditioning, analogue to digital conversion, computation, input/output, and communication.

Communication infrastructure and protocols for smart metering- Home area network, Neighborhood Area Network, Data Concentrator, meter data management system, Protocols for communication.

Unit-IV
Demand Side Integration and Distribution Management Systems

Demand Side Integration- Services Provided by DSI. Introduction Data Sources and Associated External Systems, SCADA, Customer Information System, Modeling and Analysis Tools, Distribution System Modeling, Topology Analysis, Load Forecasting, Power Flow Analysis, Fault Calculations, Applications, System Monitoring, Operation, Management, Outage Management System.

TEXT BOOKS:

1. Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins ,Smart Grid, , Wiley Publications, 2015.
2. James Momoh, ,Smart Grid: Fundamentals of Design and Analysis, Wiley, IEEE Press., 2016.

REFERENCES:

1. Clark W. Gellings, P.E.,"The Smart Grid – Enabling Energy efficiency and demand response", CRC Press, Taylor & Francis group, First Indian. 2015.
2. Smart Grid – Applications, Communications, and Security Edited by Lars Torsten Berger, Krzysztof Iniewski, WILEY,2015.
3. Cobus Strauss, "Practical Electrical Network Automation and Communication Systems", ELSVIER, 2003.

NPTEL VIDEO LINK:

https://nptel.ac.in/courses/108/107/108107113/

CLO, PO& PSO Mapping:

SMART GRID (Code: 20EEM----)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain Basic concept of Smart Grid.	3	3	2										2		
CLO2	Describe Suitable Communication Network	3	2	3										3		2
CLO3	Demonstrate Operation of Smart Metering.	2	2	3										2		3
CLO4	Illustrate Operation of Demand Side Integration and Distribution Management systems.	2	2	3										2		

9. Energy Management & Audit

B.Tech II–IV Semester (Code: 20EEM_ _ _)

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

Pre-requisites: Power Generation and Transmission, Basic Electrical & Electronics Engg.

Course objectives: To make the students

CO1: To know Global and Indian energy scenario, auditing principles &guidance for implementation.
CO2: Understand energy management and energy audit instruments.
CO3: Understand basic principles which guide to efficient operation of energy systems.
CO4: Know the Performance evaluation techniques of electrical equipment such as motors and lighting system.
CO5: Understand the usage of Energy conservation in various buildings and financial analysis
Course outcomes: At the end of the course, the student will demonstrate
CLO1: Explain Global and Indian energy scenario, Energy management and Auditing principles and effective energy management.
CLO2: Demonstrate Performance evaluation techniques of electrical energy systems and equipment.
CLO3: Illustrate lighting system and usage of energy conservation in various buildings.
CLO4: Explain cogeneration systems and usage pf financial analysis techniques.

Unit-I

Energy scenario-(Primary and secondary energy, commercial energy and non-commercial energy, Renewable and non -renewable energy) Energy, Purchase power parity(PPP), energy conservation; Energy audit-Types and objective; Energy performance; Instruments and metering for energy audit; project management - PDC & PPT.

Unit-II

Electrical Motors: Motor- Types, characteristics, efficiency, selection; Energy efficient motors, Factors affecting motor efficiency, rewinding efficiency, speed control, Star labeling

HVAC and Refrigeration system: Psychometrics' and air conditioning process; refrigeration-types,properties,selection, factors affecting performance, performance assessment-plants,window,split and package air conditioning.

Unit-III

Lighting system: basic parameters and terms in lighting system,light source and lamp types,Illuminance - levels, methods of calculating, general energy saving opportunities, energy efficient lighting controls, standards and labeling programs for FTL lamps and lighting case study

Energy conservation in Building and ECBC: Energy conservation amendment; Energy conservation building code(ECBC)- Approaches, guidelines on building envelope,heating ventilation, air conditioning system, service hot water, lighting and electrical power;building management system(BMS) ; Star rating of building; Energy efficiency measures in building.

Unit-IV

Energy Performance systems: Cogeneration systems-purpose of the performance test, terms and definitions, standards, field testing procedure, numerical, case study of bottoming cycle cogeneration in a cement industry.

Financial: Financial Analysis- Introduction,fixed and variable costs, interest charges, simple pay back period, discounted cash flow methods, factors affecting analysis

Text Books;

1. Bureau of Energy efficiency India, "General aspect of energy management and energy audit" Bureau of Energy efficiency India publisher
2. Bureau of Energy efficiency India, "Energy efficient in electrical utilities", Bureau of Energy efficiency India publisher
3. Bureau of Energy efficiency India, "Energy Performance Assessment for Equipment and utility systems Bureau of Energy efficiency India publisher.
4. Energy Management , supply and conservation, Dr. Clive Beggs,. Butterworth Heinemann

Reference Books

1. Zoran K. Morvay. Applied industrial energy and environment management . Wiley
2. BP Statical Review of world energy, june 2010
3. Office of Industrial technologies, Department of Energy , USA
4. ASHRAE Hand Book
5. Best Practices lighting Manual , BEE code, 2006
6. Lighting Handbook
7. ECBA guide Book
8. Star rating programme for existing office building
9. Energy cogeneration Handbook, George Polimeros, Industrial Press Inc.

CLO, PO& PSO Mapping:

Energy Management and Auditing (Code:20EE--)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain Global and Indian energy scenario, Energy management and Auditing principles and effective energy management.	3	2	1	1	-				2				1		3
CLO2	Demonstrate Performance evaluation techniques of electrical energy systems and equipment.	3	2	1	1	2				2				2		2
CLO3	Illustrate lighting system and usage of energy conservation in various buildings.	3	3	2	1	1				1				2		2
CLO4	Explain cogeneration systems and usage pf financial analysis techniques.	3	3	2	2	2				1				1		3

10. Industrial Drives

B.Tech II–IV Semester (Code: 20EEM_ _ _)

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

Prerequisites: Basic Electrical and Electronics Engineering, Principles of Power Electronics
Course Objectives: To make the students
CO1: Describe the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric drives an enabling technology
CO2: Describe the operation of dc motor drives to satisfy four-quadrant operation to meet Mechanical load requirements.
CO3: Describe the operation of induction machines in an energy efficient manner using Power electronics.
CO4: Learn the basic operation of stepper motors and switched-reluctance motor drives.
Course Outcomes:
After completion of this course, the student will be able to
CLO1: Explain different types of drives and applications in various industries & To know the characteristics of various motors and loads.
CLO2: Describe about operation of d.c motor speed control using converters and choppers
CLO3: Acquire the knowledge of different speed control methods in induction motors using thyristors based control schemes.
CLO4: Learn the basic operation of stepper motors and switched-reluctance motor drives.

UNIT – I

Introduction: Electric drives - advantages of electric drive - Type of electric drives - components of electric drives -. **Dynamics of Electric Drives:** Speed torque conventions and multi quadrant operation - Equivalent values of drive parameters. **Control of Electric Drives:** Modes of operation - Speed control and drive classification - closed-loop control of drives.

UNIT – II

DC motor Drives: DC motors and their performance – Starting - methods of braking - speed control -Methods of armature voltage control - Transformer and uncontrolled rectifier control. **Controlled Rectifier fed DC Drives:** Single phase fully and half controlled rectifier control of separately excited dc motor - Three phase fully and half controlled rectifier control of separately excited dc motor - Dual converter control of separately excited dc motor

Chopper fed DC Drives: Control of separately excited dc motors - Chopper control of series motor.

UNIT – III

Induction motor drives: Three phase induction motors - Operation with unbalanced source voltages and single phasing - Operation with unbalanced rotor impedances – Starting – braking - Speed control - pole amplitude modulation - stator voltage control - rotor resistance control - slip power recovery

UNIT – IV

Synchronous motor drives: Synchronous motors - Operation and fixed frequency supply - Synchronous variable speed drives - braking of synchronous motor. Switched reluctance motor drives - brush less dc motors - stepper motors – variable reluctance motor.

Text Books:

1. “Fundamentals of Electric drives’’, Narosa, G.K. Dubey, 2nd Edition, 2010.

2. Power semiconductor drives” S.B. Dewan, G.R. Selmon & Straughen, John Wiley,2009.

Reference Books:

1. “Power Semiconductor controlled drives”, G.K. Dubey, PH,.2nd Edition 2010.

2. ‘Thyristorised power controllers’ GK Dubey SR Doradla, New Age,2nd edition,2012.

E-resources and other digital material

https://nptel.ac.in/courses/108108077

CLO, PO& PSO Mapping:

	INDUSTRIAL DRIVES (20EEM----)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain different types of drives and applications in various industries & To know the characteristics of various motors	-	2	3	2	-	-	-	-	-	-	2	-	2		-
CLO2	Describe about operation of d.c motor speed control using converters and choppers	-	2	-	2	-	-	-	-	-	-	-	2	2		-
CLO3	Acquire the knowledge of different speed control methods in induction motors using thyristors based control schemes.	-	2	3	2	-	-	-	-	-	-	2	2	2		-
CLO4	Learn the basic operation of stepper motors and switched-reluctance	-	-	2		-	-	-	-	-	-	-	-	-		-

11.Solar & Fuel cell Energy Systems

B.Tech II–IV Semester (Code: 20EEM_ _ _)

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

Prerequisites: Basic Physics, Basic mathematics

Course objectives: To make the students

CO1: Understand the concepts of Solar Cell Fundamentals.

CO2: Gain knowledge about Classification of PV Systems.

CO3: Analyze systems in fuel cells technology.

CO4: Understand the concepts of Fuel cell characterization.

Course outcomes: At the end of this course, students will be able to

CLO1: Explain the concepts of Solar Cell Fundamentals.

CLO2: Analyze the behavior of PV Systems.

CLO3: Analyze systems in fuel cells technology.

CLO4: Demonstrate the concepts of Fuel cell characterization.

Unit – I

Solar Cell Fundamentals: Photovoltaic effect - Principle of direct solar energy conversion into electricity in a solar cell. Semiconductor properties, energy levels, basic equations. Solar cell, p-n junction, structure. **PV Module Performance:** V-I characteristics of a PV module, maximum power point, cell efficiency, fill factor, effect of irradiation and temperature.

Unit -II

Classification Of PV Systems - Central Power Station System, Distributed PV System, Standalone PV system, Grid Interactive PV System, small system for consumer applications, Hybrid solar PV system, Concentrator solar photovoltaic. **PV System Applications: Building**-integrated photovoltaic units, grid-interacting central power stations, stand- alone devices for distributed power supply in remote and rural areas, solar cars, aircraft, space solar power satellites.

Unit – III

Fuel cell technology: Introduction,low and high temperature fuel cells; Fuel cell thermodynamics - heat, work potentials, prediction of reversible voltage, fuel cell efficiency.

Fuel cell reaction kinetics - electrode kinetics, over voltages, Tafel equation, charge transfer reaction, exchange currents, Fuel cell charge and mass transport - flow field, transport in electrode and electrolyte.

Unit – IV

Fuel cell characterization: - in-situ and ex-situ characterization techniques, i-V curve, frequency response analyses; Fuel cell modeling and system integration: - 1D model - analytical solution and Computational fluid dynamics (CFD) models.

TEXT BOOKS:

1. Kalogirou .S.A., “Solar Energy Engineering: Processes and Systems”, Academic Press, 2009.
2. Hand Book of Batteries and Fuel cells: David Linden, Mc Graw Hill Book Co..H. P. Hsu , “Signals and Systems”, Schaum’s series, McGraw Hill Education, 3rd Edition 2013.

REFERENCE BOOKS:

1. Chetan Singh Solanki., Solar Photovoltaic: “Fundamentals, Technologies and Application”, PHI Learning Pvt., Ltd., 2009.
2. Jha .A.R, “Solar Cell Technology and Applications”, CRC Press, 2010.M. J. Robert “Fundamentals of Signals and Systems”, McGraw Hill Education, 2007.
3. Renewable Energy Sources & Conversion technology: Bansal.K: Leemann&Meliss

NPTEL COURSE LINKS:

1.NOC:Solar Energy Engineering and Technology - NPTEL, https://nptel.ac.in/courses/112/105/112105051/
2.NPTEL :: Fuel Cell Technology - NPTEL , https://nptel.ac.in/courses/103/102/103102015/

CLO, PO& PSO Mapping:

Solar & Fuel cell Energy Systems (20EEM---)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of Solar Cell Fundamentals.	3	3	2	2	1	-	1	-	1	1	1		1	2	
CLO2	Analyze the behavior of PV Systems.	3	3	2	2	1	-	1	-	1	1	1		1	2	
CLO3	Analyze systems in fuel cells technology.	3	3	2	2	1	-	1	-	1	1	1		1	2	
CLO4	Demonstrate the concepts of Fuel cell characterization.	3	3		2	1	-	1	-	1	1	1		1	2	

12.Hybrid Electrical Vehicles

II B.Tech – IV Semester (Code: 20EE---)

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

Prerequisites: Principles of Power Electronics, Industrial Drives

Course Objectives: To make the students

CO1: Understand the concept of Vehicle Fundamentals.
CO2: Know the Operation of Electric and Hybrid drive-train concept.
CO3: Understand the configuration and control of different motor drives.
CO4: Know the Operation of different types of energy storage systems.

Course outcomes: At the end of this course, students will be able to
CLO1: Explain the concepts of Vehicle Fundamentals
CLO2: Describe the operation of Electric and Hybrid drive-train concept.
CLO3: Summarize configuration and control of different motor drives.
CLO4: Illustrate operation of different types of energy storage.

Unit-I

Introduction and Vehicle Fundamentals: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles. Basics of vehicle performance, vehicle power plant characterization, transmission characteristics, and mathematical models to describe vehicle performance.

Unit-II

Electric and Hybrid drive-trains: Basic concept of electric traction - introduction to various electric drive-train topologies - power flow control in electric drive-train topologies, Basic concept of hybrid electric drive trains.

Unit-III

Electric propulsion unit: Introduction to electric components used in electric vehicles - Configuration and control of DC Motor drives - Configuration and control of Induction Motor drives-Configuration and control of Permanent Magnet Motor drives.

Unit-IV

Energy storage: Introduction to Energy Storage Requirements in Electric Vehicles - Battery based energy storage and its analysis - Fuel Cell based energy storage and its analysis - Super Capacitor based energy storage and its analysis.

TEXT BOOKS:

1. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric
   and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,Second Edition 2005.
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
3. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2014.

REFERENCES:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, Second Edition 2003.
2. H. Partab: Modern Electric Traction – Dhanpat Rai& Co, 2007.
3. Bimal Bose, 'Power electronics and motor drives', Elsevier, First Edition 2006.
4. Ion Boldea and S.A Nasar, 'Electric drives', CRC Press, Second Edition 2005.

NPTEL VIDEO LINK:

https://nptel.ac.in/courses/108/103/108103009/
https://nptel.ac.in/courses/108/106/108106182/
https://nptel.ac.in/courses/108/102/108102121/

CLO, PO& PSO Mapping:

Hybrid Electrical Vehicles (20EEM---)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of Vehicle Fundamentals	3	2	2	-									2		
CLO2	Describe the operation of Electric and Hybrid drive-train concept.	2	2	3	3									3		2
CLO3	Summarize configuration and control of different motor drives.	2	2	3	3									2		3
CLO4	Illustrate operation of different types of energy storage.	2	2	3	2									2		

Honor Courses (20 Credits): Additional courses offered to B.Tech, EEE students to obtain Honors degree in Electrical and Electronics Engineering.

