R20 COURSE STRUCTURE AND SYLLABUS

For

B. Tech

ELECTRICAL AND ELECTRONICS ENGINEERING

(*Applicable for batches admitted from 2021-22*)

PRAGATIENGINEERINGCOLLEGE

(AUTONOMOUS)

Permanently Affiliated to JNTUK, Kakinada, Accredited by NAAC with "A" Grade
Recognized by UGC 2(f) and 12(b) under UGC
act,1956#1-378,ADBRoad,Surampalem 533437
Near Peddapuram, E.G.Dist, Andhra Pradesh

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

Vision of the Institute:
To emerge as a Premier Institution for Technical Education in the Country through Academic Excellence and to be recognized as a Centre for Excellence in Research & Development, catering to the needs of our Country.

Mission of the Institute:
To realize a strong Institution by consistently maintaining State-of-art-infrastructure and building a cohesive, World Class Team and provide need based Technical Education, Research and Development through enhanced Industry Interaction.

Vision of the Department:
To excel in Engineering Education and Research, inculcating professional and social ethics among the students through academic excellence in the field of Electrical & Electronics Engineering.

Mission of the Department:
M1: To impart quality Technical Education with good infrastructure for students to make them globally competent and technically strong.
M2: To collaborate with industries and academic institutions to enhance creativity and innovation with professional and ethical values.
M3: To motivate faculty and students to do impactful research on societal needs and to build team work among them.

Program Educational Objectives (PEOs):

PEO1
To produce graduates with a strong foundation in the Basic Sciences, Mathematics, Computing and core knowledge in Electrical and Electronics Engineering through high quality Technical Education.
PEO2
To prepare graduates for successful and productive engineering careers, with emphasis on technical competency and with an attention to serve the needs of core and associated sectors by developing novel products and solutions for the real-time problems in a socio-economic way.
PEO3
To inculcate ethical attitude, honing effective communication skills and managerial skills to work in a multidisciplinary environment as a technocrat/administrator/entrepreneur and to acquire the knowledge for pursuing advanced degrees in Engineering, Science, Management, Research and Development.

Program Outcomes (POs):

1. Engineering Knowledge: Apply the knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem Analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of Mathematics, Natural Sciences, and Engineering Sciences.

3. 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.

4. Conduct Investigations of Complex 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.

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

6. 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.

7. 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.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

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

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

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

12. 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 (PSOs):

Engineering Students will be able to:

PSO1: Apply the concepts of Power Systems, Power Electronics and utilization of Renewable Energy in implementation of interdisciplinary projects.

13. PSO2: Acquire the knowledge of Electrical and Electronics Engineering to participate in national and international competitive examinations for successful higher studies and employment.

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PEO3

To inculcate ethical attitude, honing effective communication skills and managerial skills to work in a multidisciplinary environment as a technocrat/administrator/entrepreneur and to acquire the knowledge for pursuing advanced degrees in Engineering, Science, Management, Research and Development.

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5. Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. 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.
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AUTONOMOUS COLLEGES OF JNTUK
COMMON ACADEMIC REGULATIONS (R20) FOR B. TECH PROGRAMME
(Applicable for from the Academic Year 2020-21)

1. Award of B. Tech. Degree

(a) A student will be declared eligible for the award of B. Tech. Degree if he fulfils the following academic regulations:
   (i) A student shall be declared eligible for the award of B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years. After eight academic years from the year of their admission, he/she shall **forfeit** their seat in B. Tech course and their admission stands cancelled.
   (ii) The candidate shall register for 160 credits and secure all the 160 credits.

(b) The medium of instruction for the entire under graduate programme in Engineering & Technology will be in **English** only.

2. Programme Pattern:

a) Total duration of the of B. Tech (Regular) Programme is four academic years
b) Each Academic year of study is divided into **Two Semesters**.
c) Minimum number of instruction days in each semester is 90.
d) Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).
e) The total credits for the Programme is 160.
f) Three week induction program is mandatory for all first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.
g) Student is introduced to "Choice Based Credit System (CBCS)".
h) A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering (total five skill courses: two basic level skill courses, one on soft skills and other two on advanced level skill courses)
i) A student has to register for all courses in a semester.
j) All the registered credits will be considered for the calculation of final CGPA.
k) Each semester has - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.
l) A 10 months industry/field mandatory internship, both industry and social, during the summer vacation and also in the final semester to acquire the skills required for job and make engineering graduates to connect with the needs of the industry and society at large.
m) All the students shall be mandatorily registered for NCC, NSS activities and Community Service Project as per the Government and University norms.
n) Each college shall assign a faculty advisor/mentor after admission to each student or group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/GATE/other competitive exams etc.

3. Registration for Courses:

a) In each semester a student shall mandatorily register courses which he/she wishes to pursue within a week from the starting of the class work with the advice of Head of the Department and mentor of the student of the concerned department of the college.
b) If any student wishes to withdraw the registration of the course, he/she shall submit a letter to the Principal of the college through the Head of the Department and mentor within fifteen days.

c) The concerned college shall thoroughly verify and upload the data/courses registered by each student in the university examination center within 20 days. The Principal of the concerned college shall ensure that there no wrong registration courses by the student. The university registration portal will be closed after 20 days.

4. **(a) Award of B. Tech. Degree:** A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations:
   i. A student shall be declared eligible for award of the B. Tech Degree, if he pursues a course of study in not less than four and not more than eight academic years. After eight academic years from the year of their admission, he/she shall **forfeit** their seat in B. Tech course and their admission stands cancelled.
   ii. The student shall register for 160 credits and must secure all the 160 credits.
   iii. All students shall mandatorily register for the courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure at least 40% of the marks allotted in the internal evaluation for passing the course and shall maintain 75% of attendance in the subject.
   iv. All students shall mandatorily register for NCC/NSS activities and will be required to participate in an activity specified by NSS officer during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.
   v. Credits are defined as per AICTE norms.

   (b) Award of B. Tech. (Honor)/B. Tech. (Minor)**:** B. Tech. with Honors or a B. Tech. with a Minor will be awarded if the student earns 20 additional credits are acquired as per the regulations/guidelines. The regulations/guidelines are separately provided. Registering for an Honors/Minor is optional.