S.NO	Course Title	Prerequisite Course
A	Power Systems Dynamics and Control	Induction motors and Synchronous Machines (20EE403)
B	Advanced Power System Protection	Power System Protection (20EE601)
C	Advanced Electrical Drives	Electrical Drives (20EE602/603)
D	Smart Grid Technology and Applications	Generation and Transmission (20EE405) and Power System Analysis (20EE502)
E	Non-Linear Control Systems	Control Systems (20EE503)
F	Adaptive Control Systems	Control Systems (20EE503)
G	Energy Storage Systems	None
H	Electrical and Hybrid Vehicles	Induction motors and Synchronous Machines (20EE403) and Power Electronics (20EE504)
I	Sensors and Actuators	None
J	Optimization Techniques	None
K	Machine Learning for Engineering Applications	Probability and Statistics (20EE301)
L	Big data Analytics for Smart Grid	Generation and Transmission (20EE405) and Power System Analysis (20EE502)
M	Extra High Voltage AC Transmission	PE61: High Voltage Engineering
O	Block Chain Technology for Electrical Systems	Power systems-I and Power Systems-II
N	Automotive electrical and electronics	Measurements and Instrumentation

A.POWER SYSTEM DYNAMICS & CONTROL

(Code: 20EEH_ _ _)

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

Prerequisites: Induction motors and Synchronous Machines

Course objectives: To make the students

CO1: Understand the concepts of power system stability and dynamics.

CO2: Explain synchronous machine models.

CO3: Understand the concepts of turbine models, speed governors, transmission and load models.

CO4: Demonstrate stability issues in interconnected power systems and enhancing system stability.

Course outcomes: At the end of this course, students will be able to

CLO1: Explain the concepts of power system stability and dynamics.

CLO2: Derive synchronous machine models.

CLO3: Describe turbine models, speed governors, transmission and load models.

CLO4: Explain stability issues in interconnected power systems and enhancing system stability.

UNIT-I

Introduction to Power System Stability: Power System Operation and Control, Stability Problems faced by Power Systems, Impact on Power System Operation and Control.

Analysis of Dynamical Systems Concept of Equilibria: Small and Large Disturbance Stability, Example: Single Machine Infinite Bus System. Modal Analysis of Linear Systems, Analysis using Numerical Integration Techniques, Issues in Modeling, Slow and Fast Transients, Stiff Systems.

UNIT-II

Modeling of a Synchronous Machine: Physical Characteristics, D-Q Transformation, Model with Standard Parameters, Steady State Analysis of Synchronous Machine, Short Circuit Transient Analysis of a Synchronous Machine, Synchronous Machine Connected to Infinite Bus.

UNIT-III

Modeling of Excitation and Prime Mover Systems: Physical Characteristics and Models, Control system components, Excitation System Controllers, Prime Mover Control Systems.Modeling of Transmission Lines and Loads Transmission Line: Physical Characteristics, Transmission Line Modeling, Load Models - induction machine model,

Other Subsystems - HVDC, protection systems.

UNIT-IV

Stability Issues in Interconnected Power Systems: Single Machine Infinite Bus System, Multi-machine Systems. Stability of Relative Motion, Frequency Stability, Concept of Load Sharing, Voltage Stability, Torsional Oscillations.Enhancing System Stability: Planning Measures, Stabilizing Controllers (Power System Stabilizers), Operational Measures- Preventive Control, Emergency Control.

TEXT BOOKS:

1. K.R.Padiyar, “Power System Dynamics, Stability & Control”, 2nd Edition, B.S.Publications, 2002.
2. P.Kundur, “Power System Stability and Control”, McGraw Hill Inc, New York, 1995.

REFERENCE BOOKS:

1. P.Sauer & M.A.Pai, “Power System Dynamics & Stability”, Wiley-IEEE Press, 2nd Edition 2017.
2. R.Ramunujam, “Power System Dynamics Analysis and Simulation”, PHI Learning Private Limited, New Delhi, 2009.

NPTEL COURSE LINKS:

1. https://nptel.ac.in/courses/108/101/108101004/
2. NPTEL :: Electrical Engineering - NOC: Power System Dynamics, Control and Monitoring

CO, PO &PSO Mapping:

POWER SYSTEM DYNAMICS AND CONTROL (Code: 20EEH_ _ _)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of power system stability and dynamics.	3	3	2	2	1	-	-	-	-	-	-	-	3	2	-
CLO2	Derive synchronous machine models.	3	3	1	2	-	-	-	-	-	-	-	-	3	2	-
CLO3	Describe turbine models, speed governors, transmission and load models.	3	3	1	2	-	-	-	-	-	-	-	-	3	2	-
CO4	Explain stability issues in interconnected power systems and enhancing system stability.	3	3	2	2	1	-	-	-	-	-	-	-	3	2	-

B.ADVANCED POWER SYSTEM PROTECTION

(Code: 20EEH__O)

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

Prerequisites: Power System Protection

Course objectives: To make the students

CO1: Understand the concepts of Static relay schemes.

CO2: Gain knowledge about various microprocessor-based relays.

CO3: Analyze models of Digital relays.

CO4: Understand AI methods to Power system Protection.

Course outcmes: At the end of this course, students will be able to

CLO1: Describe and design Static relay schemes.

CLO2: Implement various microprocessor based relays.

CLO3: Develop models of Digital relays.

CLO4: Apply AI methods to Power system protection.

UNIT -I

Static Relays: Basics of Electromagnetic Relays, Basic Block diagram – Advantages of Static Relays – Comparators – Phase and amplitude Comparators. Operating principles–Static Over current relays – Differential relays – distance relays – Pilot relaying and Carrier current protection schemes – Protection of Transmission lines – 3–zone protection schemes – carrier aided distance schemes. Transformer protection – mal operation of relays – Harmonic Restraint relay

UNIT –II

Microprocessor Base Relays: Basic Block diagram, advantages of Microprocessor Based Relays, Over Current relay, impedance relay, directional relay, reactance relay, Mho relay, offset Mho relay.

UNIT – III

Digital relays: Developments in computer relaying mathematical basis for protective relaying algorithms, Differential equation based technique, Fourier based algorithms, Wavelet transforms based technique, Numerical Over current Protection, numerical Distance protection, Numerical Differential protection

UNIT – IV

AI Based Numerical Protection: Application of ANN to over current protection, Application of ANN to Transmission line protection, Neural Networks Based Directional

Relay, ANN modular approach for fault detection, classification and location, ANN Fuzzy based approach for fault classification Power transformer protection based on ANN & Fuzzy logic.

TEXT BOOKS:

1. T.S.MadhavaRao, "Power System Protection: Static Relays: with Microprocessor Applications", 2ND Edition, McGraw Hill Education, 2017.
2. Badri Ram, "Power System Protection and Switchgear ", 2nd Edition, McGraw Hill Education, 2017.
3. A.T.Johns and S.K.Salman, "Digital Protection for Power Systems", Shankars Book Agency, 2008.

REFERENCE BOOKS:

1. Oza, B. A., N. C. Nair, R. P. Mehta, et al., Power System Protection & Switchgear, McGraw Hill Education, New Delhi, 2017.
2. Bhavesh Bhalja, R. P. Maheshwari, N. G. Chothani, Protection and Switchgear, Oxford University Press, 2nd Edition, New Delhi, India, 2018.

NPTEL COURSE LINKS:

1. https://nptel.ac.in/courses/117/107/117107148/
2. https://nptel.ac.in/courses/108/105/108105167/
3. https://nptel.ac.in/courses/108/101/108101039/

CO, PO &PSO Mapping:

ADVANCED POWER SYSTEM PROTECTION (Code: 20EEH__O)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Describe and design Static relay schemes.	3	3	2	2	1	-	-	-	-	-	-	-	3	2	-
CLO2	Implement various microprocessor based relays.	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CL3	Develop models of Digital relays.	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CLO4	Apply AI methods to Power system protection.	3	3	2	-	1	-	-	-	-	-	-	-	3	2	-

C.ADVANCED ELECTRIC DRIVES

(Code: 20EEH_ _ _)

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

Prerequisites: Electrical Drives.

Course Objectives: To make the Students

CO1: Describe the Vector control of Induction motor

CO2: Describe the different speed control strategies Synchronous motor

CO3: Describe the different speed control strategies Switched Reluctance motor

CO4: Learn the basic operation of Brushless DC motor drives.

Course Outcomes:

After completion of this course, the student will be able to

CLO1: Acquire basic concepts of Vector Control of Induction Motor.

CLO2: Apply speed control methods of Synchronous Motor drives.

CLO3: Acquire the knowledge of different speed control methods in Switched Reluctance Motors.

CLO4: Describe various speed control methods of BLDC motor drives.

UNIT – I

Introduction: Vector Control of Induction Motor: Principles of vector control, direct vector control, derivation of indirect vector control, implementation-block diagram; estimation of flux, flux weakening operation.

UNIT – II

Control of Synchronous Motor Drives: Synchronous motor and its characteristics- Control strategies-Constant torque angle control- power factor control, constant flux control, flux weakening operation, Load commutated inverter fed synchronous motor drive, motoring and regeneration, phasor diagrams.

UNIT– III

Control of Switched Reluctance Motor Drives: SRM Structure-Stator Excitation-techniques of sensor less operation-convertor topologies-SRM Waveforms-SRM drive design factors-Torque controlled SRM-Torque Ripple-Instantaneous Torque control - using current controllers-flux controllers.

UNIT – IV

Control of BLDC Motor Drives: Principle of operation of BLDC Machine, Sensing and logic switching scheme, BLDM as Variable Speed Synchronous motor-methods of reducing Torque pulsations -Three-phase full wave Brushless dc motor -Sinusoidal type of Brushless dc motor - current controlled Brushless dc motor Servo drive.

Energy Conservation in Electrical Drives: Losses in electrical drive system, Measures for energy conservation in electric drives, Use of efficient motor, Energy efficient operation of drives, Improvement of power factor and quality of supply.

Text Books:

1. De Doncker, Rik W., Pulle, Duco W.J., Veltman, Andre, "Advanced Electrical Drives", Springer, 2020.
2. P.C. Krause, O. Wasynczuk, and S. D. Sudhoff, "Analysis of Electric Machinery", McGraw-Hill Book Company.

Reference books:

1. G.K. Dubey, "Power Semiconductor controlled drives", PH,.2nd Edition 2010.
2. S.B. Dewan, G.R. Selmon & Straughen, "Power semiconductor drives" John Wiley, 2009.
3. GK Dubey SR Doradla, 'Thyristorised power controllers' New Age, 2nd edition,2012.
4. R. Krishnan, "Electric Motor Drives: Modeling, Analysis and Control", Prentice Hall.
5. Ned Mohan, "Advanced Electric Drives: Analysis, Control, and Modeling Using MATLAB/Simulink®", John Wiley & Sons, Inc, 2014

E-resources and other digital material

https://nptel.ac.in/courses/108108077

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

CO, PO &PSO Mapping:

ADVANCED ELECTRIC DRIVES (20EEH_ _ _)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Acquire basic concepts of Vector Control of Induction Motor.															
CLO2	Apply speed control methods of Synchronous Motor drives.	3	2	-	2	-	2	-	-	-	-	-	-	2	2	2
CLO3	Acquire the knowledge of different speed control methods in Switched Reluctance Motors.															
CLO4	Describe various speed control methods of BLDC motor drives.	3	2	3		2	-	3	-	-	-	-	-	2	2	2

D. SMART GRID TECHNOLOGY AND APPLICATIONS

(Code: 20EEH_ _ _)

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

Prerequisites: Generation and Transmission (20EE405), Power System Analysis (20EE502)

Course objectives: To make the students

CO1: Understand the Basic concept of Smart Grid.
CO2: Understand the Information & Communications Technology for The Smart Grid.
CO3: Acquire Knowledge about Smart Metering and Advanced Metering infrastructure.
CO4: Know the operation of Demand Side Integration and Distribution Management Systems.

Course outcomes: At the end of this course, students will be able to
CLO1: Explain Basic concept of Smart Grid.
CLO2: Describe Suitable Communication Network And Security System For Smart Grid.
CLO3: Demonstrate Operation of Smart Metering and Advanced Metering infrastructure.
CLO4: Explain Operation of Demand Side Integration and Distribution Management Systems.

Unit-I

The Smart Grid: Introduction, Ageing Assets and Lack of Circuit Capacity, Thermal Constraints, Operational Constraints, Security of Supply, National Initiatives, Early Smart Grid Initiatives, Active Distribution Networks, Virtual Power Plant, Other Initiatives and Demonstrations, Overview of The Technologies Required for The Smart Grid.

Unit-II

Information and Communications Technology for the Smart Grid

Data communication: Introduction, Dedicated and shared communication channels, Switching techniques, Communication channels, Layered architecture and protocols.
Communication technologies for the Smart Grid: Introduction- Communication technologies-IEEE 802 series, Mobile communications, Multi-protocol label switching, Power line communication. Standards for information exchange-Standards for smart metering Modbus, DNP3, IEC 61850.
Information security for the Smart Grid: Encryption and decryption, authentication, Digital signatures, Cyber security standards

Unit-III

Smart Metering and Advanced Metering infrastructure

Introduction, smart metering – evolution of electricity metering, key components of smart metering, smart meters: an overview of the hardware used – signal acquisition, signal conditioning, analogue to digital conversion, computation, input/output, and communication.
Communication infrastructure and protocols for smart metering- Home area network, Neighborhood Area Network, Data Concentrator, meter data management system, Protocols for communication.
Advanced Metering infrastructure (AMI), AMI protocols – Standards and initiatives.

Unit-IV

Demand Side Integration and Distribution Management Systems

Demand Side Integration- Services Provided by DSI. Introduction Data Sources and Associated External Systems, SCADA, Customer Information System, Modeling and Analysis Tools, Distribution System Modeling, Topology Analysis, Load Forecasting, Power Flow Analysis, Fault Calculations, Applications, System Monitoring, Operation, Management, Outage Management System.

TEXT BOOKS:

3. Smart Grid, Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Wiley Publications, 2012, Reprint 2015.
4. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press., 2012, Reprint 2016.

REFERENCES:

4. The Smart Grid – Enabling Energy efficiency and demand response, Clark W. Gellings, P.E., CRC Press, Taylor & Francis group, First Indian Reprint. 2015.
5. Smart Grid – Applications, Communications, and Security Edited by Lars Torsten Berger, Krzysztof Iniewski, WILEY, 2012, Reprint 2015.
6. Practical Electrical Network Automation and Communication Systems, Cobus Strauss, ELSVIER, 2003.

NPTEL VIDEO LINK:

https://nptel.ac.in/courses/108/107/108107113/

CLO, PO &PSO Mapping:

SMART GRID TECHNOLOGY AND APPLICATIONS (Code:20EEH---)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Explain Basic concept of Smart Grid.	3	3	2	2	-	-	-	-	-	-	-	-	2	2	-
CLO2	Describe Suitable Communication Network And Security System For Smart Grid.	3	2	3	3	-	-	-	-	-	-	-	-	3	3	2
CLO3	Demonstrate Operation of Smart Metering and Advanced Metering infrastructure.	2	2	3	2	2	-	-	-	-	-	-	-	2	2	3
CLO4	Explain Operation of Demand Side Integration and Distribution Management Systems.	2	2	3	2	-	-	-	-	-	-	-	-	2	2	3

E. NON-LINER CONTROL SYSTEMS

(Code: 20EEH_ _ _)

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

Prerequisites: Control Systems,

Course Objectives: To make the students

CO1: To interpret distinct features of nonlinear dynamical system vs. linear systems

CO2: To introduce the need and concept of nonlinear system.

CO3: To impart knowledge about different strategies adopted in the analysis of nonlinear systems.

CO4: To familiarize with the design of different types of nonlinear controllers.

Course Outcomes: Students will be able

CLO1: Characterize distinct features of nonlinear dynamical system vs. linear systems

CLO2: Interpret different strategies adopted in the analysis of nonlinear systems.

CLO3: Interpret the stability analysis methods of nonlinear systems.

CLO4: design controllers for nonlinear systems.

Course Syllabus:

UNIT – I

Introduction: Nonlinear system behaviour, distinct features of nonlinear dynamical system vs. linear systems, nonlinear control.

Nonlinear system analysis:

Phase plane analysis**:** Concepts of phase plane analysis, Phase plane analysis of linear and

Nonlinear systems, Existence of limit cycles.

.UNIT – II

Fundamentals of Liapunov theory: Nonlinear systems and equilibrium points, Concepts of Stability, Linearization and local stability, Lyapunov's direct method, Invariant set theorems, Lyapunov analysis of LTI systems, Krasovskii's method, Variable gradient method, Physically motivated Lyapunov functions, Performance analysis. Control design based on Liapunov's direct method.

UNIT - III

Advanced stability theory:

Concepts of stability for Non-autonomous systems, Lyapunov analysis of non-autonomous systems, instability theorems, Existence of Lyapunov functions, Barbalat's Lemma and stability analysis, Positive real systems: PR and SPR Transfer functions, The Kalman-Yakubovich Lemma, The passivity Formalism: passivity in linear systems., Absolute stability, Establishing boundedness of signals, Existence and Unicity of solutions.

UNIT – IV

Nonlinear Control systems design:

Feedback Linearization and the canonical form, Input-state Linearization of SISO systems, Input output Linearization of SISO systems, multi input systems. Sliding Mode Control: Sliding surfaces, Filippov's construction of the equivalent dynamics, direct implementations of switching control laws, Continuous approximations of switching control laws, modeling and performance tradeoffs Lie derivative, Lie Bracket, Back stepping method for non-feedback linearizable systems.

TEXT BOOKS:

1. Jean- Jacques Slotine and Weiping Li, Applied nonlinear Control, Prentice Hall, 1991, ISBN:0-13-040890.

2. H.K. Khalil, Nonlinear Systems, 3rd ed., Prentice hall, 2002.

REFERENCE BOOKS:

1. P. LaSalle, Solomon Lefschetz, Stability by Liapunov's direct method: with applications,

Joseph Academic Press, 1961

2. Mathukumalli Vidyasagar, Nonlinear syste.ms analysis, SIAM, 2002.

3. Alberto Isidori, Nonlinear Control Systems - Volume 1, Springer, 1995.

4. Alberto Isidori, Nonlinear Control Systems – Volume 2,Sringer, 1999.

CO, PO&PSO Mapping:

Nonlinear Control Systems (20EEH--)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	Characterize distinct features of nonlinear dynamical system vs. linear systems.	3	2	-	2	2	1	-	-	1	-	1	2				
CLO2	Interpret different strategies adopted in the analysis of nonlinear systems.	2	3	2	2	1	2	1	1	1	1	1	2		2		
CLO3	Interpret the stability analysis methods of nonlinear systems.	2	2	1	2	2	1	1	-	-	1	-	1			2	
CLO4	Design controllers for nonlinear systems.	3	3	2	2	2	1	1	-	1	-	1	2		2		2

F. ADAPTIVE CONTROL SYSTEMS

(Code: 20EEH_ _ _)

<table>
<tr><td>Lectures</td><td>3</td><td>Tutorial</td><td>1</td><td>Practical</td><td>0</td><td>Self-study</td><td>0</td><td>Credits</td><td>4</td></tr>
<tr><td colspan="4">Continuous Internal Assessment</td><td>30</td><td colspan="4">Semester End Examination (3 Hours)</td><td>70</td></tr>
</table>

Prerequisites: Control Systems.

Course Objectives: To make the students

CO1: To interpret distinct features of adaptive systems.

CO2: To introduce the need and concept of self-tuning regulators.

CO3: To impart knowledge about Model reference adaptive control.

CO4: To familiarize with properties of adaptive systems.

Course Outcomes: Students will be able

CLO1: Characterize distinct features of adaptive systems.

CLO2: Interpret different strategies adopted in the design and analysis of self-tuning regulators.

CLO3: Interpret the design issues of Model reference adaptive control.

CLO4: Characterize distinct properties of adaptive systems.

Course Syllabus:

UNIT – I

Introduction: Parametric models of dynamical systems, Adaptive control problem. **Real time parameter estimation**: Least squares and regression models, Estimating parameters in Dynamical Systems, Experimental conditions, Prior information, MLE, RLS,Instrument variable method.

UNIT – II

Deterministic Self tuning regulators (STR): Pole placement design, Indirect self-tuning regulators, Continuous time self-tuners, direct self-tuning regulators, disturbances with known characteristics.

Stochastic and Predictive Self tuning regulators: Design of Minimum variance and Moving average controllers, stochastic self-tuning regulators, Unification of direct self-tuning regulators. Linear quadratic STR, adaptive predictive control.

UNIT – III

Model reference adaptive control (MRAS): The MIT Rule, Determination of adaptation gain, Lyapunov theory, Design of MRAS using Lyapunov theory, BIBO stability, Output feedback,Relations between MRAS and STR.

UNIT – IV

Properties of Adaptive systems: Nonlinear dynamics, Analysis of Indirect discrete time self-tuners, Stability of direct discrete time algorithms, Averaging, Application of averaging techniques, averaging in stochastic systems, robust adaptive controllers.

TEXT BOOKS:

1. K.J. Astrom and B. Wittenmark, Adaptive Control, 2nd ed., Pearson Education, 1995.

2. Petros Ioannou and Baris Fidan, Adaptive Control Tutorial, SIAM, 2006.

REFERENCE BOOKS:

1. M. Krstic, I. Kanellakopoulos and P. Kokotovic, Nonlinear and Adaptive Control Design,Wiley-Interscience, 1995.

2. H.K. Khalil, Nonlinear Systems, Prentice Hall, 3rd ed., 2002.

3. Jean- Jacques Slotine and Weiping Li, Applied nonlinear Control, Prentice Hall,1991.

4. Torsten Söderström, Instrumental variable estimation, Springer, 1983.

CLO, PO&PSO Mapping:

ADAPTIVE CONTROL SYSTEMS (20EEH---)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	Characterize distinct features of adaptive systems.	3	2	-	2	2	1	-	-	1	-	1	2				
CLO2	Interpret different strategies adopted in the design and analysis of self-tuning regulators.	2	3	2	2	1	2	1	1	1	1	1	2		2		
CLO3	Interpret the design issues of Model reference adaptive control.	2	2	1	2	2	1	1	-	-	1	-	1			2	
CLO4	Characterize distinct properties of adaptive systems.	3	3	2	2	2	1	1	-	1	-	1	2		2		2

G. ENERGY STORAGE SYSTEMS

(Code: 20EEH_ _ _)

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

Prerequisites: Basic physics and Chemistry

Course objectives: To make the students

CO1: Understand the concepts of Electrical Energy Storage Technologies.

CO2: Gain knowledge about Needs for Electrical Energy Storage.

CO3: Understand the concepts of Features of Energy Storage Systems.

CO4: Understand the concepts of applications of Energy Storage Systems.

Course outcomes: At the end of this course, students will be able to

CLO1: Explain the concepts of Electrical Energy Storage Technologies.

CLO2: Illustrate the behavior Needs for Electrical Energy Storage.

CLO3: Describe the concepts of Features of Energy Storage Systems.

CLO4: Demonstrate the concepts of applications of Energy Storage Systems.

Unit – I

Electrical Energy Storage Technologies:

Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, long distance between generation and consumption, Congestion in power grids, Transmission by cable.

Unit -II

Needs for Electrical Energy Storage:

Emerging needs for EES, more renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

Unit – III

Features of Energy Storage Systems:

Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

Unit – IV

APPLICATION CONSIDERATION

Comparing Storage Technologies – Technology options – Performance factors and metrics – Efficiency of Energy Systems – Energy Recovery – Battery Storage System; Introduction with focus on Lead Acid and Lithium – Chemistry of Battery Operation, Power storage calculations, Reversible reactions, Charging patterns, Battery Management systems, System Performance. Areas of Application of Energy Storage: Waste heat recovery, Solar energy storage, green house heating, Power plant applications, Drying and heating for process industries, energy storage in automotive applications in hybrid and electric vehicles.

TEXT BOOKS:

1.Jiujun Zhang, Lei Zhang, Hansan Liu, Andy Sun, Ru-Shi Liu, "Electrochemical Technologies for Energy Storage and Conversion", John Wiley and Sons, 2012.

2.Doughty Liaw, Narayan and Srinivasan, "Batteries for Renewable Energy Storage",The Electrochemical Society, New Jersy,2010.

3."James M. Eyer, Joseph J. Iannucci and Garth P. Corey ", "Energy Storage Benefits and Market Analysis", Sandia National Laboratories, 2004.

EFERENCE BOOKS:

1."Jim Eyer, Garth Corey", Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.
2..A. R. Pendse, "Energy Storage Science and Technology", SBS Publishers & Distributors Pvt. Ltd., New Delhi, (ISBN – 13:9789380090122), 2011.

NPTEL COURSE LINKS:

3. NPTEL :: Electrical Engineering - NOC: energy storage systems, https://nptel.ac.in/courses/113/105/113105102/

CLO, PO & PSO Mapping:

ENERGY STORAGE SYSTEMS (Code: 20EEH_ _ _)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CLO1	Explain the concepts of Electrical Energy Storage Technologies.	2	3	2	2	1	-	-	-	-	-	-	-	3	2	-
CLO2	Illustrate the behavior Needs for Electrical Energy Storage.	3	2	1	2	-	-	-	-	-	-	-	-	2	2	-
CLO3	Describe the concepts of Features of Energy Storage Systems.	2	3	1	2	-	-	-	-	-	-	-	-	3	2	-
CLO4	Demonstrate the concepts of applications of Energy Storage Systems.	3	3	2	-	1	-	-	-	-	-	-	-	2	2	-

H. ELECTRICAL AND HYBRID VEHICLES

(Code: 20EEH_ _ _)

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

Prerequisites: Induction motors and Synchronous Machines (20EE403) and Power Electronics (20EE504)

Course objectives: To make the students

CO1: Understand the concept of Vehicle Fundamentals.
CO2: Know the Operation of Electric and Hybrid drive-train topologies.
CO3: Understand the configuration and control of different motor drives.
CO4: Know the Operation of different types of energy storage systems.

Course outcomes: At the end of this course, students will be able to
CLO1: Explain the concepts of Vehicle Fundamentals
CLO2: Describe the operation of Electric and Hybrid drive-train topologies.
CLO3: Summarize configuration and control of different motor drives.
CLO4: Explain operation of different types of energy storage.

Unit-I

Introduction and Vehicle Fundamentals: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.

Unit-II

Electric and Hybrid drive-trains: Basic concept of electric traction - introduction to various electric drive-train topologies - power flow control in electric drive-train topologies, Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies.

Unit-III

Electric propulsion unit: Introduction to electric components used in electric vehicles - Configuration and control of DC Motor drives - Configuration and control of Induction Motor drives- Configuration and control of Permanent Magnet Motor drives - Configuration and control of Switch Reluctance Motor drives - Drive system efficiency.

Unit-IV

Energy storage: Introduction to Energy Storage Requirements in Electric Vehicles - Battery based energy storage and its analysis - Fuel Cell based energy storage and its analysis - Super Capacitor based energy storage and its analysis -Hybridization of different energy storage devices.

TEXT BOOKS:

1.Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,Second Edition 2005.

2.Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.

REFERENCES:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, Second Edition 2003.
2. H. Partab: Modern Electric Traction – Dhanpat Rai& Co, 2007.
3. Bimal Bose, 'Power electronics and motor drives', Elsevier, First Edition 2006.
4. Ion Boldea and S.A Nasar, 'Electric drives', CRC Press, Second Edition 2005.

NPTEL VIDEO LINK:

https://nptel.ac.in/courses/108/103/108103009/

https://nptel.ac.in/courses/108/106/108106182/

https://nptel.ac.in/courses/108/102/108102121/

CLO, PO & PSO MAPPING:

Electrical and Hybrid Vehicles (Code: 20EEH_ _ _)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of Vehicle Fundamentals	3	2	2	2	-	-	-	-	-	-	-	-	2	-	-
CLO2	Describe the operation of Electric and Hybrid drive-train topologies.	3	2	3	3	-	-	-	-	-	-	-	-	3	3	2
CLO3	Summarize configuration and control of different motor drives.	2	2	3	3	-	-	-	-	-	-	-	-	2	2	3
CLO4	Explain operation of different types of energy storage.	2	2	3	2	-	-	-	-	-	-	-	-	2	3	3

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

I. SENSORS AND ACTUATORS

(Code: 20EEH_ _ _)

ectures	3	Tutorial	1	Practical	0	Self-study	0	Credits	4
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Basic Physics

Course objectives: To make the students

CO1: Understand the concept of Various Sensors.

CO2: Know the Operation of temperature sensors and radiation sensors.

CO3: Understand the configuration and control of different actuators.

CO4: Know the Operation of different type's cylindrical rotatory actuators.

Course outcomes: At the end of this course, students will be able to

CLO1: To study about classification of sensors and their applications.

CLO2: Obtain the basic knowledge of Radiation sensors and thermal sensors.

CLO3: Describe about linear actuators and their usages.

CLO4: Explain cylindrical rotatory actuators and their applications.

UNIT-1

Introduction- Classification of Sensors - Magnetic Sensors - Smart Sensors: Introduction, Primary Sensors, Standards for Smart Sensor Interface, the Automation. Sensors Applications: Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing, Sensors for environmental Monitoring.

UNIT-II

Radiation Sensors: Introduction – Basic Characteristics – Types of Photo sensistors/Photo detectors– X-ray and Nuclear Radiation Sensors– Fiber Optic Sensors. Electro Analytical Sensors: Introduction – The Electrochemical Cell – The Cell Potential.

Thermal Sensors: Introduction, Gas thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor, Magnetic Sensors: Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto-resistive Sensing, Hall Effect and Sensors, Inductance and Eddy Current Sensors, Electromagnetic Flow meter, Switching Magnetic Sensors, SQUID Sensors.

UNIT-III

Linear Actuators - Mathematical Model for Linear Actuators - Fast-Acting Actuators - Disk

Solenoids - Plunger Solenoids - Ball Solenoids - Conical Solenoids - Applications of Solenoid Actuators - Long Stroke Solenoid Fuel Pump - Gasoline Injectors - Natural Gas Injectors -

Transmission Solenoids- Rotary Actuators - Disk Rotary Actuators - Disk Rotary Actuator Analysis - Disk Rotary-Actuator Design - Disk Rotary Actuator Excitation Electromagnetic Circuit - Disk Rotary Actuator Toothed Magnetic Part - Disk Rotary Actuator PM .

UNIT-IV

Cylindrical Rotary Actuators - Cylindrical Rotary Actuator PM - Cylindrical Rotary Actuator Excitation Electromagnetic Circuit - Cylindrical Rotary Actuator Toothed Magnetic Structure - Rotary Actuator Applications - Disk Rotary Actuator Application Controls in NC Machines and fluidic control- stepper motors- feedback devices- encoders-resolvers - induct sync – Tachogenerators - principles of fluid logic control - Coanda effect – basic fluidic devices.