5. **Attendance Requirements**
   a) A student is eligible to write the University examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the subjects.
   b) Condonation of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) may be granted by the College Academic Committee. However, this condonation concession is applicable only to any two semesters during the entire programme.
   c) Shortage of Attendance below 65% in aggregate shall not be condoned.
   d) A student who is short of attendance in a semester may seek re-admission into that semester when offered within 4 weeks from the date of commencement of class work.
   e) Students whose shortage of attendance is not condoned in any semester are not eligible to write their end semester examination of that class.
   f) A stipulated fee of Rs. 500/- in the concerned semester shall be payable towards condonation of shortage of attendance. Students availing condonation on medical ground shall produce a medical certificate issued by the competitive authority.
   g) A student will be promoted to the next semester if he satisfies the (i) attendance requirement of the present semester and (ii) minimum required credits.
   h) If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
   i) For induction programme attendance shall be maintained as per AICTE norms.
   j) For non-credit mandatory courses the students shall maintain the attendance similar to credit courses

6. **Evaluation-Distribution and Weightage of marks**

   (i) Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the University Examination section from time to time.

   (ii) To maintain the quality, external examiners and question paper setters shall be selected from reputed institutes like IISc, IITs, IIITs, IISERs, NITs and Universities.

   (iii) For non-credit mandatory courses, like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the

marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

(iv) A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/ project etc by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the sum total of the internal marks and end semester examination marks together.

(v) Distribution and Weightage of marks:

The assessment of the student's performance in each course will be as per the details given:

S. No	Components	Internal	External	Total
1	Theory	30	70	100
2	Engineering Graphics/Design/Drawing	30	70	100
3	Practical	15	35	50
4	Mini Project/Internship/Industrial Training/ Skill Development programmes/Research Project	-	50	50
5	Project Work	60	140	200

(vi) Continuous Internal Theory Evaluation:

a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one online objective examination (20 multiple choice questions) for 10 marks for a duration of 20 minutes (ii) one descriptive examination (3 full questions for 5 marks each) for 15 marks for a duration of 90 minutes and (iii) one assignment for marks. All the internal exams shall be conducted as per university norms from first 50% of the syllabi.

b) In the similar lines, the second online, descriptive examinations assignment shall be conducted on the rest of the 50% syllabus.

c) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The first mid marks (Mid-1) consisting of marks of online objective examination, descriptive examination and assignment shall be submitted to the University examination section within one week after completion of first mid examination.

d) The mid marks submitted to the University examination section shall be displayed in the concerned college notice boards for the benefit of the students.

e) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of university examination section within one week from the submission.

f) Second mid marks (Mid-2) consisting of marks of online objective examination, descriptive examination and assignment shall also be submitted to University examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of university examination section within one week from the submission.

g) Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for other mid exam.

Example:

Mid-1 marks = Marks secured in (online examination-1+descriptive examination-1 +one assignment-1)

Mid-2 marks = Marks secured in (online examination-2+descriptive examination-2 +one assignment-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

h) With the above criteria, university examination section will send mid marks of all subjects in consolidated form to all the concerned colleges and same shall be displayed in the concerned college notice boards. If any discrepancy found, it shall be brought to the notice of university examination section through proper channel within one week with all proofs. Discrepancies brought after the given deadline will not be entertained under any circumstances.

(vii) Semester End Theory Examinations Evaluation:

a) The semester end examinations will be conducted university examination section for 70 marks consists of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.
b) For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows: day to day work - 5 marks, Record-5 marks and the remaining 5 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner appointed.
c) For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester for 15 marks each and final marks can be calculated with 80% weightage for better of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work.
d) Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 6 weeks. The student shall register for the course as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the University. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department. A certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the University.
e) The job oriented skill courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner (course instructor or mentor). There are no internal marks for the job oriented skill courses.
f) Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.
g) **Procedure for Conduct and Evaluation of MOOC:** There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint

one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be pass.

h) *Major Project (*Project - Project work, seminar and internship in industry):
In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.
Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks.

7. Results Declaration:
(i) Before results declaration, an academic council meeting shall be conducted and results shall be placed before the academic council for approval.
(ii) With the approval of academic council, the results shall be submitted to the University to get the approval from Honorable Vice-Chancellor.
(iii) The University may normalize the result, if required, before declaration of the result (Guidelines for normalization will be provided separately)
(iv) A copy of approved results in a CD shall be submitted to the University examination Center.

8. Academic Audit: Academic audit in each semester will be conducted as per norms.

9. Recounting or Re-evaluation of Marks in the End Semester Examination: A student can request for recounting of revaluation of his/her answer book on payment of a prescribed fee as per university norms.

10. Supplementary Examinations: A student who has failed to secure the required credits can appear for a supplementary examination, as per the schedule announced by the University.

11. Malpractices in Examinations: Disciplinary action shall be taken in case of malpractices during Mid/End examinations as per the rules framed by the University.

12. Promotion Rules
The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.5 for promotion to higher classes

a) A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per University norm.
b) A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to either II year I-Semester or II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
c) A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

13. Course Pattern
a) The entire course of study is for four academic years; all years are on semester pattern.

b) A student eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.
c) When a student is detained for lack of credits / shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

14. Earning of Credit:

A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range A+ to E as given below. Letter grade 'F' in any course implies failure of the student in that course and no credits earned. Absent is also treated as no credits earned. For project same % percentages will be followed for grading.

Marks Range Theory (Max – 100)	**Marks Range Lab (Max – 50)**	**Level**	**Letter Grade**	**Grade Point**
≥ 90	≥ 45	Outstanding	A+	10
≥80 to <89	≥40 to <44	Excellent	A	9
≥70 to <79	≥35 to <39	Very Good	B	8
≥60 to <69	≥30 to <34	Good	C	7
≥50 to <59	≥25 to <29	Fair	D	6
≥40 to <49	≥20 to <24	Satisfactory	E	5
<40	<20	Fail	F	0
-		Absent	AB	0

15. 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 shall be placed in one of the following four classes:

Class Awarded	CGPA to be secured	Remarks
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)	From the CGPA secured from 160 Credits
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 5.00 to < 5.75	

16. Minimum Instruction Days

The minimum instruction days for each semester shall be 90 working days. There shall be no branch transfers after the completion of the admission process. There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Kakinada.

17. Withholding of Results

If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

18. Transitory Regulations

a) Discontinued or detained candidates are eligible for re-admission as and when next offered.
b) The re-admitted candidate will be governed by the rules & regulations under which the candidate has been admitted.
c) (i) In case of transferred students from other Universities, credits shall be transferred to JNTUK as per the academic regulations and course structure of JNTUK.
d) The students seeking transfer to colleges affiliated to JNTUK from various other Universities / Institutions have to obtain the credits of any equivalent subjects as prescribed by JNTUK. In addition, the transferred candidates have to pass the failed subjects at the earlier Institute with already obtained internal/sessional marks to be conducted by JNTUK.