Text Books

1. Andrzej M. Pawlak , “Sensors and Actuators in Mechatronics, Design and Applications” , Taylor &Francis Group, 2006

CLO, PO & PSO MAPPING:

SENSORS AND ACTUATORS (20EEH_ _ _)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	To study about the classification of Sensors and their applicartions	3	2	2	2	-	-	-	-	-	-	-	-	2	-	-
CLO2	Obtain the basic knowledge of Radiation sensors and thermal sensors.	3	2	3	3	-	-	-	-	-	-	-	-	3	3	2
CLO3	Describe about linear actuators and their usages.	2	2	3	3	-	-	-	-	-	-	-	-	2	2	3
CLO4	Explain cylindrical rotatory actuators and their applications.	2	2	3	2	-	-	-	-	-	-	-	-	2	3	3

J.OPTIMIZATION TECHNIQUES

(Code: 20EEH_ _ _)

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

Prerequisites: Basic Maths

Course Objectives: This course enables the students to know

CO1**:** Introduction to Classical Optimization Techniques

CO2: Understand the Integer and dynamic programming problems

CO3: Derive the non-linear programming methods with various Interpolation methods.

CO4: Develop the various stochastic programming methods to analyze engineering problems.

Course Outcomes (COs): By the end of the course the student would be able to

CLO1: Describe the concepts of Classical Optimization Techniques

CLO2: Write the formulations of the Integer and dynamic programming problems

CLO3: Develop the various Interpolation methods in non-linear programming methods

CLO4: Solve and analyze the engineering problems using various stochastic programming methods .

UNIT-I

Introduction to Classical Optimization Techniques

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

Classical Optimization Techniques

Single variable Optimization, Multi variable Optimization with and without constraints, Multivariable Optimization with equality constraints - solution by method of Lagrange multipliers, Multivariable Optimization with inequality constraints - Kuhn – Tucker conditions.

UNIT-II

Dynamic Programming

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

Integer Programming

Pure and mixed integer programming problems, Solution of Integer programming problems – Gomory's all integer cutting plane method and mixed integer method, branch and bound method, Zero-one programming.

UNIT-III

Nonlinear Programming: Introduction-Unimodal Function; Elimination Methods-Unrestricted Search-Exhaustive Search-Interval Halving Method-Fibonacci Method-Comparison of Elimination Methods

Interpolation Methods: Quadratic Interpolation Method-Cubic Interpolation Method-Direct Root Methods: Newton Method-Quasi-Newton Method-Secant Method

UNIT-IV

Stochastic Programming: Introduction, Basic Concepts of Probability Theory-Definition of Probability-Random Variables and Probability Density Functions-Jointly Distributed Random Variables-Covariance and Correlation-Probability Distributions-Central Limit Theorem

Stochastic Linear Programming-Stochastic Nonlinear Programming-Stochastic Geometric Programming.

TEXT BOOKS:

3. Singiresu S. Rao, Engineering Optimization Theory and Practice, 4th ed., Hoboken, New Jersey: John Wiley & Sons, Inc, 2009
4. Hamdy. A. Taha, Operations Research, 7th ed., New Delhi: Prentice Hall of India Ltd, 2002.

REFENCE BOOKS:

1. Hillier F S and Lieberman G J, Operations Research, Holden Day Inc., San Francisco.
2. J. K. Sharma. – 'Operations Research Theory and Applications' – Macmillan India Ltd, New Delhi – 2013 – 5th Edition

ONLINE COURSES:

https://nptel.ac.in/courses/111/105/111105039 - NPTEL :: Mathematics - Optimization

CO,PO &PSO MAPPING:

OPTIMIZATION TECHNIQUES (Code: 20EEH_ _ _)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Describe the concepts of Classical Optimization Techniques.	2	2	1	-	2	-	-	-	-	-	-	-	2	-	-
CLO2	Write the formulations of the Integer and dynamic programming problems	2	3	1	-	2	-	-	-	-	-	-	-	2	2	2
CLO3	Develop the various Interpolation methods in non-linear programming methods	3	3	1	1	1	-	-	-	-	-	-	-	2	2	2
CLO4	Solve and analyze the engineering problems using various stochastic programming methods.	3	2	1	1	1	-	-	-	-	-	-	-	3	2	2

K. MACHINE LEARNING FOR ENGINEERING APPLICATIONS

(Code: 20EEH_ _ _)

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

Prerequisites: Probability and Statistics (20EE301)

Course Objectives: This course enables the students to know

CO1**:** Understand the machine learning preliminary concepts

CO2: Principles of Decision Tree and supervised learning of machine learning

CO3: Derive the learning of Instance-based and Bayesian of machine learning

CO4: Develop the analytical and Reinforcement Learning principles

Course Outcomes (COs):

By the end of the course the student would be able to

CLO1: Describe the concepts machine learning preliminary concepts

CLO2: Write the formulations Decision Tree and supervised learning of machine learning

CLO3: Develop the learning of Instance-based and Bayesian of machine learning

CLO4: Demonstrate the analytical and Reinforcement Learning principles.

UNIT-I

What Is Machine Learning? -Applications and example disciplines of Machine Learning- Designing a learning System-Training Experience-Target Function-Function Approximation algorithm- final design of checkers learning system

Unsupervised Learning- Reinforcement Learning-General-to-Specific Ordering of Hypotheses-candidate-elimination algorithm- List-then-eliminate algorithm- Illustrative Example- weakest to strongest bias learning algorithms.

UNIT-II

Decision Tree Learning: Introduction- Univariate Trees- Pruning- Rule Extraction from Trees- Learning Rules from Data- Multivariate - Issues in Decision Tree Learning

Supervised learning: Learning a Class from Examples- Vapnik-Chervonenkis Dimension- Probably Approximately Correct Learning- Noise- Learning Multiple Classes- Regression- Model Selection and Generalization- Dimensions of a Supervised Machine Learning Algorithm

UNIT-III

Instance-Based Learning: Introduction - K-Nearest Neighbour Learning- Distance-Weighted Nearest Neighbour Algorithm- Locally Weighted Linear Regression Radial Basis Functions- Case-Based Reasoning

Bayesian Learning: Introduction- Bayes Theorem- Brute-Force Bayes Concept Learning-Map Hypotheses and Consistent Learner- Maximum Likelihood and Least-Squared Error Hypotheses- Maximum Likelihood Hypotheses for Predicting Probabilities- Minimum Description Length Principle.

UNIT-IV

Analytical Learning: Introduction- Inductive and Analytical Learning Problems - Prolog-EBG- Explain The Training Example- Refine The Current Hypothesis- Remarks On Explanation-Based Learning.

Reinforcement Learning: Introduction- The Learning Task-Q Learning- The Q Function- Algorithm for Learning Q- Convergence- Experimentation Strategies-Updating Sequence- Temporal Difference Learning

TEXT BOOKS:

1. Ethem Alpaydin," Introduction to Machine Learning", MIT Press, Prentice Hall of India, 3rd Edition2014.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rdEdition, 1997.

REFENCE BOOKS:

1. Charu C. Aggarwal, "DATA CLUSTERING Algorithms and Applications", CRC Press, 2014.
2. Kevin P. Murphy" Machine Learning: A Probabilistic Perspective", The MIT Press, 2012

ONLINE COURSES:

https://onlinecourses.nptel.ac.in/noc21_cs24/preview - NPTEL :: Introduction to Machine Learning

CLO, PO &PSO MAPPING:

MACHINE LEARNING FOR ENGINEERING APPLICATIONS (Code: 20EEH_ _ _)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	POll	PO12	PSO1	PSO2	PSO3
CLO1	Describe the concepts machine learning preliminary concepts	2	1	1		2								1		
CLO2	Write the formulations Decision Tree and supervised learning of machine learning	3	3	1		2							1	2	1	
CLO3	Develop the learning of Instance-based and Bayesian of machine learning	2	3	1	1	1							1	2	1	
CLO4	Demonstrate the analytical and Reinforcement Learning principles.	1	2	1	1	1							1	3	1	

L. BIG DATA ANALYTICS FOR SMART GRID

(Code: 20EEH_ _ _)

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

Prerequisites: Generation and Transmission (20EE405) and Power System Analysis (20EE502)

Course Objectives: This course enables the students to

CO1: Understand the basics of Smart Grid and data collection devices

CO2: Learn the big data analytics and tools to smart grid

CO3: Understand the machine learning algorithms for data analytics

CO4: Analyze the case studies, cloud and Edge Computing for Smart Grid

Course Outcomes (COs): By the end of the course the student would be able to

CLO1: Explain the basics of Smart Grid and data collection devices

CLO2: Apply big data tools to smart grid analysis

CLO3: Demonstrate the big data using machine learning algorithms

CLO4: Explain the case studies, cloud and Edge Computing for Smart Grid

UNIT-I

Need of Data Analysis in Smart Grid: Introduction, Basics of Smart Grid, Use of Satellite Communication in Modern Power System, Challenges and Solutions in Power Systems, Need for Big Data Analytics in Smart Grid.

Intelligent Data Collection Devices in Smart Grid: Introduction, Role of PMU in Smart Grid, Emerging Trends and BIg Data Analytics at Distribution level Grid

UNIT-II

Data Science pertaining to Smart Grid Analytics: Introduction, Smart Grid Use Cases, Analytics in Smart Grids, Tools and Technologies for Smart Grid

Tools for Big Data Analytics: Introduction to Python, Python Data Structure, Functions in Python, Arrays, Data and File Handling, Data Plotting and Visualization.

UNIT-III

Conventional Machine Learning Algorithms for Data Analytics: Intro to machine learning, Logistic Regression, Support Vector Machine, Unsupervised Learning

Advanced Machine Learning Algorithms for Data Analytics: Overview of Deep Learning, Artificial Neural Network, Deep Convolution Neural Network, Demonstration of NN implementation of Time Series of Data in the Google CoLab using Python, Implementation of CNN of Imdb Data in Google CoLab using Python.

UNIT-IV

Big Data Analytics for Smart Grid- Case Studies: Intro to Python, Data Exploration, Intro to AI, Machine Learning, sklearn, Data Preprocessing in python, Supervised and unsupervised learning.

Cloud and Edge Computing for Big Data Analytics: Cloud computing and cloud Analytics, Cloud Analytics, Edge Computing for Smart Grid Applications.

TEXT BOOKS:

1.Ahmed F. Zobaa and Trevor J. Bihl, "Big Data Analytics in Future Power Systems" CRC Press Taylor & Francis Grou, 2019.
2.John Zelle and Michael Smith, "Python Programming: An Introduction to Computer Science", 3rd Edition, Franklin Beedle & Associates Inc,2016.
3.Andreas C. Mueller and Sarah Guido, "Introduction to Machine Learning with Python", O'Reilly Media, Inc., 1st edition, 2016

REFENCE BOOKS:

1.James A. Momoh, "Smart Grid: Fundamentals of Design and Analysis", 1st Edition, Wiley-IEEE Press, 2012.
2.R. Nageswara Rao, "Core Python Programming", Dreamtech Press, 2nd edition, 2018.
3.Manaranjan Pradhan, "Machine Learning using Python", Wiley, 2019.

ONLINE SOURCES:

1. https://onlinecourses.swayam2.ac.in/arp20_ap10/preview.

CLO, PO & PSO MAPPING:

BIG DATA ANALYTICS FOR SMART GRID (20EEH---)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the basics of Smart Grid and data collection devices	3	3	2	2									2	2	
CLO2	Apply big data tools to smart grid analysis	2	2	3	3									3	3	2
CLO3	Demonstrate the big data using machine learning algorithms	2	2	2	3									2	3	3
CLO4	Explain the case studies, cloud and Edge Computing for Smart Grid	3	2	3	2									2		

M. EXTRA HIGH VOLTAGE TRANSMISSION

(Code: 20EEH_ _ _)

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

Prerequisites: High Voltage Engineering.

Course objectives: To make the students

CO1: To identify the different aspects of Extra High Voltage A.C and DC Transmission design and analysis.

CO2: To understand the importance of modern developments of EHV and UHV Transmission systems.

CO3: To demonstrate EHV AC transmission system components, protection and insulation level for over voltages.

CO4: To understand Measurements of audio noise radio interference due to Corona and Properties of radio noise.

Course Outcomes: Upon the completion of this course, the student will be able to

CLO1: Explain the importance of EHV AC transmission

CLO2: Estimate choice of voltage for transmission, line losses and power handling capability of EHV Transmission.

CLO3: Describe the statistical procedures for line designs, scientific and engineering Principles in power systems.

CLO4: Measurements of audio noise radio interference due to Corona and properties of radio noise.

Unit-I

E.H.V.A.C. Transmission line trends and preliminary aspect standard transmission voltages : Estimation at line and ground parameters-Bundle conductor systems-Inductance and Capacitance of E.H.V. lines – positive, negative and zero sequence impedance – Line Parameters for Modes of Propagation.

Unit-II

Electrostatic field and voltage gradients : calculations of electrostatic field of AC lines – effect of high electrostatic field on biological organisms and human beings – surface voltage gradients and maximum gradients of actual transmission lines – voltage gradients on sub conductor.

Unit-III

Electrostatic induction in un energized lines: measurement of field and voltage gradients for three phase single and double circuit lines – un energized lines. Power Frequency Voltage control and over voltages in EHV lines: No load voltage – charging currents at power frequency-voltage control – shunt and series compensation – static VAR compensation.

Unit-IV

Corona in E.H.V. lines – Corona loss formulae- attention of traveling waves due to Corona – Audio noise due to Corona, its generation, characteristic and limits. Measurements of audio noise radio interference due to Corona – properties of radio noise – frequency spectrum of RI fields – Measurements of RI and RIV.

TEXT BOOKS:

1. R. D. Begamudre, “EHVAC Transmission Engineering”, New Age International (p) Ltd. 3rd Edition.
2. K.R. Padiyar, “HVDC Power Transmission Systems” New Age International (p) Ltd. 2nd revised Edition, 2012.

REFERENCES:

1. S. Rao “EHVAC and HVDC Transmission Engineering. Practice” Khanna publishers.
2. Arrillaga. J “High Voltage Direct Current Transmission” 2nd Edition (London) Peter Peregrines, IEE, 1998.
3. Padiyar. K.R, “FACTS Controllers in Power Transmission and Distribution” New Age International Publishers, 2007.
4. Hingorani H G and Gyugyi. L “Understanding FACTS-Concepts and Technology of Flexible AC Transmission Systems” New York, IEEE Press, 2000.

CLO, PO & PSO MAPPING:

Extra high voltage AC transmission (20EEH---)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the importance of EHV AC transmission	3	2	2	2									2		
CLO2	Estimate choice of voltage for transmission, line losses and power handling capability of EHV Transmission.	2	2	3	3									3	3	2
CLO3	Describe the statistical procedures for line designs, scientific and engineering Principles in power systems.	2	2	3	3									2	2	3
CLO4	Measurements of audio noise radio interference due to Corona and properties of radio noise.	2	2	3	2									2		

N. BLOCK CHAIN TECHNOLOGY FOR ENERGY SYSTEMS

(Code: 20EEH_ _ _)

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

Prerequisites: Generation and Transmission (20EE405) and Power System Analysis (20EE502)

Course Objectives: This course enables the students to

CO1: Discuss the Block Chain-Technology Basics and Conceptual back ground principles.

CO2: Learn the Evolutionary Transformation of Block Chain Technology and bit coin digital crypto currency.

CO3: Understand the applications of energy sector and industry

CO4: Discriminate application and challenges in power distribution systems

Course Outcomes (COs): By the end of the course the student would be able to

CLO1: Explain awareness about Block Chain-Technology Basics and Conceptual back ground principles.

CLO2: Write about Evolutionary Transformation of Block Chain Technology and bit coin digital crypto currency.

CLO3: Develop the applications of energy sector and industry

CLO4: Illustrate the application and challenges in power distribution systems

UNIT-I

Block chain Technology: Introduction to Block Chain-Components of Block chain--Hashing Methods-Transactions-Public Key Cryptography-Address and Walle-Blocks-Consensus Mechanism-Smart Contracts, Evolution of Block chain, Applications of Block chain, Challenges of Block chain.

Block chain technology conceptual background: Definition and overview of fundamental principles, Two important paradigms: Bitcoin and Ethereum, Taxonomies of block chain system architectures. Taxonomies of block chain system architectures

UNIT-II

The Evolutionary Transformation of Block Chain Technology: Introduction, Fundamentals of Block chain, Historical Background, Basic Terminologies in Block chain, Structure of a Block, Types of Block chain, The Evolutionary Transformation of Block chain, Comparison of Different Generations of Block chain, A Block Chain Based Supply Chain Management.

Bitcoin: A Digital Cryptocurrency-Introduction-Bitcoin Block's Structure-Bitcoin Transactions' Structure-Bitcoin's Anonymity & Privacy-Machine Learning Approaches to Price Prediction-Threats and Machine Learning Based Solution-

UNIT-III

Block chain technology in the energy sector: Introduction, Distributed consensus Algorithms-Proof of Work (PoW)- Proof of Stake (PoS)- Practical Byzantine Fault Tolerance (PBFT)- Delegated Proof of Stake (DPoS)- Federated Byzantine Agreement (FBA)- Proof of Authority (PoAu)- Proof of Elapsed Time (PoET)- Proof of Activity (PoAc), Criteria for technology suitability, potential impact on energy company operations- Wholesale energy trading and supply- Imbalance settlement- Digitalization and IoT platforms, P2P trading and decentralized energy.

Block chains in the energy industry- Metering, billing and security- Decentralized energy trading- Wholesale energy trading- Energy trading support for small generators and end-consumers- Trading for utilities and energy system Stakeholders-Grid management- IoT, smart devices, automation and asset management- Electric e-mobility- Discussion of key challenges and future outlook

UNIT-IV

Block chain technology applications in power distribution systems: Transactive energy, Cryptocurrencies and tokens in energy transactions, Peer-to-peer energy trading, Carbon trading, Grid management, Device automation for metering and billing, Identity, security, and privacy management, **Challenges of block Chain applications in power distribution Systems**-Implementation Costs-Consumer participation-. Data-processing Constraints-Legal support and Regulations-Proof of Burn (PoB)- Proof of Capacity (PoC), Block chain potential and notable use cases in energy applications, Block chain potential impact on energy company operations, Wholesale energy trading and supply, Imbalance settlement, Digitalization and IoT platforms, P2P trading and decentralized energy.

TEXT BOOKS:

1.Sandeep Kumar Panda Ajay Kumar Jena Santosh Kumar Swain Suresh Chandra Satapathy "Blockchain Technology: Applications and Challenges" Intelligent Systems Reference Library, Springer 203.2021 (UNIT-I & II)

2.M. Andoni et al. "Blockchain technology in the energy sector: A systematic review of challenges and opportunities **"**Renewable and Sustainable Energy Reviews 100 (2019). (UNIT-III)

3.A. Adeyemi, et al. "Blockchain technology applications in power distribution systems"The Electricity Journal 33 (2020).UNIT-IV)

REFENCE BOOKS:

1.Daniel Drescher "Blockchain Basics A Non-Technical Introduction In 25 Steps" Apress,, DOI 10.1007/978-1-4842-2604-9 .

CLO, PO & PSO MAPPING:

BLOCK CHAIN TECHNOLOGY FOR ENERGY SYSTEMS (20EEH----)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	POll	PO12	PSO1	PSO2	PSO3
CLO1	Explain awareness about Block Chain-Technology Basics and Conceptual back ground principles.	1	1	1		2								1		
CLO2	Write about Evolutionary Transformation of Block Chain Technology and bit coin digital crypto currency.		1	1		2							1	1		
CLO3	Develop the applications of energy sector and industry	2	2	1	1	1							1	1		
CLO4	Illustrate the application and challenges in power distribution systems	2	2	1	1	1							1	2		

O. AUTOMOTIVE ELECTRICAL AND ELECTRONICS

(Code: 20EEH_ _ _)

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

UNIT I

Batteries: Lead acid and alkaline batteries, battery rating, battery testing and maintenance. Starting System: Principle and construction of starter motor, working of different starter drive units and solenoid switches.

UNIT II

Ignition System: Conventional ignition system and study of its components. Types of ignition systems, spark advance and retarding mechanisms. Types of spark plugs, ignition timing, maintenance, servicing and fault diagnosis. Electronic ignition systems, programmed ignition and distributor-less ignition. R15 97

UNIT III

Charging System: DC and AC Generators – principle, construction and working, cut-outs and regulators and charge balancing. (6) Lighting System: Insulated and earth return system, details of head light and side light, LED lighting system, head light dazzling and preventive methods. Horn, wiper system and trafficator.

UNIT IV

Sensors and Actuators: Classification of sensors, sensor for speed, knock, throttle position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors and relay.

Electronic Engine Controls: Concept of an electronic engine control system, electronic fuel injection - throttle body fuel injection, multi point fuel injection, gasoline direct injection, common rail direct injection, electronic ignition control, engine mapping, on-board diagnostics – engine control module and powertrain control module.

TEXT BOOKS:

1. Crouse W H, “Automobile Electrical Equipment”, McGraw Hill Book Co., Inc., New York 3rd edition,1986.

2. William B Ribbens, “Understanding Automotive Electronics”, 5th edition, Butter worth Heinemann Woburn, 1998.

REFERENCES :

1. Bechhold “Understanding Automotive Electronics” SAE, 1998.

2. Judge A W, “Modern Electrical Equipment of Automobiles”, Chapman & Hall, London,1992.

3. Robert Bosch, “Automotive Hand Book” SAE, 5th edition, 2000.

4. Kholi P L, “Automotive Electrical Equipment”, Tata McGraw Hill Co., Ltd., New Delhi, 1975.

5. Young A P and Griffiths L, “Automotive Electrical Equipment”, ELBS & New Press, 1999.

6. “Automotive Electrics Automotive Electronics”, 4th Edition, Robert Bosch GmbH, 2004.

CLO, PO & PSO MAPPING:

Automotive Electrical and Electronics (20EEH----)		**PO 1**	**PO 2**	**PO 3**	**PO4**	**PO5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**POl l**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO3**
CLO 1	Explain the fundamentals, working and advanced concepts of automotive battery, ignition and starting systems.	1	1	1		2								1		
CLO 2	Discuss the working of basic and advanced concepts of automotive charging and lighting systems.		1	1		2							1	1		
CLO3	Present basics of automotive electronics and working principle of sensors and actuators.	2	2	1	1	1							1	1		
CLO 4	Apply control system concepts in engine control.	2	2	1	1	1							1	2		

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

POWER SYSTEM OPERATION CONTROL AND STABLITY
IV B.Tech-VII Semester (Code: 20EE701)

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

Prerequisites: Mathematics, Power system-1, Power System-2

Course Objectives: To make the students

CO1: Understand economic load dispatch under various operational constraints and techniques to solve the problem.

CO2: Modeling of turbines and generators and know the importance of quality of power, P-f, Q-V control loops, AGC

CO3: To deal with the numerical methods studied in applied mathematics courses to get the Solutions of load flow problem and comparison of different methods.

CO4: Discuss the concept of reactive power and voltage control in detail.

CO5: Understand Power system stability and voltage stability in operation of power system.

Course Outcomes: Students will be able

CLO1: Explain the importance of economic operation of power systems

CLO2: Develop the mathematical models of turbines and governors and know the importance of single area and AGC

CLO3: Develop proper mathematical models for analysis of load flow study

CLO4: Explain the importance and control of reactive power and voltage

CLO5: Explain the stability issues concerned with power system operation

UNIT – I

Economic operation of power systems: Economic dispatch in thermal power station: Heat rate curves, cost curves, incremental fuel and Production costs, economic distribution of load between units without consideration to line losses; Transmission line losses as a function of plant generation, calculation of loss coefficients, Optimum generation allocation between thermal plants; Capability diagram of a synchronous generator.

UNIT – II

Quality of power: Importance of keeping voltage and frequency constant in a power system **The two main control loops- (P-δ) and (Q – V) loops:** Load frequency control (LFC) single area case, the P- **δ** loop: Schematic of load frequency and AVR of a synchronous generator, mathematical modelling of generator, loads, prime mover and speed governor for LFC & corresponding block diagram representation, LFC block diagram of an isolated power system, steady state analysis, dynamic response. The automatic generation control (AGC) scheme – AGC in a single area system, block diagram representation of AGC for an isolated power System

UNIT – III

Formulation of Load Flow Problem: Introduction – nonlinear equations - Power Flow Solution Algorithms, solution techniques using Gauss Seidal, Newton Raphson Load Flow Methods.
Reactive power control: The role of excitation system- exciter, generator and sensor models, simplified AVR block diagram,
Voltage control of distribution systems: Tap changing, booster transformers, synchronous phase modifiers, induction regulators and static capacitors.
Transmission line compensation: Series compensation, shunt compensation, static VAR Compensators – thyristor controlled reactors (TCR), thyristor switched capacitors (TSC), and STATCOM,.

UNIT – IV

Power system stability: Introduction – steady state stability, Transient stability, Review of machine swing equation - Equal area criterion of stability – applications. Step by step solution of the swing curve – factors affecting steady state and transient stabilities.
Voltage stability: Introduction, comparison of angle & voltage stability, reactive power flow and voltage collapse, Mathematical formulation of voltage stability problem.

TEXT BOOKS:

1. Power system analysis by H.Saadat , McGraw Hill -2nd Edition 2004
2. Modern power system analysis by D.P.Kothari & I.J.Nagrath McGraw Hill-4th Edition, 2011.

REFERENCE BOOKS:

1. Economic Operation of Power System - L. K. Kirchmeyer, Wiley India Pvt Ltd 2009.
2. Power System Analysis by T.K.Nagsarkar M.S.Sukhija, OXFORD university press, 2nd edition 2014.
3. Generation Distribution and utilization of Electrical Energy by CL Wadhwa, New Age Int. Pub, Revised 2/E 3rd Edition 2015.
4. Electrical Energy Systems by John Weedy, Willey Eastern, 5th Edition 2012.
5. Power System Stability and Control by Prabha Kundur, McGraw Hill Education; 1st edition 2006.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Power Systems Operation and Control
2. NPTEL :: Electrical Engineering - Power Systems Operation and Control
3. NPTEL:: Electrical Engineering - Power Systems Analysis

CLO,PO & PSO Mapping:

Power System Operation Control and Stablity (20EE701)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Know the importance of economic operation of power systems	3	2	2	-	-	-	-	-	3	-	-	2	3	2	2
CO2	Develop the mathematical models of turbines and governors and know the importance of single area and AGC	3	3	2	2	-	-	-	-	-	-	-	-	-	3	-
CO3	Know the importance of voltage control of distribution systems	3	-	3	-	-	-	-	-	-	-	2	-	-	2	-
CO4	Control the voltage and reactive power in practical case also.	3	2	3	-	-	-	-	-	-	-	-	-	3	-	-
CO5	Explain the stability issues concerned with power system operation	3	-	3	3	-	-	-	-	-	-	-	-	-	3	-

HIGH VOLTAGE ENGINEERING
IV B.Tech – VII Semester (Code: 20EE702/PE71)

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

Pre-requisites: Physics, Circuit theory, Power systems-1

Course objectives: To make the students

CO1: Understand the breakdown phenomenon in solids, liquids and gases.

CO2: Know the concepts of partial discharges.

CO3: To know the generation of high voltages.

CO4: Understand different measuring techniques in high voltages.

CO5: To know the protective techniques against over voltages.

CO6: Understand the testing techniques of different high voltage apparatus.

CO7: Know the layout of high voltage laboratories.

Course outcomes: At the end of the course, the student will demonstrate

CLO1: Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.
CLO2: Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.
CLO3: Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.
CLO4: Knowledge of protection against over voltages.

UNIT-I

Breakdown phenomenon of Gases , Liquids and Solids: Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge. Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

UNIT-II

Generation of High voltages: Generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III

Measurement of high voltages and currents: Measurements of Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements. Protection against over-voltages, Surge diverters, Surge modifiers.

UNIT-IV

High voltage testing techniques: Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

TEXTBOOKS:

1. High Voltage Engineering by M.S.Naidu and V.Kamaraju – TMH.
2. High Voltage Engineering fundamentals by Kuffel and Zungel, Elsavier Publications

REFERENCE BOOKS:

1. C. L. Wadhwa, "High Voltage Engineering", New Age International Publishers,
2. D. V. Razevig (Translated by Dr. M. P. Chourasia), "High Voltage Engineering Fundamentals", Khanna Publishers, 1993.
3. R. Arora and W. Mosch "High Voltage and Electrical Insulation Engineering", John Wiley & Sons, 2011.
4. Various IS standards for HV Laboratory Techniques and Testing 2007.

NPTEL COURSE LINK:

NPTEL :: Electrical Engineering - High Voltage Engineering

CLO, PO & PSO MAPPING:

High Voltage Engineering (20EE701/PE71)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.	3	-	-	2	-	3	-	-	-	-	-	2	2	3	-
CLO2	Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.	-	-	2	-	3	2	-	-	-	-	-	-	3	2	-
CLO3	Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.	3	-	-	-	-	-	-	-	-	-	-	-	2	2	-
CLO4	Knowledge of protection against over voltages.	-	-	3	-	-	-	-	2	-	-	-	-	2	2	-

ADVANCED ELECTRIC DRIVES

IV B.Tech – VII Semester (Code: 20EE702/PE72)

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

Prerequisites: Electrical machines, Power Electronics.

Course Objectives: To make the students

CO1: Design controllers for closed-loop operation of separately excited DC motor drives.

CO2: Develop high performance IM using principles of Scalar control and Direct Torque Control.

CO3: Develop Vector controlled Induction Motor drives and PMSM drives

CO4: Implement control schemes for BLDC and Switched Reluctance Motor drives

Course Outcomes: Students will be able to

CLO1: Understand and Design controllers for closed-loop operation of separately excited DC motor drives.

CLO2: Design and analyze IM using Scalar control and Direct Torque Control.

CLO3: Design Develop Vector Controlled Induction Motor drives and PMSM drives.

CLO4: Design and Implement, control schemes for BLDC and Switched Reluctance Motor drives

UNIT-I

Separately Excited DC-motor Drives: Introduction, Review of DC-motor drives, Speed control of a Separately excited DC motor through state-space Model, drive with controlled rectifiers and choppers, Review of controllers, need for anti-windup feature for integral controllers, Speed control of a separately excited DC drive with inner current loop and outer speed loop, Design of current loop with pole-zero cancellation, Design of speed loop with symmetrical optimization technique.

UNIT-II

Induction Motor drives: Implementation of V/f control with slip compensation scheme, Review of dq0 model of 3-Ph IM with simulation studies, Principle of vector control of IM, Direct Vector control, Indirect vector control with feed-forward, Indirect vector control in various frames of reference, Decoupling of vector control with feed forward compensation, Direct Torque Control of IM , Control of wound rotor induction machine, introduction to five-phase induction motor drives.

UNIT-III

Permanent Magnet Drives: PM Synchronous motors: Types, Construction, operating principle,Expression for torque, Model of PMSM, Implementation of vector control for PMSM, Introduction to BLDC drives.

UNIT-IV

Switched Reluctance Motor Drives: Review of Switched Reluctance Motor, Torque expression,converters for SRM drives, Control of SRM drives with hard and soft chopping techniques.

TEXT BOOKS:

1. Modern Power Electronics & AC Drives – B.K. Bose, Pearson, First edition

2. Electric Motor Drives: Modeling, Analysis and Control – R. Krishnan – Prentice Hall

REFERENCE BOOKS:

1.Power Semiconductor Controlled Drives- Dubey G. K, Prentice Hall International Edition 1989.