19. 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 I/II/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at university level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

20. General

a) Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

b) The academic regulation should be read as a whole for the purpose of any interpretation.

c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

d) The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

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ACADEMIC REGULATIONS (R19) FOR B. TECH. (LATERAL ENTRY SCHEME)

Applicable for the students admitted into II year B. Tech. from the Academic Year 2020-21 onwards

1 **Award of B. Tech. Degree**

A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations:

a) A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years. After six academic years from the year of their admission, he/she shall **forfeit** their seat in B. Tech course and their admission stands cancelled.

b) The candidate shall register for 121 credits and secure all the 121 credits.

2. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech (lateral entry).

3. **Promotion Rules**

A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.

A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

4. **Award of Class**

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

Class Awarded	CGPA to be secured	Remarks
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)	From the CGPA secured from 121 Credits from II Year to IV Year
First Class	≥ 6.75	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 5.00 to < 5.75	

The Grades secured, Grade points and Credits obtained will be shown separately in the memorandum of marks.

5. All the other regulations as applicable to **B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)**

COMMUNITY SERVICE PROJECT

Introduction

1. Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
2. Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
3. Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

1. To sensitize the students to the living conditions of the people who are around them,
2. To help students to realize the stark realities of the society.
3. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
4. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
5. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
6. To help students to initiate developmental activities in the community in coordination with public and government authorities.
7. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

1. Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
2. Each class/section should be assigned with a mentor.
3. Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
4. A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
5. The log book has to be countersigned by the concerned mentor/faculty in charge.
6. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
7. The final evaluation to be reflected in the grade memo of the student.
8. The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
9. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
10. Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

1. A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.

2. The Community Service Project is a twofold one –

a) First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.

b) Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –

- Agriculture
- Health
- Marketing and Cooperation
- Animal Husbandry
- Horticulture
- Fisheries
- Sericulture
- Revenue and Survey
- Natural Disaster Management
- Irrigation
- Law & Order
- Excise and Prohibition
- Mines and Geology
- Energy
- Internet
- Free Electricity
- Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

1. Positive impact on students' academic learning
2. Improves students' ability to apply what they have learned in "the real world"
3. Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
4. Improved ability to understand complexity and ambiguity

Personal Outcomes

1. Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
2. Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

1. Reduced stereotypes and greater inter-cultural understanding
2. Improved social responsibility and citizenship skills
3. Greater involvement in community service after graduation

Career Development

1. Connections with professionals and community members for learning and career opportunities
2. Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

1. Stronger relationships with faculty
2. Greater satisfaction with college
3. Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

1. Satisfaction with the quality of student learning
2. New avenues for research and publication via new relationships between faculty and community
3. Providing networking opportunities with engaged faculty in other disciplines or institutions
4. A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

1. Improved institutional commitment
2. Improved student retention
3. Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

1. Satisfaction with student participation
2. Valuable human resources needed to achieve community goals
3. New energy, enthusiasm and perspectives applied to community work
4. Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water

29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilization of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

Programmes for School Children

1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Womens' Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharat
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga

4. Tree plantation
5. Programmes in consonance with the Govt. Departments like –
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law & Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

Role of Students:

1. Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
2. For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
3. As and when required the College faculty themselves act as Resource Persons.
4. Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
5. And also, with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
6. An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**
    a) A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
    b) A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
    c) The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.
2. ***Community Awareness Campaigns (Two Weeks)***
    Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.
3. ***Community Immersion Programme (Four Weeks)***
    Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.
4. ***Community Exit Report (One Week)***

During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject 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 candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate 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 subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	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 subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	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 clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects 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 will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action and impose suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions: (if the squad reports that the college is also involved in encouraging malpractices)
   - (i) A show because notice shall be issued to the college.
   - (ii) Impose a suitable fine on the college.
   - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

* * * * *

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA - 533 003, Andhra Pradesh, India
For Constituent Colleges and Affiliated Colleges of JNTUK

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PRAGATIENGINEERINGCOLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

I Semester

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BS&H	20HE1T01	Professional communicative English	3	0	0	3
2	BS&H	20BM1T01	Differential Equations and Numerical methods	3	0	0	3
3	BS&H	20BM1T02	Linear Algebra and Partial Differential Equations	3	0	0	3
4	ME	20ME1T02	Engineering Drawing	1	0	4	3
5	CSE	20CS1T01	Programming for Problem Solving using C	3	0	0	3
6	BS&H	20HE1L01	Professional communicative English Laboratory	0	0	3	1.5
7	EEE	20EE1L02	Electrical engineering workshop	0	1	3	1.5
8	CSE	20CS1L01	Programming for Problem Solving using C Laboratory	0	0	3	1.5
				Total Credits			**19.5**

II Semester

Sl.No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BS&H	20BM2T03	Transforms and Vector calculus	3	0	0	3
2	BS&H	20BP2T02	Applied Physics	3	0	0	3
3	CSE	20CS2T02	Data structures Through C	3	0	0	3
4	EEE	20EE2T02	Electrical circuit Analysis-I	3	0	0	3
5	CE&ME	20ME2T03	Basic Civil and Mechanical Engineering	3	0	0	3
6	CE&ME	20ME2L02	Basic Civil and Mechanical Engineering Laboratory	0	0	3	1.5
7	BS&H	20BP2L02	Applied Physics Laboratory	0	0	3	1.5
8	CSE	20CS2L02	Data structures Through C Laboratory	0	0	3	1.5
9	BS&H	20HM2T05	Constitution of India	2	0	0	0
				Total Credits			**19.5**

II Year I Semester

Sl.No.	Category	Course Code	Course Title	L	T	P	Credits
1	BSC	20BM3T04	Complex Variables and Statistical Methods	3	0	0	3
2	ESC	20EC3T05	Electronic Devices and Circuits	3	0	0	3
3	PCC	20EE3T04	Electrical Circuit Analysis ŀI	3	0	0	3
4	PCC	20EE3T05	Transformers And DC Machines	3	0	0	3
5	PCC	20EE3T06	Electro Magnetic Fields	3	0	0	3
6	PCC	20EE3L04	Electrical Circuits Laboratory	0	0	3	1.5
7	PCC	20EE3L05	Transformers And DC Machines Laboratory	0	0	3	1.5
8	ESC	20EC3L02	Electronic Devices and Circuits Laboratory	0	0	3	1.5
9	SOC	20EE3S01	Design of Electrical Circuits using Engineering Software Tools	0	0	4	2
10	MC	20HM3T07	Professional Ethics & Human Values	2	0	0	0
11	PROJECT	20EE3P01	Community Service Project	0	0	0	4
Total Credits							**25.5**