2. High-power Converters and AC Drives: Bin-Wu, IEEE Press, John Wiley &Sons

3. Simulation of Power Electronic Circuits: M. B. Patil, V. Ramanarayanan, V.T. Ranganathan,Narosa Publications, 2013.

4. Permanent Magnet Synchronous and Brushless DC motor Drives- R.Krishnan, CRC Press 2009.

5. Vector Control of Electric Drives: Peter Vas, Oxford Publishers.

CLO PO and PSO mapping:

ADVANCED ELECTRIC DRIVES (20EE702/PE72)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Design controllers for closed-loop operation of separately excited DC motor drives.	3	2	-	2	-	-	-	-	-	-	-	2	-	2	-
CLO2	Develop high performance IM using principles of Scalar control and Direct Torque Control.	3	3	-	3	-	-	-	-	-	-	-	3	-	-	3
CLO3	Develop Vector controlled Induction Motor drives and PMSM drives.	3	-	3	3	2	2	3	-	-	-	-	2	-	-	-
CLO4	Implement control schemes for BLDC and Switched Reluctance Motor drives.	3	3	-	3	-	3	-	-	-	2	-	2	-	3	-

SOLAR & FUEL ENERGY SYSTEMS
IV B.Tech – VII Semester (Code: 20EE702/PE73)

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

Prerequisites: Basic Physics, Basic mathematics

Course objectives: To make the students

CO1: Understand the concepts of Solar Cell Fundamentals.

CO2: Gain knowledge about Classification of PV Systems.

CO3: Analyze systems in fuel cells technology.

CO4: Understand the concepts of Fuel cell characterization.

Course outcomes: At the end of this course, students will be able to

CLO1: Explain the concepts of Solar Cell Fundamentals.

CLO2: Analyze the behavior of PV Systems.

CLO3: Analyze systems in fuel cells technology.

CLO4: Demonstrate the concepts of Fuel cell characterization.

Unit – I

Solar Cell Fundamentals: Photovoltaic effect - Principle of direct solar energy conversion into electricity in a solar cell. Semiconductor properties, energy levels, basic equations. Solar cell, p-n junction, structure. **PV Module Performance:** V-I characteristics of a PV module, maximum power point, cell efficiency, fill factor, effect of irradiation and temperature.

Unit -II

Classification Of PV Systems - Central Power Station System, Distributed PV System, Standalone PV system, Grid Interactive PV System, small system for consumer applications, Hybrid solar PV system, Concentrator solar photovoltaic. **PV System Applications: Building**-integrated photovoltaic units, grid-interacting central power stations, stand- alone devices for distributed power supply in remote and rural areas, solar cars, aircraft, space solar power satellites.

Unit – III

Fuel cell technology: Introduction,low and high temperature fuel cells; Fuel cell thermodynamics - heat, work potentials, prediction of reversible voltage, fuel cell efficiency.

Fuel cell reaction kinetics - electrode kinetics, over voltages, Tafel equation, charge transfer reaction, exchange currents, Fuel cell charge and mass transport - flow field, transport in electrode and electrolyte.

Unit – IV

Fuel cell characterization: - in-situ and ex-situ characterization techniques, i-V curve, frequency response analyses; Fuel cell modeling and system integration: - 1D model - analytical solution and Computational fluid dynamics (CFD) models.

TEXT BOOKS:

1. Kalogirou .S.A., “Solar Energy Engineering: Processes and Systems”, Academic Press, 2009.
2. Hand Book of Batteries and Fuel cells: David Linden, Mc Graw Hill Book Co..H. P. Hsu , “Signals and Systems”, Schaum’s series, McGraw Hill Education, 3rd Edition 2013.

REFERENCE BOOKS:

1. Chetan Singh Solanki., Solar Photovoltaic: “Fundamentals, Technologies and Application”, PHI Learning Pvt., Ltd., 2009.
2. Jha .A.R, “Solar Cell Technology and Applications”, CRC Press, 2010.M. J. Robert “Fundamentals of Signals and Systems”, McGraw Hill Education, 2007.
3. Renewable Energy Sources & Conversion technology: Bansal.K: Leemann & Meliss

NPTEL COURSE LINKS:

1.NOC:Solar Energy Engineering and Technology - NPTEL, https://nptel.ac.in/courses/112/105/112105051/
2.NPTEL :: Fuel Cell Technology - NPTEL , https://nptel.ac.in/courses/103/102/103102015/

CLO PO and PSO mapping:

Solar & Fuel cell Energy Systems (20EE702/PE73)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Explain the concepts of Solar Cell Fundamentals.	3	3	2	2	1	-	1	-	1	1	1		1	2	
CLO2	Analyze the behavior of PV Systems.	3	3	2	2	1	-	1	-	1	1	1		1	2	
CLO3	Analyze systems in fuel cells technology.	3	3	2	2	1	-	1	-	1	1	1		1	2	
CLO4	Demonstrate the concepts of Fuel cell characterization.	3	3		2	1	-	1	-	1	1	1		1	2	

SMART GRID TECHNOLOGY & APPPLICATIONS

IV B.Tech VII-Semester (Code:20EE702/PE74)

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

Prerequisites: Fundamentals of Power System

Course objectives: To make the students

CO1: Understand the Basic concept of Smart Grid.
CO2: Understand the Information & Communications Technology for The Smart Grid.
CO3: Acquire Knowledge about Smart Metering and Advanced Metering infrastructure.
CO4: Know the operation of Demand Side Integration and Distribution Management Systems.

Course outcomes: At the end of this course, students will be able to

CLO1: Explain Basic concept of Smart Grid.
CLO2: Describe Suitable Communication Network And Security System For Smart Grid.
CLO3: Analyze Operation of Smart Metering and Advanced Metering infrastructure.
CLO4: Analyze Operation of Demand Side Integration and Distribution Management Systems.

UNIT-I

Smart Grid: Introduction, Ageing Assets and Lack of Circuit Capacity, Thermal Constraints, Operational Constraints, Security of Supply, National Initiatives, Early Smart Grid Initiatives, Active Distribution Networks, Virtual Power Plant, Other Initiatives and Demonstrations, Overview of The Technologies Required for The Smart Grid.

UNIT-II

Data communication: Introduction, Dedicated and shared communication channels, Switching techniques, Communication channels, Layered architecture and protocols.

Communication technologies for the Smart Grid: Introduction- Communication technologies- IEEE 802 series, Mobile communications, Multi-protocol label switching, Power line communication. Standards for information exchange-Standards for smart metering Modbus, DNP3, IEC 61850.

Information security for the Smart Grid: Encryption and decryption, authentication, Digital signatures, Cyber security standards

UNIT-III

Smart Metering and Advanced Metering infrastructure: Introduction, smart metering – evolution of electricity metering, key components of smart metering, smart meters: an overview of the hardware used – signal acquisition, signal conditioning, analogue to digital conversion, computation, input/output, and communication. Communication infrastructure and protocols for smart metering- Home area network, Neighborhood Area Network, Data Concentrator, meter data management system, Protocols for communication. Advanced Metering infrastructure (AMI), AMI protocols – Standards and initiatives.

UNIT-IV

Demand Side Integration and Distribution Management Systems: Demand Side Integration- Services Provided by DSI. Introduction Data Sources and Associated External Systems, SCADA, Customer Information System, Modeling and Analysis Tools, Distribution System Modeling, Topology Analysis, Load Forecasting, Power Flow Analysis, Fault Calculations, Applications, System Monitoring, Operation, Management, Outage Management System.

TEXT BOOKS:

1. Smart Grid, Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Wiley Publications, 2012, Reprint 2015.
2. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press., 2012, Reprint 2016.

REFERENCES:

1. The Smart Grid – Enabling Energy efficiency and demand response, Clark W. Gellings, P.E., CRC Press, Taylor & Francis group, First Indian Reprint. 2015.
2. Smart Grid – Applications, Communications, and Security Edited by Lars Torsten Berger,Krzysztof Iniewski, WILEY, 2012, Reprint 2015.
3. Practical Electrical Network Automation and Communication Systems, Cobus Strauss, ELSVIER, 2003.

NPTEL VIDEO LINK:

https://nptel.ac.in/courses/108/107/108107113/

CLO PO and PSO mapping:

Smart Grid Technology & Applications (20EE702/PE74)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Understand the Basic concept of Smart Grid.	3	3	2	2	-	-	-	-	-	-	-	-	2	-	-
CLO2	Understand the Information & Communications Technology for The Smart Grid.	3	2	3	3	-	-	-	-	-	-	-	-	3	3	2
CLO3	Acquire Knowledge about Smart Metering and Advanced Metering infrastructure.	2	2	3	2	2	-	-	-	-	-	-	-	2	-	3
CLO4	Know the operation of Demand Side Integration and Distribution Management Systems	2	2	3	2	-	-	-	-	-	-	-	-	2	-	-

ADAPTIVE CONTROL SYSTEMS

IV B.Tech VII-Sem ester (Code:20EE703/PE75)

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

Prerequisites: Control Systems.

Course Objectives: To make the students

CO1: To interpret distinct features of adaptive systems.

CO2: To introduce the need and concept of self-tuning regulators.

CO3: To impart knowledge about Model reference adaptive control.

CO4: To familiarize with properties of adaptive systems.

Course Outcomes: Students will be able

CLO1: Characterize distinct features of adaptive systems.

CLO2: Interpret different strategies adopted in the design and analysis of self-tuning regulators.

CLO3: Interpret the design issues of Model reference adaptive control.

CLO4: Characterize distinct properties of adaptive systems.

Course Syllabus:

UNIT – I

Introduction: Parametric models of dynamical systems, Adaptive control problem. **Real time parameter estimation**: Least squares and regression models, Estimating parameters in Dynamical Systems, Experimental conditions, Prior information, MLE, RLS, Instrument variable method.

UNIT – II

Deterministic Self tuning regulators (STR): Pole placement design, Indirect self-tuning regulators, Continuous time self-tuners, direct self-tuning regulators, disturbances with known characteristics.

Stochastic and Predictive Self tuning regulators: Design of Minimum variance and moving average controllers, stochastic self-tuning regulators, Unification of direct self-tuning regulators. Linear quadratic STR, adaptive predictive control.

UNIT – III

Model reference adaptive control (MRAS): The MIT Rule, Determination of adaptation gain, Lyapunov theory, Design of MRAS using Lyapunov theory, BIBO stability, Output feedback,Relations between MRAS and STR.

UNIT – IV

Properties of Adaptive systems: Nonlinear dynamics, Analysis of Indirect discrete time self-tuners, Stability of direct discrete time algorithms, Averaging, Application of averaging techniques, averaging in stochastic systems, robust adaptive controllers.

TEXT BOOKS:

1. K.J. Astrom and B. Wittenmark, Adaptive Control, 2nd ed., Pearson Education, 1995.

2. Petros Ioannou and Baris Fidan, Adaptive Control Tutorial, SIAM, 2006.

REFERENCE BOOKS:

1. M. Krstic, I. Kanellakopoulos and P. Kokotovic, Nonlinear and Adaptive Control Design,Wiley-Interscience, 1995.

2. H.K. Khalil, Nonlinear Systems, Prentice Hall, 3rd ed., 2002.

3. Jean- Jacques Slotine and Weiping Li, Applied nonlinear Control, Prentice Hall,1991.

4. Torsten Söderström, Instrumental variable estimation, Springer, 1983.

5. P.A. Ioannou and J. Sun, Robust Adaptive Control, Prentice Hall, 1995.

6. Sankar Sastry and Marc Bodson, Adaptive Control- Stability, Convergence and Robustness, Springer, 2011.

CLO PO and PSO mapping:

ADAPTIVE CONTROL SYSTEMS (20EE703/PE75)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	To interpret distinct features of adaptive systems.	3	2	-	2	2	1	-	-	1	-	1	2				
CLO2	To introduce the need and concept of self-tuning regulators.	2	3	2	2	1	2	1	1	1	1	1	2		2		
CLO3	To impart knowledge about Model reference adaptive control.	2	2	1	2	2	1	1	-	-	1	-	1			2	
CLO4	To familiarize with properties of adaptive systems.	3	3	2	2	2	1	1	-	1	-	1	2		2		2

AI APPLICATIONS TO ELECTRICAL ENGINEERING

IV B.Tech VII-Sem ester (Code:20EE703/PE76)

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

Course Objectives (COs): To make the students

CO1 Understand the concepts of artificial neural networks
CO2 Understand the concepts of Fuzzy Logic.
CO3 Understand the concepts of genetic algorithms
CO4 Analyze the applications of AI techniques to Electrical Engineering

Course Outcomes (CLOs): After completion of this course, students will be able to

CLO1 Realize the concepts of ANN Algorithms.
CLO2 Realize the concepts of Fuzzy Logic.
CLO3 Realize the concepts of Genetic Algorithm.
CLO4 Apply soft computing (AI) techniques to real-world problems.

UNIT – I

Artificial Neural Networks: Introduction, Models of Neuron Network-Architectures – Knowledge representation, Artificial Intelligence and Neural networks–Learning process- Error correction learning, Hebbian learning–Competitive learning-Boltzman learning, supervised learning-Unsupervised learning–Reinforcement learning-Learning tasks.

ANN Paradigms: Multi-layer perceptron using Back propagation Algorithm (BPA), Self – Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network

UNIT – II

. **Fuzzy Logic:** Introduction –Fuzzy versus crisp, Fuzzy sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets –Fuzzy cartesion Product, Operations on Fuzzy relations –Fuzzy logic –Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

UNIT – III

Meta Heuristic techniques: Introduction Description of meta heuristics, Principle of population-based meta heuristics Principle of population-based meta heuristics, Genetic algorithm, Differential evolution, Evolutionary programming, Backtracking search optimization algorithm, Particle swarm optimization, Ant colony optimization, Artificial bee colony, Firefly algorithm, Teaching–learning-based optimization

UNIT – IV

Applications of AI Techniques: ANN applications to Load forecasting and frequency control in Single area system, Fuzzy logic application to PSS and Speed control of DC and AC Motors, Meta Heuristic applications to Economic load dispatch.

TEXT BOOKS:

1. S.Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms", PHI, New Delhi, 2003.
2. Chaturvedi, Devendra K, "Soft Computing Techniques and its Applications in Electrical Engineering", Springer, 2008. J

REFERENCE BOOKS:

1. Hassoun, "Fundamentals of Artificial Neural Networks", MIT Press, 2010.
2. Kosko, "Neural Networks and Fuzzy Systems", Pearson Education, 2007.
3. Samir Roy, Udit Chakraborty, "Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms", Pearson Education India, 1st edition, 2013.

NPTEL COURSE LINKS:

1. NPTEL :: Computer Science and Engineering - NOC:Introduction to Soft Computing
2. NPTEL :: Electronics & Communication Engineering - Neural Networks and Applications
3. NPTEL :: Electrical Engineering - NOC:Fuzzy Sets, Logic and Systems & Applications
4. NPTEL :: Mechanical Engineering - NOC:Traditional and Non-Traditional Optimization Tools

CLO PO and PSO mapping:

AI Applications to Electrical Engineering (20EE703/PE76)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Realize the concepts of ANN Algorithms.	2	2	3	-	2	-	-	-	2	-	-	2	-	-	-
CLO2	Realize the concepts of Fuzzy Logic.	2	2	3	-	2	-	-	-	2	-	-	2	-	1	-
CLO3	Realize the concepts of Genetic Algorithm.	2	-	3	-	2	-	-	-	2	-	-	2	2	-	-
CLO4	Apply soft computing (AI) techniques to real-world problems.	1	-	-	1	-	2	1	-	-	1	-	-	1	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

DIGITAL PROTECTION OF POWER SYSTEMS
IV B.Tech VII-Sem ester (Code:20EE703/PE77)

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

Prerequisites: Power system protection, Power System

Course Objectives: To make the students

CO1: Understand the advantages of digital relays over conventional relays.

CO2: Apply the suitable signal processing technique for protection.

CO3: Understand the adaptive criterion for relay decision making.

CO4: Identify the new developments in protective relaying and applications.

Course Outcomes: After completion of this course students will be able to

CLO1: Recognize the advantages of digital relays over conventional relays.

CLO2: Apply the suitable signal processing technique for protection.

CLO3: Understand the adaptive criterion for relay decision making.

CLO4: Identify the new developments in protective relaying and applications.

UNIT - I

Static and Digital Relays: Overview of Static relays, Transmission line protection, Transformer protection, Need for digital protection.

Digital Relays: Basic elements of a digital relay and their functions, signal conditioning subsystem, conversion subsystem, digital relay subsystem

UNIT -II

Signal processing techniques: Sinusoidal based algorithms, Fourier Analysis based algorithms, Least squares-based algorithm, Discrete Fourier Transforms, Wavelet Transforms, Kalman Filtering.

Digital filters: Fundamentals of Infinite Impulse Response Filters, Finite Impulse Response filters, Filters with sine and cosine windows. Travelling Wave Protection scheme, Digital Protection of Transformers.

UNIT-III

Decision making in Protective Relays: Deterministic decision making, Statistical Hypothesis testing, Decision making with multiple criterion, Adaptive decision schemes, Adaptive Differential protective scheme.

UNIT-IV

Applications: Applications of Fuzzy Logic and ANN for power system protection, Fault location algorithm, Wide Area Monitoring and Protection.

TEXT BOOKS:

1. Bhide S. R., “Digital Power System Protection”, Springer, 2009.
2. Waldemar Rebizant, Janusz Szafran and Andrzej Wiszniewski, “Digital Signal Processing in Power System Protection and Control”, Springer, 2011.
3. Arun G. Phadke, James S. Thorp, “Computer Relaying for power Systems”, Wiley India Pvt Ltd; Second edition, 2012.

REFERENCE BOOKS:

1. A.T. Johns and S.K. Salman, “Digital Protection for Power Systems”, Institution of Engineering and Technology, New Ed edition, 1995.
2. Badri Ram, D. N. Vishwakarma, “Power System Protection and Switchgear”, Tata Mc-Graw Hill, 2nd Edition, 2017.
3. T.S. Madhava Rao, “Power system protection Static relays”, Tata Mc-Graw Hill, 2nd Edition, 2017.

CLO PO and PSO mapping:

Digital Protection of Power System 20EE703/PE78		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Recognize the advantages of digital relays over conventional relays	3	2	2	-	-	-	-	-	-	-	-	-	3	2	2
CLO2	Apply the suitable signal processing technique for protection	3	3	2	-	2	-	-	-	-	-	-	-	3	2	2
CLO3	Understand the adaptive criterion for relay decision making	3	3	2	2	2	2	-	-	-	-	-	-	3	2	2
CLO4	Identify the new developments in protective relaying and applications	3	3	2	2	2	2	-	-	-	-	-	-	3	2	2

COMPUTER APPLICATIONS ON POWERSYSTEMS

IV B.Tech VII-Sem ester (Code:20EE703/PE78)

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

Prerequisites: Mathematics-I, Power System-II

Course Objectives: To make the students

CO1: To form incidence matrices and to prepare primitive impedance and admittance matrices with and without mutual coupling

CO2: To deal with the numerical methods studied in applied mathematics courses to get the solutions of load flow and comparison of different methods.

CO3: To teach the methods of mathematical formulation of complex power system and short circuit calculations.

CO4: To analyse the Contingency situations in the power system network

CO5: To understand the Transient Stability analysis of power system

Course Outcomes: Students will be able

CLO1: Acquire the knowledge of analysing power system network to get the primitive data with and without mutual coupling

CLO2: Develop proper mathematical models for analysis of a selected problem like load flow study or fault analysis.

CLO3: Identify the significance to conduct short circuit analysis of power system network for selection of protective devices

CLO4: Conduct contingency analysis.

CLO5: Identify transient stability problems in power system.

UNIT – I

Incidence & Network Matrices: Introduction to Graph Theory, Element-node incidence matrix - reduced incidence matrix or bus incidence matrix - basic loop incidence matrix - augmented loop incidence matrix - basic cut set incidence matrix - augmented cut set incidence matrix - branch path incidence matrix - concept of primitive network - primitive impedance and admittance matrices with and without mutual coupling - network performance equations - formation of network matrices using singular & nonsingular transformation.

UNIT – II

Formulation of Load Flow Problem: Introduction – nonlinear equations - Power Flow Solution Algorithms solution techniques using Gauss iterative, Gauss Seidal Power Flow Equations, Newton Raphson Load Flow Method, Fast Decoupled Load Flow Method and DC Load Flow Methods. AC-DC System Power Flow Analysis- Sequential and Simultaneous Solution Algorithms.

UNIT – III

Algorithm for formation of network matrices: Formation of bus admittance and bus impedance matrices and respective algorithms - modifications of bus impedance and admittance matrices for

changes in the networks with and without mutual coupling. Representation of three phase network elements for balanced and unbalanced systems.
Short Circuit studies: Short circuit calculations for symmetrical and unsymmetrical faults using Bus Impedance matrix.

UNIT – IV

Security Analysis: Basic Concepts, Static Security Analysis at Control Centers, Contingency Analysis, Importance of contingency analysis, Contingency Selection.
Formulation of Transient Stability Problem: Transient Stability Analysis of Multi-Machine Systems, Eigen Analysis of Dynamical Systems, Small Signal Stability Analysis using Classical Model. Flow chart for digital simulation of transient stability problem. Infinite bus using swing equation for the machine and incorporating excitation (IEEE, 1981) turbine and speed governor controls.

TEXT BOOKS:

1. Stagg, G.W. & El-Abiad, Computer methods in Power System Analysis, TMH,1988
2. L.P. Singh, Advanced Power System Analysis and Dynamics, New Age International Private Limited; 6th edition 2012.

REFERENCE BOOKS:

1. O.I.Elgerd, Electric Energy systems Theory, Tata McGraw-hill Publishing Company Ltd.,2nd ed., 46th reprint 2016
2. Anderson &Fouad, Power Systems Control and stability, Wiley-IEEE ***Press*,** 3rd edition 2019
3. Nagrath&Kothari, Modern power system analysis 4th edition, TMH 2011.
4. M.A. Pai,Computer Techniques in Power System Analysis, TMH 2017.
5. P. Kundur, Power System Stability & Control, 1st edition TMH 2006.
6. J.D. Glover, M.Sarma and T.J. Overbye, Power System Analysis and Design, CL Engineering; 4th edition 2007
7. James Momoh, "Smart Grid: Fundamentals of design and analysis", John Wiley & sons Inc, IEEE press 2012.

CLO PO and PSO mapping:

Computer Application on Power System (20EE703/PE78)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Acquire the knowledge of analysing power system network to get the primitive data with and without mutual coupling	3	2	2	2	-	-	-	-	3	-	-	-	3	-	3
CLO2	Develop proper mathematical models for analysis of a selected problem like load flow study or fault analysis.	3	2	3	2	2	-	-	-	2	-	-	-	3	-	2
CLO3	Identify the significance to conduct short circuit analysis of power system network for selection of protective devices	3	2	2	2	2	-	-	-	-	-	-	-	3	-	3
CLO4	Conduct contingency analysis.	3	2	2	2	2	-	-	-	-	-	2	-	3	-	3
CLO5	Identify transient stability problem in power system.	3	2	2	2	2	-	-	-	-	-	-	-	3	2	3

CYBER SECURITY

IV B.Tech – VII Semester (Code: 20EE704/JO71)

Lectures	2	Tutorial	0	Practical	2	Self-study	0	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Operating Systems, Computer Networks, Cryptography & Network Security

Course Objectives: To make the students

CO1: Learn the Installations of different Tools (VMWare, Kali Linux, Windows OS, Metasploitable2, Veil frame work and DVWA) concepts for hacking a system and gathering information of a system using metasploit frame work and meterpreter shell commands.

CO2: Undersatnd the Information Gathering tools and know how to perform cyber security attacks.

CO3: Know the Web application hijacking tools, mechanisms for cracking passwords and wireless network attacks

CO4: Learn how to detect/prevent intrusions in system by using snort and configuring firewall settings using IPtables, analyze the incident response concepts for identifying incidents in unix systems and analyze the disk.

Course Outcomes: By the end of the course the student will be able to

CLO-1: Install the different Tools (VMWare, Kali Linux, Windows OS, Metasploitable2, Veil frame work and DVWA), practice the hacking & gathering information of a system using metasploit frame work and meterpreter shell commands.

CLO-2: Understand and use the Information Gathering tools and cyber security attacks.

CLO-3: Test the Web application hijacking tools, Passwords Cracking and wireless network attacks.

CLO-4: Analyze the intrusions, Incidents and disk

.

Course Syllabus

UNIT – I

Installing & Basic Over View: Installing kali with VM ware player, updating kali, Installing VM ware Tools for Linux, installing Metasploit able 2, Installing Windows OS, Installing Veil frame work, Installing DVWA.

Metasploit Tutorial: Introduction to metasploit: Metasploit overview, picking an exploit, setting exploit options, Multiple Target types, picking a payload, Setting payload options, Running the exploit

Meterpreter Shell: Basic Meterpreter Commands, Core commands, File system Commands, Network Commands, System Commands, Capturing Webcam Video, Screen shots.

UNIT – II

Information Gathering & Mapping: Recon Tool, Dmitry, netdiscover, nmap, Zenmap, Nessus.
Viruses, malware, Trojan, Types **of cyber security attacks:** malware, phishing, SQL injection attack(sqlmap), cross-site scripting, denial of service, session hijacking and man-in-the middle attacks.

UNIT – III

Web application hijacking tools- Burp suite, OWASPZAP.

Web based password cracking Techniques: Introduction, Authentication Techniques, password cracking: definition, password cracking Tolls and techniques.

Wireless Network Attacks: Wireless Security Protocols, Using MacChanger to Change the Address (MAC) of your Wi-Fi Card**,** Fern WIFI Cracker, aircrack-ng**,** Wi-Fi Testing with WiFite**,** **Kismet:** Scanning with Kismet, Analysing the Data.

UNIT – IV

Troubleshooting and configuring of network devices: Firewalls-what is firewall, packet, traffic, protocol, port, tool: IPtables (rules), IDS and IPS: what is IDS and IPS, installation procedure for snort, snort rules.

Incident Response: What is IR, Need for IR, Goals of IR.?

IR Methodologies: Based on procedure: Phases of IR, Pre-incident Preparation, Detection and Analysis, Containment, Eradication and Recovery, Post Incident Activity. Based on Artifacts: Investigating Unix Systems.

Disk analysis: FTK imager.

TEXT BOOKS:

1. Basic Security Testing with Kali Linux -Daniel W. Dieterle
2. hacking exposed web applications - JOEL SCAMBRAY MIKE SHEMA

CLO PO and PSO mapping:

Cyber Security (20EE604/JO61)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Install the different Tools (VMWare, Kali Linux, Windows OS, Metasploitable2, Veil frame work and DVWA), practice the hacking & gathering information of a system using metasploit frame work and meterpreter shell				3		3					3	2			
CLO2	Understand and use the Information Gathering tools and cyber security attacks.				3		3					3	2			
CLO3	Test the Web application hijacking tools, Passwords Cracking and wireless network attacks				3		3					3	2			
CLO4	Analyze the intrusions, Incidents and disk.			3	3		3					3	2			

ANALOG VLSI

IV B.Tech – VII Semester (Code: 20EE704/JO72)

Lectures	2	Tutorial	0	Practical	2	Self-study	0	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Prerequisites: Nil

Course Objectives: To make the students

CO1: To understand various techniques of MOS fabrication process and basic electrical properties of MOS and Bi CMOS circuits.

CO2: To design and analyse basic MOS circuits by using stick diagram and MOSlayout with the help technology-based design rules

CO3: To design combinational and sequential circuits using MOS technology

CO4: To get introduced to various types of design flows like ASIC design Flow, FPGA, CPLD.

Course Outcomes: By the end of the course the student will be able to

CLO-1: Understand various MOS fabrication processes and basic electrical properties of MOS and BiCMOS circuits

CLO-2: Develop stick diagrams, layout diagrams for MOS circuits using design rules. Understand basic circuit concepts..

CLO-3: Design combinational and sequential subsystems using design rules.

CLO-4: Describe VLSI design flow, ASICs , PLD’s.

.

Course 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 Vt, Transconductance gm, Figure of merit, 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 and sequential logic). Design of an ALU subsystem.

UNIT – IV

VLSI design flow, Introduction to ASICs, Full Custom ASICs, and standard cell based ASICs, Gate array based ASICs, Programmable logic devices, ROM, PLAs, PALs, CPLDs and FPGAs.

TEXT BOOK:

1. B.C. Kuo, Automatic control systems, 9th edition, PHI
2. I. J. Nagrath& M Gopal, Control Systems Engineering, 3rd edition, New Age International.

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, 3rdedition, Prentice Hall, 1993.
4. K. Ogata, Modern Control Engineering, 3rdedition, PHI.
5. Control Systems Engineering, Norman S. Nise, 6thedition, Wiley, 2011.
6. Modern Control Systems,Richard C. Dorf and Robert H. Bishop,12thEdition, Prentice Hall,2011.

CLO PO and PSO mapping:

ANALOG VLSI (20EE704/JO72)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Understand various MOS fabrication processes and basic electrical properties of MOS and BiCMOS circuits				3		3					3	2			
CLO2	Develop stick diagrams, layout diagrams for MOS circuits using design rules. Understand basic circuit concepts.				3		3					3	2			
CLO3	Design combinational and sequential subsystems using design rules.			2	3		3					3	2			
CLO4	Describe VLSI design flow, ASICs , PLD’s.			3	3		3					3	2			

EMBEDED SYSTEMS

IV B.Tech – VII Semester (Code: 20EE704/JO73)

Lectures	2	Tutorial	0	Practical	2	Self-study	0	Credits	3
Continuous Internal Assessment				30		Semester End Examination (3 Hours)			70

Prerequisites: Problem-Solving with Programming, Microprocessors, and Microcontrollers.

Course Objectives (COs):

The main objectives of this course are:

CO1 : To impart basic design and architectural concepts of embedded systems & To Explain Keil µVision 4 IDE and RTX51concepts.

CO2 : To impart the concepts of Real-Time Operating Systems and provide the scheduling Algorithms & To Explain RTOS task scheduling, task synchronization, and task communication mechanisms.

CO3 : To provide fundamentals of prevalent IP-Core: ARM Cortex M3/M4 & Design of an embedded system using ARM Cortex Processor & To explain the concepts of ARM Cortex M3/M4 Processor.

CO4 : To explain instruction set of ARM Cortex M3/M4 processor and explain the ALP's using ARM processor & Explain the basic programming concepts ARM Processor.

Course Outcomes (CLOs): On successful completion of this course students will be able to:

CLO1 : Have a basic understanding of different methodologies and approaches in the design of embedded systems and basic understanding and exploring the features of Keil and RTX51 OS.

CLO2 : Understand the requirements, and concepts of Real-Time Operating systems for real-time task processing and Understand the concepts of RTOS algorithms for real-time task processing.

CLO3 : Analyze the basic concepts, architecture, memory management unit, and features of Embedded Processors & Basic understanding and exploring the features of ARM Cortex M3/M4 Processor

CLO4 : Understand the basic concepts of ARM instruction set and design the embedded applications & Understand and explore the simple assembly language programs using ARM Cortex M3/M4 processor.

SYLLABUS

UNIT - I

Embedded Systems Design: Introduction to Embedded System, categories of embedded system, specialties, and recent trends in Embedded System.