II Year II Semester

Sl.No.	Category	Course Code	Course Title	L	T	P	Credits
1	ESC	20CS4T03	Python Programming	3	0	0	3
2	ESC	20EC4T11	Digital Electronics	3	0	0	3
3	PCC	20EE4T07	Power System-I	3	0	0	3
4	PCC	20EE4T08	Induction and Synchronous Machines	3	0	0	3
5	HSC	20HM4T01	Managerial Economics & Financial Analysis	3	0	0	3
6	ESC	20CS4L03	Python Programming Laboratory	0	0	3	1.5
7	PCC	20EE4L07	Induction and Synchronous Machines Laboratory	0	0	3	1.5
8	ESC	20EC4L06	Digital Electronics Laboratory	0	0	3	1.5
9	SOC	20EC4S03	IoT Applications of Electrical Engineering	0	0	4	2
10	MC	20BE4T01	Environmental Science	2	0	0	0
Total Credits							**21.5**
Internship 2 Months (Mandatory) during summer vacation							

PRAGATIENGINEERINGCOLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

Course Structure of R-20 Regulation

III Year I Semester

Sl.No.	Dept	Course Code	Course Title	L	T	P	Credits
1	PCC	20EE5T09	Power Systems-II	3	0	0	3
2	PCC	20EE5T10	Power Electronics	3	0	0	3
3	PCC	20EE5T11	Control Systems	3	0	0	3
Open Elective- I/Job Oriented Elective-I							
4	OEC	20CE5T01	Surveying	3	0	0	3
		20ME5T21	Operations Research				
		20EC5T15	Principles of Communication Engineering				
		20AM5T04	Deep Learning				
		20HM5T03	Entrepreneurship				
Professional Elective –I							
5	PEC	20EC5T12	Linear IC Applications	3	0	0	3
		20EE5T12	Utilization of Electrical Energy				
		20EC5T18	Computer Architecture and Organization				
		20ME5T29	Optimization Techniques				
6	PCC	20EE5L08	Control Systems Laboratory	0	0	3	1.5
7	PCC	20EE5L09	Power Electronics Laboratory	0	0	3	1.5
8	SOC	20HE5S01	Soft skills and interpersonal communication	1	0	2	2
9	#PROJ	20EE5I01	Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)	0	0	0	1.5
Total Credits				**21.5**			
Minors Course*/Honors Course*				4	0	0	4

PRAGATIENGINEERINGCOLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II Semester

Sl.No.	Dept	Course Code	Course Title	L	T	P	Credits
1	PCC	20EC6T24	Microprocessors and Microcontrollers	3	0	0	3
2	PCC	20EE6T14	Electrical Measurements and Instrumentation	3	0	0	3
3	PCC	20EE6T15	Power System Analysis	3	0	0	3
Professional Elective –II							
4	PEC	20EC6T25	Signal and Systems	3	0	0	3
		20EE6T16	Electric Drives				
		20EE6T17	Advanced Control Systems				
		20EE6T18	Power System Operation and Control				
Open Elective–II/Job Oriented Elective-II							
5	OEC	20CE6T35	Disaster Management	3	0	0	3
		20ME6T25	Introduction to Automobile Engineering				
		20EC6T26	Sensors and Transducers				
		20CS6T15	Computer Forensics				
6	PCC	20EE6L10	Electrical Measurements and Instrumentation Laboratory	0	0	3	1.5
7	PCC	20EC6L08	Microprocessors and Microcontrollers Laboratory	0	0	3	1.5
8	PCC	20EE6L11	Power Systems and Simulation Laboratory	0	0	3	1.5
9	SOC	20AM6S03	Skill Advanced Course: Machine Learning with Python-I	1	0	2	2
10	MC	20HM6T10	Research Methodology	2	0	0	0
Total Credits				**21.5**			
Minors Course*/Honors Course*				4	0	0	4
Industrial/ ResearchInternship2 Months (Mandatory) after third year (to be evaluated during VII Semester)							

PRAGATIENGINEERINGCOLLEGE: SURAMPALEM
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III Year I Semester

Sl.No.	Dept	Course Code	Course Title	L	T	P	Credits
Professional Elective –III							
1	PEC	20EC7T30	Digital Signal Processing	3	0	0	3
		20EE7T20	Renewable and Distributed Energy Technologies				
		20EE7T21	Flexible AC Transmission Systems				
		20EE7T22	Power Systems Deregulation				
Professional Elective –IV							
2	PEC	20EE7T23	Hybrid Electric Vehicles	3	0	0	3
		20EE7T24	High Voltage Engineering				
		20EE7T25	Programmable Logic Controllers and Applications				
		20CS7T12	Cloud Computing				
Professional Elective –V							
3	PEC	20EE7T26	Switchgear and Protection	3	0	0	3
		20EE7T27	Switched Mode Power Conversion				
		20EE7T28	AI Applications to Electrical Engineering				
		20DS7T11	Data Science				
Open Elective-III/Job Oriented Elective-III							
4	OEC	20CE7T11	Highway Engineering	3	0	0	3
		20ME7T28	Additive Manufacturing				
		20EC7T40	Industrial Electronics				
		20DS7T02	Big Data Analytics				
		20HM7T09	Organizational behavior				
Open Elective-IV/Job Oriented Elective-IV							
5	OEC	20CE7T18	Water resource engineering	3	0	0	3
		20ME7T38	Sustainable Energy Technologies				
		20EC7T41	Biomedical Instrumentation				
		20IT7T10	Cryptography and network security				
		20HM7T04	Marketing Management				
6	HSMC	20HM7T11	UniversalHumanValues-2: Understanding Harmony	3	0	0	3
7	SOC	20AM7S04	Skill Advanced Course Machine Learning with Python-II	1	0	2	2
8	#PROJ	20EE7I02	Industrial/ Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII Semester)	0	0	0	3
Total Credits				**23**			
Minors Course*/Honors Course*				4	0	0	4

PRAGATIENGINEERINGCOLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year II Semester

Sl.No.	Dept		Course Title	L	T	P	Credits
1	Major Project	20EE8P02	Project work, seminar and internship in industry (6Months)	--	--	--	8
Total Credits				**8**			

HSMC : Humanities and Social Science Including Management Courses
BSC : Basic Science Courses
ESC : Engineering Science Courses
PCC : Professional Core Courses
PEC : Professional Elective Courses
OEC : Open Elective Courses
PROJ : Internship, Seminar, Project Wok
MC : Mandatory Courses
SC : Skill Oriented Course

< Professional Communicative English >

<Common to CE, EEE, MECH, ECE, CSE, CSE (DS), CSE (AI&ML), & IT >

The following textbooks are recommended for study in I B.Tech I Semester (Common for all branches) of Pragati Engineering College, Surampalem from the academic year 2020-21 (R-20 Regulations)

DETAILED TEXTBOOK:

- **PROFESSIONAL COMMUNICATIVE ENGLISH** *Published by Maruthi Publishers.*

NON-DETAILED TEXTBOOK:

- ***PANORAMA: A COURSE ON READING****, Published by Oxford University Press India*

The course content, along with the study material, is divided into six units.

UNIT 1:

1. 'The Greatest Resource- Education' from Professional Communicative English.

Objective: Schumacher describes the education system by saying that it was mere training, something more than knowledge of facts.
Outcome: Underscores that the ultimate aim of Education is to enhance wisdom.
2. 'War' from 'Panorama: A Course onReading'
Objective: To develop extensive reading skill and comprehension for pleasure and profit.
Outcome: Acquisition of LSRW skills

UNIT 2:

1. ' A Dilemma' from Professional Communicative English.
Objective: The lesson centres on the pros and cons of the development of science and technology.
Outcome: Enables the students to promote peaceful co-existence and universal harmony among people in society.
2.'The Verger' from 'Panorama: A Course on Reading'
Objective: To develop extensive reading skill and comprehension for pleasure and profit.
Outcome: Acquisition of LSRW skills

UNIT 3:

1. 'Cultural Shock': Adjustments to new Cultural Environments from Professional Communicative English.
Objective: Depicts of the symptoms of Cultural Shock and the aftermath consequences
Outcome: Enables the students to manage different cultural shocks due to globalization.
2. ' The Scarecrow' from Panorama: A Course on Reading
Objective: To develop extensive reading skill and comprehension for pleasure and profit.
Outcome: Acquisition of LSRW skills

UNIT 4:

1. 'The Secret of Work' from *Professional Communicative English.*

Objective: Portrays the ways of living life in its real sense.
Outcome: Arouses the thought to lead life in a right path by recognizing the importance of work.

2. 'A Village Lost to the Nation' from Panorama: A Course on Reading

Objective: To develop extensive reading skill and comprehension for pleasure and profit.
Outcome: Acquisition of LSRW skills

UNIT 5:

1. ' The Chief Software Architect' from Professional Communicative English.
Objective: Supports the developments of technology for the betterment of human life.Outcome: Pupil gets inspired by eminent personalities who toiled for the present-dayadvancement of software development.

2. 'Martin Luther King and Africa' from Panorama: A Course on Reading
Objective: To develop extensive reading skill and comprehension for pleasure and profit.
Outcome: Acquisition of LSRW skills

Differential Equations and Numerical Methods

(Common to CE, EEE, ME, ECE, CSE, CSE-DS, CSE-AI&ML & IT)

I B. Tech I Semester

Course Category	Basic Sciences	**Course Code**	20BM1T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Differentiation, Integration	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	solve first order differential equations and its applications	K3
CO2	solve the linear differential equations with constant coefficients by appropriate method	K3
CO3	apply Newton, Gauss and Lagrange interpolation formulae to find interpolating polynomials for the given data.	K3
CO4	find the approximate roots of transcendental equations by using different numerical methods	K2
CO5	solve initial value problems by using different numerical schemes	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Differential equations of first order and first degree** Linear _ Bernoulli _ Exact _ Reducible to exact. **Applications:** Newton's Law of cooling _ Law of natural growth and decay _ Orthogonal trajectories.
UNIT II	**Linear differential equations of higher order** Non-homogeneous equations of higher order with constant coefficients with non-homogeneous form polynomialsin $x^n, e^{ax}V(x), x^mV(x)$-Method of Variation of parameters.
UNIT III	**Interpolation** Introduction_ Errors in polynomial interpolation _ Finite differences _ Forward differences _ Backward differences _Central differences _properties _ Differences of a polynomial-Newton's formulae for interpolation _Gauss formulae for interpolation- Interpolation with unequal intervals: Lagrange's interpolation formula.
UNIT IV	**Solution of Algebraic and Transcendental Equations** Introduction- Bisection method _ Method of false position _ Iteration method _ Newton-Raphson method (One variable).
UNIT-V	**Solution of Ordinary Differential equations** Solution of ordinary differential equations by Taylor's series -Picard's method of successive approximations-Euler's method – Modified Euler's method - Runge-Kutta method (second and fourth order).

TEXT BOOKS	
1.	**B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	**Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	**Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	**Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3.	**Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
4.	**Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
5.	**T.K.V. Iyengar et. al.,** Engineering Mathematics Volume I & III S Chand Publications.
WEB RESOURCES	
1.	**UNIT I: Differential equations of first order and first degree** https://en.wikipedia.org/wiki/Differential_equationhttp://um.me ndelu.cz/maw-html/index.php?lang=en&form=ode https://www.khanacademy.org/math/differential-equations/first-order-differential-equations
2.	**UNIT II: Linear differential equations of higher order** https://en.wikipedia.org/wiki/Differential_equationhttp://um.me ndelu.cz/maw-html/index.php?lang=en&form=ode https://nptel.ac.in/courses/122107037/20

3.	**UNIT III: Interpolation** https://en.wikibooks.org/wiki/Introduction_to_Numerical_Methods/Interpolation
4.	**UNIT IV: Solution of Algebraic and Transcendental Equations** https://en.wikibooks.org/wiki/Numerical_Methods/Equation_Solving https://www.slideshare.net/100005232690054/algebraic-and-transcendental-equations
5.	**UNIT V: Solution of Ordinary Differential Equations** https://nptel.ac.in/courses/111107063/ https://www.facweb.iitkgp.ac.in/~rajas/cgen/page/nptlcrs

Pragati Engineering College (Autonomous)

Linear Algebra and Partial Differential Equations (For EEE Only)

I B. Tech I Semester

Course Category	Basic Sciences	**Course Code**	20BM1T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basics of Matrices, Differentiation, Integration	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	solve systems of linear equations, determine the rank, find the eigenvalues and eigenvectors, diagonalization of a matrix.	K3
CO2	identify special properties of a matrix, such as positive definite, etc., and use this information to facilitate the calculation of matrix characteristics.	K2
CO3	find areas and volumes using double and triple integrals	K2
CO4	find partial derivatives of multivariable functions and apply them to find extreme values of a function.	K3
CO5	apply a range of techniques to find solutions of standard PDEs	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Solving system of linear equations, Eigen Values and Eigen vectors** Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss elimination method, Gauss Jacobi and Gauss Seidel for solving system of equations – Eigenvalues and Eigen vectors and their properties.
UNIT II	**Cayley-Hamilton Theorem and Quadratic forms** Cayley-Hamilton theorem (without proof) – Finding inverse and powers of a matrix by Cayley-Hamilton theorem – Quadratic forms-Reduction to canonical form by congruent transformations- nature of the quadratic form - reduction of quadratic form to canonical form by orthogonal transformation.
UNIT III	**Multiple integrals** Multiple integrals: Double and triple integrals – Change of variables -Polar coordinates - Cylindrical coordinates-Change of order of integration. **Applications:** Finding Areas and Volumes.
UNIT IV	**Partial differentiation** Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Generalized Mean value theorem for single variable (without proof) – Taylor's and Maclaurin's series expansion of functions of two variables – Jacobian – Functional dependence. **Applications:** Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints)
UNIT V	**Partial Differential Equations and Applications** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions-solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations. **Applications:** One dimensional wave and heat equations.