Architecture of an Embedded System: Hardware Architecture, Software Architecture, application Software, Communication Software, Development/Testing Tools.

UNIT - II

Overview of RTOS: Architecture of the Kernel, Tasks, Task scheduler, real-time tasks, Task scheduling, Interrupt Service Routine, Memory Management, Semaphores, Mutex, Mailboxes, Message Queues, Event Registers, Pipes.

Classification of scheduling algorithms: Clock driven Scheduling, Event-driven Scheduling, Resource sharing, Priority inversion problem, Deadlock.

UNIT - III

Embedded Processors: Introduction to ARM family, ARM Architecture - Pipeline, Registers, Operation modes, Big Endian and Little Endian. Cache Mechanism, Memory Management Unit.

UNIT – IV

ARM Instructions: ARM and Thumb Instruction Sets, Data Processing Instructions, Data Transfer Instructions, Control Flow Instructions, Basic Assembly Language Programs.

Case Study: Smart Phone, Digital Camera, and Automatic Washing Machine.

Practical Exercises

1. Exploring the features of Keil and RTX51(CO1)
2. Task Creation and Deletion using RTX51 in Keil(CO2)
3. Task scheduling using RTX51 in Keil (CO2)
4. Processing Critical Section using RTX51 in Keil (CO2)
5. Task Synchronization using RTX51 semaphores in Keil (CO2)
6. Task Communication using shared memory in Keil (CO2)
7. Task Communication using RTX51 mailbox in Keil (CO2)
8. Introduction to ARM Cortex M3 Processor (CO3)
9. ALP to multiply two 16-bit binary numbers (CO4)
10. ALP to find the sum of the first 10 integers. (CO4)
11. ALP to find the number of 0’s and 1’s in 32-bit data. (CO4)
12. ALP to determine whether the given 16-bit number is ODD or EVEN.(CO4)
13. ALP to write data in RAM(CO4)
14. Display Hello World message using Internal UART. (CO4)
15. Interface a Stepper motor and rotate it in clockwise and anti-clockwise direction.(CO4)

***Any Ten programs Compulsory.**

TEXT BOOK:

1. KVKK Prasad, “Embedded/Real Time Systems” Dream tech Press, 2005.
2. Andrew N. Sloss/ Dominic Symes/ Chris Wright, “ARM System Developer’s Guide Designing and Optimizing” Elsevier, 2004.

REFERENCE BOOKS:

1. Frank Vahid / Tony Givargis, "Embedded System Design A unified Hardware / Software Introduction" John Wiley & Sons, Inc.
2. Jonathan W Valvano, "Embedded Systems: Real-Time Operating Systems for ARM Corte-M Microcontrollers" Create Space, Volume 3, 5th Edition, 2019.

ONLINE SOURCES:

1. http://users.ece.utexas.edu/~valvano/
2. http://www.nptelvideos.in/2012/11/embedded-systems.html
3. https://developer.arm.com/ip-products/processors/cortex-m/cortex-m3

CLO PO and PSO mapping:

EMBEDED SYSTEMS (20EE704/JO73)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Have a basic understanding of different methodologies and approaches in the design of embedded systems and basic understanding and exploring the features of Keil and RTX51 OS.				3		3					3	2			
CLO2	Understand the requirements, and concepts of Real-Time Operating systems for real-time task processing				3		3					3	2			
CLO3	Analyze the basic concepts, architecture, memory management unit, and features of Embedded Processors				3		3					3	2			
CLO4	Understand the basic concepts of ARM instruction set and design the embedded applications			3	3		3					3	2			

METAHEURISTIC TECHNIQUES TO ELECTRICAL ENGINEERING

IV B.Tech – VII Semester (Code: 20EE705/JO74)

Lectures	2	Tutorial	0	Practical	2	Self-study	0	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Course Objectives: This course enables the students to know

CO1: **Introduction to** Metaheuristic Techniques **and software frame work**
CO2: Understand the Single-Solution Based and Population-Based Metaheuristics implementation
CO3: Design and implementing the Multi objective Optimum and hybrid metaheuristic approach.
CO4: Develop solution for electrical engineering problems

Course Outcomes (COs): By the end of the course the student would be able to

CLO1: Describe the concepts of Metaheuristic Techniques **and software frame work.**
CLO2: Write the formulations of Single-Solution Based and Population-Based Metaheuristics implementation
CLO3: Develop the various Multi objective Optimum and hybrid algorithm developments
CLO4: Solve and analyze the analyze Electrical Engineering using metaheuristic algorithms .

UNIT-I

Introduction to Metaheuristic Techniques

Introduction-decision making steps-classical optimization models and Methods-Applications of Metaheuristics- classification of metaheuristic- Common concepts for metaheuristic- Optimization using a meta-model- performance analysis of metaheuristics

Software Framework for Metaheuristics- Guidelines for solving a given optimization problem. main objectives of the used framework-limitations- set of modules

UNIT-II

Single-Solution Based Metaheuristics: Common Concepts- Neighborhood-Very Large Neighborhoods - Heuristic Search- Simulated Annealing- Tabu Search- Iterated Local Search

Population-Based Metaheuristics: Initial Population- Evolutionary Algorithms- Genetic Algorithms- Evolution Strategies-Evolutionary Programming-Genetic Programming- Selection Methods- Reproduction- Replacement Strategies- Swarm Intelligence-Ant Colony Optimization Algorithms- Other Population-Based Method-Bees Colony-Artificial immune systems

UNIT-III

Metaheuristics for Multi objective Optimization: Multi objective Optimization Problems- Main Design Issues of Multi objective Metaheuristic, Fitness Assignment Strategies- Scalar Approaches- Criterion-Based Methods- Dominance-Based Approaches- Indicator-Based Approaches.

Hybrid Metaheuristics: Design Issues - Implementation Issues - Combining Metaheuristics with Constraint Programming- Hybrid Metaheuristics with Machine Learning and Data Mining- Hybrid Metaheuristics for Multi objective Optimization

UNIT-IV

Applications of heuristic methods in Electrical Engineering: heuristic methods for unit commitment Problem-Particle Swarm Optimization-Economic Dispatch Based on Genetic Algorithms and Particle Swarm-Artificial Bee Colony Algorithm for Solving Optimal Power Flow.

Differential evolution in active power multi-objective optimal dispatch, Multi-Objective Model of Active Power Optimization for Wind Power Integrated Systems Load Flow Computation via Particle Swarm Optimization with Mutation Operation.

TEXT BOOKS:

1. 1.El-Ghazali Talbi, Metaheuristics from design to implementation John Wiley & Sons, Inc., Hoboken, New Jersey, 2009.(UNIT-I,II and III).
2. Kwang Y. Lee,Zita A. Vale applications of modern heuristic optimization methods in power and energy systems, wilay, IEEE Press,2020. (Unit-IV)

REFENCE BOOKS:

1. Sunith Bandarua , Kalyanmoy Debb, Metaheuristic Techniques, COIN Report Number 2016029 Decision Sciences: Theory and Practice, CRC Press, Taylor & Francis Group.
2. Sean Luke: Essentials of Metaheuristics, Lulu, second edition, 2013, available for free at http://cs.gmu.edu/~sean/book/metaheuristic
3. Coello C.A., van Veldhuizen D.A., Lamont, G.B.: Evolutionary Algorithms for Solving Multi objective Problems, Kluwer, 2002

ONLINE COURSES:

https://nptel.ac.in/courses/110/105/110105096/

CLO PO and PSO mapping:

Metaheuristic Techniques to Electrical Engineering (20EE705/JO74)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	POll	PO12	PSO1	PSO2	PSO3
CLO1	Introduction to Metaheuristic Techniques and software frame work	1	1	1		2								1	1	
CLO2	Understand the Single-Solution Based and Population-Based Metaheuristics implementation		3	1		2							1	2	2	3
CLO3	Design and implementing the Multi objective Optimum and hybrid metaheuristic approach.	2	2	3	1	3							1	2	2	3
CLO4	Develop solution for electrical engineering problems	2	2	1	1	1							1	2	2	

PROFESSIONAL COMMUNICATION

IV B.Tech – VII Semester (Code: 20EE705/JO75)

Lectures	2	Tutorial	0	Practical	2	Self-study	0	Credits	3
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

<u>Course Objectives</u>

The course will enable students to

1. Improve grammar, mechanics and writing style for clarity, concision, coherence and emphasis and increase knowledge of technical communication
2. Identify and understand the facets and functions of the primary genres of technical writing, reports, proposals and project reports
3. Define and identify different life skills required in professional life
4. Explain the basic mechanics of effective communication and demonstrate these through presentations.

<u>Course Outcomes</u>

The students will be able to

1. Use and apply writing skills in writing Technical reports, Project Proposals and make oral presentations of their findings
2. Develop strategies for addressing multiple audiences, expert and lay audiences.
3. Apply principles of cross cultural etiquette and build professional network
4. Demonstrate improved competency of Soft Skills required for the workplace

UNIT-I

<u>Preparing project reports</u>

Research methods- Abstract writing- background knowledge of the research topic-Literature review—Plagiarism- methodology- sampling- data collection and analysis- Integrate tables, figures, and other images into documents -presenting the findings- conclusion- preparing references- Appendices

UNIT-II

<u>Oral presentation of the Projects (Viva voce)</u>

Presentation and oral communication skills- presenting the findings of research- Maintaining audience orientation- body language- voice modulation- delivery of ideas

Unit III

<u>Life skills for professionals</u>

Understanding career management- Networking professionally- Mastering Cross Cultural Etiquette - Respecting social protocols- Developing a long term career plan- Making career choices

Unit IV

<u>Corporate Etiquette</u>

Power Dressing – Greeting – Introduction - Polishing Business Manners (Hand Shakes, Gifts, Humour, Office Behaviour) – The art of Small talk & Conversations - Dining Etiquette

TEXT BOOKS:

1. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India; 6 edition, 2015.
2. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1 edition, 2013.

REFERENCE BOOKS:

1. Butterfield Jeff, "Soft Skills for Everyone", Cengage Learning India Pvt Ltd; 1 edition, 2011.
2. Markel, Mike, Technical Communication (9th Edition) Boston: Bedford/St. Martin's, 2009.

CLO PO and PSO mapping:

Professional Communication (20EE705/JO75)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Use and apply writing skills in writing Technical reports, Project Proposals and make oral presentations of their findings								2		3	3	2	2	1	1
CLO2	Develop strategies for addressing multiple audiences, expert and lay audiences								2		3	3	2	2	1	1
CLO3	Apply principles of cross cultural etiquette and build professional network								3	2	3	2	2	2	1	1
CLO4	Demonstrate improved competency of Soft Skills required for the workplace								3	2	3	2	2	2	1	1

INUSTRIAL MANAGEMENT & ENTREPRENEUR SHIP DEVELOPMENT

IV B.Tech – VII Semester (Code: 20EE706)

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

Course Objectives:

1. To provide students an insight into the concepts of general, scientific management and various forms of business organizations along with awareness about various organization structures
2. It aims to provide the students with an understanding of basics of human resource management, marketing management.
3. To make the students to understand inventory control concepts, fundamentals of TQM, and supply chain management.
4. To provide an understanding of financial management and realize the importance of Entrepreneurship.

Course Outcomes:

Student will be able to

1. Describe the various functions of the management. Learn various forms and structures of business organizations.
2. Understand how resources to be planned and also understand various motivation theories, leadership styles and marketing management.
3. Develop knowledge about inventory control. Gain the knowledge on Total quality management and understand supply chain management.
4. Grasp complete knowledge on importance of entrepreneurship and ability to understand capital and various types of capital.

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; Merits and demerits. **Organization**: Definition, Line, line and staff, functional and matrix organization **Introduction to Strategic Management:** Definition and scope

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, objectives of inventory control, Inventory costs, Basic EOQ model, Model with Price breaks, ABC analysis, FSN Analysis, VED Analysis.

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

Introduction to Supply Chain Management: Definition, scope of SCM, Drivers of SCM, Advantages, limitations

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.
2. Manufacturing Organization and Management / Amrine / Pearson Education

REFERENCE BOOKS:

1. Management Science, A. R. Aryasri.
2. Industrial Engineering and production management by M Mahajan, Dhanapatrai Publications
3. Marketing Management, Philip Kotler.

CLO PO and PSO mapping:

Industrial Management & Entrepreneur Ship Development (20EE706)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	Describe the various functions of the management. Learn various forms and structures of business organizations.									1	2	3				1
CLO2	Understand how resources to be planned and also understand various motivation theories, leadership styles and marketing management.						2			3		1				1
CLO3	Develop knowledge about inventory control. Gain the knowledge on Total quality management and understand supply chain management.									3	2	1	2			1
CLO4	Grasp complete knowledge on importance of entrepreneurship and ability to understand capital and various types of capital.	2	3	2	3			2								

INUSTRIAL AUTOMATION

IV B.Tech – VII Semester (Code: 20EEL701/SO05)

Lectures	1	Tutorial	0	Practical	2	Self-study	0	Credits	2
Continuous Internal Assessment				30	Semester End Examination (3 Hours)				70

Course Objectives:

1. The functionality of the basic elements of industrial automation systems
2. The fundamental principles of operation of numerous instruments and machines.
3. The various control techniques employed in process automation including programmable logic controllers.
4. The substantial applications of automation systems and analyze real-life problems from an automation perspective based on engineering and cost-oriented thinking.

Course Outcomes:

Student will be able to

1. Illustrate the architecture of automation system for supervisory control of an industrial process.
2. Identify the suitable control technique to control a given process for achieving desired response.
3. Illustrate the organization of programmable logic controller to familiarize numerous control modules in physical environment.
4. Choose an appropriate electric drive for an industrial application based on drive characteristics.

UNIT – I

Introduction to Industrial Automation & Control

Introduction to Industrial Automation and Control: Introduction to industrial automation and control architecture of industrial automation system, measurement systems specifications, temperature measurement, pressure and force measurement, displacement and speed measurement, signal conditioning circuits, errors and calibration.

UNIT – II

Process Control

Process control: Introduction to process control, PID control, controller tuning, implementation of PID controllers, special control structures, feed forward and ratio control special control structures: predictive control, control of systems with inverse response.

UNIT – III

Programmable Logic Control Systems:

Programmable logic control systems: introduction to sequence or logic control and programmable logic controllers, the software environment and programming of PLCs, formal modeling of sequence control

specifications. Programming, programming of PLCs: sequential function charts, the PLC hardware environment.

UNIT – IV

Electrical Machine Drives: Electrical machine drives: Energy savings with variable speed drives, step motors: principles, construction and drives, electrical actuators, DC motor drives, electrical actuators: induction motor drives, electrical actuators, BLDC motor drives.

TEXT BOOKS:
1.Madhu Chanda Mitra, Samarjit Sen Gupta, “Programmable Logic Controllers and Industrial Automation: An Introduction”, Penram International Publishing (India) Pvt. Ltd., 1st Edition, 2008.
2.K Krishnaswamy, S Vijayachitra, “Industrial Instrumentation”, New Age Publications, 1st Edition, 2010.

REFERENCE BOOKS:

1.AK Gupta, S K Arora, “Industrial Automation and Robotics”, Laxmi Publications, 2nd Edition, 2013.
2. Jon Stenerson, “Industrial Automation and Process Control”, Prentice Hall, 1st Edition, 2002.

Web References:
1. ttps://www.google.co.in/search?q=introduction+to+industrial+automation+and+control&ie=utf-8&oe=utf-8&client=firefox-b-ab&gfe_rd=cr&ei=puocwoxvl67v8wekwzngaw
2. https://www.noorropidah.files.wordpress.com/2012/01/plc-1-3.pdf
3. https://www.radix.co.in/families/automation?gclid=cjfw24pbjtacfuyeaaodicqghq

Notes