TEXT BOOKS	
1.	**B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	**Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	**Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	**Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3.	**Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
4.	**Srimanta Pal, Subodh C. Bhunia**, Engineering Mathematics, Oxford University Press.
5.	**T.K.V. Iyengar et. al.,** Engineering Mathematics Volume I & III S Chand Publications.
6.	**T. Amarnath,** An Elementary Course in Partial Differential Equations, Narosa Publications

WEB RESOURCES	
1.	**UNIT I: Solving system of linear equations, Eigen Values and Eigen vectors** https://en.wikipedia.org/wiki/System_of_linear_equationshttps://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
2.	**UNIT II: Cayley-Hamilton Theorem and Quadratic forms** https://www.math.hmc.edu/calculus/tutorials/eigenstuff/ https://en.wikipedia.org/wiki/Quadratic_form
3.	**UNIT III: Multiple Integrals** https://en.wikipedia.org/wiki/Multiple_integralhttp://tutorial.math.lamar.edu/Classes/CalcIII/MultipleIntegralsIntro.aspx
4.	**UNIT V: Partial Differentiation** https://en.wikipedia.org/wiki/Partial_derivative https://www.whitman.edu/mathematics/calculus_online/section14.03.html
5.	**UNIT V: Partial Differential Equations and Applications** https://en.wikipedia.org/wiki/Partial_differential_equation

ENGINEERING DRAWING
(Common for EEE, ECE & ME)

Course Category	Engineering Science	**Course Code**	20ME1T02
Course Type	Theory	**L-T-P-C**	1-0-4-3
Prerequisites	Nil	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce the students to use drawing instruments and to draw polygons, Engineering Curves and Scales.
2	To introduce the students to use orthographic projections, projections of points and lines.
3	To make the students draw the projections of the planes.
4	To make the students draw the projections of the various types of solids.
5	To represent the object in 3D view through isometric views.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Construct polygons, scales and engineering curves.	K3
CO2	Identify the position of points and lines with use of orthographic projections.	K3
CO3	Analyze the location and position of plane figures through orthographic projections.	K4
CO4	Analyze the location and position of solid bodies through orthographic projections.	K4
CO5	Develop 2D and 3D objects by converting their views.	K4

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	1	1	-	-	-	-	-	1	-	1	-
CO2	3	2	1	2	1	-	-	-	-	-	1	-	1	-
CO3	3	2	1	2	1	-	-	-	-	-	1	-	1	-
CO4	3	2	1	2	1	-	-	-	-	-	1	-	1	-
CO5	3	2	1	3	3	-	-	-	-	-	1	-	1	-

COURSE CONTENT

UNIT I

Introduction to Engineering Drawing.

Polygons: Constructing regular polygons by general method.

Curves: Parabola, Ellipse and Hyperbola by general methods tangent & normal for the curves. Cycloid and Involutes.

Scales: Vernier and Diagonal scales.

UNIT II

Orthographic Projections: Introduction, importance of reference lines, projections of points in various quadrants. Projections of straight lines inclined to both the planes, determination of true lengths and angle of inclination.

UNIT III

Projections of planes: Regular planes perpendicular/parallel to one plane. Regular planes inclined to one plane and parallel to other, inclined to both the planes.

UNIT IV

Projections of Solids: Simple positions of Prisms, Pyramids, Cones and Cylinders. Solids inclined to both the planes.

UNIT V

Isometric Projections: Introduction, Conversion of isometric views to orthographic views, Conversion of orthographic views to isometric views. Introduction to AutoCAD (Demo only)

TEXT BOOKS

1. Engineering Drawing by N.D. Bhatt, Chariot Publications, 56th Edition.
2. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age International (P) Limited (2008).

REFERENCE BOOKS

1. Engineering Drawing by K.L.Narayana& P. Kannaiah, Scitech Publishers, 3rd Edition.
2. Engineering Graphics for Degree by K.C. John, PHI Publishers.
3. Engineering Graphics by PI Varghese, Mc Graw Hill Publishers, 2013.
4. Engineering Drawing by Basant Agarwal, Tata McGraw Hill Publishers, 2014.
5. B.V.R. Gupta & M. Raja Roy, Engineering Drawing, I.K. International Publishing House Pvt. Ltd., 2009

WEB RESOURCES

1. http://nptel.ac.in/courses/112103019/
2. http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html
3. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/env_health_science_ stu dents/engineeringdrawing.pdf

I-I Semester

Programming for Problem solving using C
(Common to CE, ME, EEE, ECE, CSE, CSE (AI&ML),CSE(DS), IT)

Course Category	Engineering Science	**Course Code**	20CS1T01
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program
2	To gain knowledge of the operators, selection, control statements and repetition in C
3	To learn about the design concepts of arrays, strings, enumerated structure and union types and their usage.
4	To assimilate about pointers, dynamic memory allocation and know the significance of Preprocessor.
5	To assimilate about File I/O and significance of functions

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Apply the fundamentals of C Programming for Problem solving.	K3
CO2	Identify the appropriate Decision statement and Loops for a given Problem.	K2
CO3	Make use of Arrays and Strings to solve the problems in C.	K3
CO4	design and implement programs to analyze the different pointer applications	K3
CO5	Develop solutions for problems using Files and Functions.	K3

Note: K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	1	0	0	0	0	0	0	0	1	1	0
CO2	3	3	3	3	1	0	0	0	0	0	0	0	1	1	0
CO3	3	3	3	2	1	0	0	0	0	0	0	0	2	1	0
CO4	2	3	3	3	1	0	0	0	0	0	0	0	2	2	0
CO5	3	3	3	3	1	0	0	0	0	0	0	0	2	2	0

COURSE CONTENT	
UNIT I	**Introduction to Computers**: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers **Introduction to the C Language:** Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and TypeQualifiers. **Structure of a C Program:** Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.
UNIT II	**Bitwise Operators**: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators. **Selection & Making Decisions**: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions. **Repetition:** Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.
UNIT III	**Arrays:** Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages **Strings:** String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.
UNIT IV	**Pointers:** Introduction, Pointers to pointers, Compatibility, L value and R value Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, ProgrammingApplication. Processor Commands: Processor Commands.
UNIT V	**Functions:** Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion **Text Input / Output:** Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS	
1.	Programming for Problem Solving, Beerhouse A. Forouzan, Richard F.Gilberg, CENGAGE.
2.	The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e,Pearson.
REFERENCE BOOKS	
1.	Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill.
2.	Programming in C, Ashok N. Kamthane, Amit Kamthane, Pearson.
3.	Computer Fundamentals and Programming in C, Pradip Dey, ManasGhosh, OXFORD.
WEB RESOURCES	
1.	http://nptel.ac.in/courses/106104128/
2.	http://students.iitk.ac.in/programmingclub/course/#notes
3.	http://c-faq.com/~scs/cclass/cclass.html
4.	http://www.youtube.com/watch?v=b00HsZvg-V0&feature=relmfu
5.	http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-087-practical-programming-in-c-january-iap-2010/

Subject Code:
20HE1L01

DEPARTMENT OF ENGLISH

L	T	P	C
0	0	3	1.5

Professional Communicative English Lab

PRESCRIBED LAB MANUAL FOR SEMESTER I:

'**STRENGTHEN YOUR STEPS**: A Multimodal Course in Communication Skills' Published by Maruthi Publications.

OBJECTIVES: To enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

OUTCOME: A study of the communicative items in the laboratory will help the students become successful in the competitive world.

The course content, along with the study material, is divided into six units.

UNIT1:
Introduction
Consonant Sounds
Vowel Sounds

UNIT2:
Rhythm and Pronunciation
Weak/strong and contrasted forms
Practice of Rhythm

UNIT3:
Dialogues

UNIT4:
Group Discussions

UNIT 5:
Presentations & Public Speaking

UNIT-6: Interviews

PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

I Year I semester

Electrical Engineering workshop

Course Category	Engineering Sciences	**Course Code**	20EE1L02
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	**NA**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To demonstrate the usage of measuring equipment
2	To train the students in setting up simple wiring circuits
3	To impart methods in electrical machine wiring
4	To study different types of earthing.
5	To study different types of wirings.

COURSE OUTCOMES			
Upon successful completion of the course, the student will be able to:		**Cognitive Level**	
CO1	Explain the limitations, tolerance, safety aspects of electrical systems and wiring.	Understanding	K2
CO2	Select wires/cables and other accessories used in different types of wiring.	Understanding	K2
CO3	Make simple lighting and power circuits.	Applying	K3
CO4	Measure current, voltage and power in a circuit.	Understanding	K2
CO5	Make different types of wirings	Applying	K3

PRAGATI ENGINEERING COLLEGE : SURAMPALEM

(Autonomous)

ELECTRICAL AND ELECTRONICS ENGINEERING

Contribution of Course Outcomes towards achievement of Program													
Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	0	3	0	0	2	3	0	0	0	0	0	3	1
CO2	3	1	1	0	0	1	1	0	0	0	0	0	3	1
CO3	3	0	1	0	0	1	3	0	0	0	0	0	3	1
CO4	3	1	1	0	0	0	0	0	0	0	0	0	3	1
CO5	3	1	1	0	0	0	0	0	0	0	0	0	1	0

LIST OF EXPERIMENTS:	
Any 10 of the following experiments are to be conducted	
Experiment 1	Study of various electrical tools and symbols.
Experiment 2	Study various types of electrical cables/wires, switches, fuses, fuse carriers, MCB, ELCB, RCCB and MCCB with their specifications and usage.
Experiment 3	Soldering and de-soldering practice.
Experiment 4	Identification of various types of resistors and capacitors and understand the usage digital multi-meter.
Experiment 5	Identification of various semiconductor devices.
Experiment 6	Study of Moving Iron, Moving Coil, Electrodynamic and Induction type meters.
Experiment 7	Fluorescent lamp wiring.
Experiment 8	Wiring of lighting circuit using two way control.(stair case wiring)
Experiment 9	Godown wiring/ Tunnel wiring
Experiment 10	Hospital wiring.
Experiment 11	Measurement of voltage, current, power in DC circuit.
Experiment 12	Wiring of power distribution arrangement using single phase MCB distribution board with ELCB, main switch and energy meter for calculating Power and Power Factor.
Experiment 13	Measurement of earth resistance.
Experiment 14	Wiring of backup power supply for domestic Installations including inverter, battery and load.
Experiment 15	Troubleshooting of domestic electrical equipment's (tube light and fan)
Experiment 16	Understand the usage of CRO, function generator. & Regulated power supply and Measurement of ac signal parameters using CRO.
Experiment 17	Assembling electronic components on bread board.
Experiment 18	Obtain V-I characteristics of Light Emitting Diode.

References – Lab Manuals will be provided

Programming for Problem solving using C Lab
(Common to CE, ME, EEE, ECE, CSE, CSE (AI&ML),CSE(DS), IT)

Course Category	Engineering Science	**Course Code**	20CS1L01
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Apply the principles of C language in problem solving.
2	To design flowcharts, algorithms and knowing how to debug programs.
3	To design & develop of C programs using arrays, strings pointers & functions.
4	To review the file operations, preprocessor commands.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Knowledge on various concepts of a C language.	K3
CO2	Draw flowcharts and write algorithms.	K3
CO3	Design and development of C problem solving skills.	K3
CO4	Design and develop modular programming skills.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	1	0	0	0	0	0	0	0	2	2	0
CO2	3	3	3	3	1	0	0	0	0	0	0	0	2	2	0
CO3	3	3	3	3	1	0	0	0	0	0	0	0	2	2	0

COURSE CONTENT	
1.	**Exercise 1:** 1. Write a C program to print a block F using hash (#), where the F has aheight of six characters and width of five and fourcharacters. 2. Write a C program to compute the perimeter and area of a rectangle witha height of 7 inches and width of 5inches. 3. Write a C program to display multiplevariables.
2.	**Exercise 2:** 1. Write a C program to calculate the distance between the twopoints. 2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if thesumofrandsisgreaterthanthesumofpandqprint"Correctvalues", otherwise print "Wrong values".
3.	**Exercise 3:** 1. Write a C program to convert a string to a longinteger. 2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometricalshape. 3. Write a C program to calculate the factorial of a givennumber.
4.	**Exercise 4:** 1. Write a program in C to display the n terms of even natural number and theirsum. 2. Write a program in C to display the n terms of harmonic series and their sum.1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms. 3. Write a C program to check whether a given number is an Armstrong number ornot.
5.	**Exercise 5:** 1. Write a program in C to print all unique elements in anarray. 2. Write a program in C to separate odd and even integers in separatearrays. 3. Write a program in C to sort elements of array in ascendingorder.
6.	**Exercise 6:** 1. Write a program in C for multiplication of two squareMatrices. 2. Write a program in C to find transpose of a givenmatrix.
7.	**Exercise 7:** 1. Write a program in C to search an element in a row wise and column wise sortedmatrix. 2. Write a program in C to print individual characters of string in reverseorder.
8.	**Exercise 8:** 1. Write a program in C to compare two strings without using string libraryfunctions. 2. Write a program in C to copy one string to anotherstring.
9.	**Exercise 9:** 1. Write a C Program to Store Information Using Structures withDynamically MemoryAllocation 2. Write a program in C to demonstrate how to handle the pointers in theprogram.

10.	**Exercise 10:** 1. Write a program in C to demonstrate the use of & (address of) and *(valueat address)operator. 2.Write a program in C to add two numbers usingpointers
11.	**Exercise 11:** 1. Write a program in C to add numbers using call byreference. 2. Write a program in C to find the largest element using Dynamic Memory Allocation.
12.	**Exercise 12:** 1. Write a program in C to swap elements using call byreference. 2. Write a program in C to count the number of vowels and consonants in a string using apointer.
13.	**Exercise 13:** 1. Write a program in C to show how a function returningpointer. 2. Write a C program to find sum of n elements entered by user. To performthis program, allocate memory dynamically using malloc( )function.
14.	**Exercise 14:** 1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand the difference between the above twoprograms 2. Write a program in C to convert decimal number to binary number using thefunction.
15.	**Exercise 15:** 1. Write a program in C to check whether a number is a prime number or not using thefunction. 2. Write a program in C to get the largest element of an array using thefunction.
16.	**Exercise 16:** 1. Write a program in C to append multiple lines at the end of a textfile. 2. Write a program in C to copy a file in anothername. 3. Write a program in C to remove a file from thedisk.

Transforms and Vector Calculus

(For EEE only)

I B. Tech II Semester

Course Category	Basic Sciences	**Course Code**	20BM2T03
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**InternalAssessment** **Semester EndExamination** **TotalMarks**	30 70 100

COURSE OBJECTIVES	
1	The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2	The skills derived from the course will help the student form a necessary base to develop analytic and design concepts.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	examine the properties of Laplace transformation	K3
CO2	solve ordinary differential equations by using Laplace transformation technique	K2
CO3	expand a periodic function as a Fourier series and find Fourier transform of a given function.	K3
CO4	understand vector differential properties of scalar and vector point functions and their applications.	K2
CO5	apply Green's, Stokes and Divergence theorem to evaluate line, surface and volume integrals.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Laplace transforms:** Laplace transforms of standard functions – Properties - Periodic functions - Unit step function – Dirac's delta function.
UNIT II	**Inverse Laplace transforms:** Inverse Laplace transforms – Properties – Convolution theorem (without proof). **Applications:** Solving ordinary differential equations (initial value problems) using Laplace transforms.
UNIT III	**Fourier Analysis:** Introduction- Periodic functions – Dirichlet's conditions - Fourier series of a function, even and odd functions –Change of interval – Half-range sine and cosine series. Fourier integral theorem (without proof) – Fourier sine and cosine integrals – sine and cosine transforms – Inverse transforms.
UNIT IV	**Vector Differentiation:** Gradient - Directional derivative - Divergence – Curl – Laplacian and second order operators – Vector identities.
UNIT V	**Vector Integration:** Line integral – Work done – Potential function – Area, Surface and volume integrals - Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.

TEXT BOOKS	
1.	**B.S.Grewal**, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2.	**Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
REFERENCE BOOKS	
1.	**Micheael Greenberg**, Advanced Engineering Mathematics, 9th edition, Pearson edn
2.	**Dean G. Duffy**, Advanced engineering mathematics with MATLAB, CRC Press
3.	**Peter O'neil**, Advanced Engineering Mathematics, Cengage Learning.
4.	**Srimanta Pal, Subodh C.Bhunia**, Engineering Mathematics, Oxford University Press.
5.	**T.K.V. Iyengar et. al.,** Engineering Mathematics Volume I & III S Chand Publications.
6.	**Murray R Speigel,** Schaum's Outline of Vector Analysis, Schaum's Outline
7.	**Shanti Narayan**, Integral Calculus – Vol. 1 & II
WEB RESOURCES	
1.	**UNIT I: Laplace transforms** https://en.wikipedia.org/wiki/Laplace_transform https://web.stanford.edu/~boyd/ee102/laplace.pdf
2.	**UNIT II: Inverse Laplace transforms** https://www.intmath.com/laplace-transformation/7-inverse-laplace-transform.php
3.	**Unit – III: Fourier Analysis** https://www.mathsisfun.com/calculus/fourier-series.html

	https://lpsa.swarthmore.edu/Fourier/Xforms/FXformIntro.html
4.	**UNIT IV: Vector Differentiation** https://en.wikipedia.org/wiki/Vector_calculus
5.	**UNIT V: Vector Integration** https://en.wikipedia.org/wiki/Divergence_theorem http://tutorial.math.lamar.edu/Classes/CalcIII/StokesTheorem.aspx

< APPLIED PHYSICS>

< For I-I CSE& IT>

<ForI-IIEEE,ECE,CSE(DS)&CSE(AI&ML))>

Course Category	BASIC SCIENCES	**Course Code**	20BP2T02
Course Type	Theory	**L-T-P-C**	3 -0-0-3
Prerequisites	Intermediate Physics	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
2	Impart the knowledge of Lasers, Optical Fibers and their implications in optical communications.
3	To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in emerging micro devices.
4	To explain the concepts of Quantum Mechanics and free electron theories for study of metals and semiconductors.
5	Understand the formation of bands in Semiconductors and their working mechanism for their utility in Engineering applications

COURSE OUTCOMES		**Cognitive Level**
Upon successful completion of the course, the student will be able to:		
CO1	Analyze the optical applications using the concepts of Interference and diffraction.	Analyze (K4)
CO2	Apply the basics of Laser Mechanism and fiber optics for the communications systems.	Applying (K3)
CO3	Applythebasicsofphenomenonrelatedtodielectricmaterialsand Magnetic Materialstostudytheirdependenceontemperatureandfrequencyresponse.	Applying(K3)
CO4	Understand the concepts of quantum mechanics for calculation of free quantum particle energies and phenomenon of electrical & thermal conductivities to sub microscopic particles.	Understanding(K2)
CO5	Understand the Band formation, electrical conductivities in semiconductors and study the types of semiconductors using Hall Effect.	Understanding(K2)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	-	1	1	-	-	-	-	-	-	-	-	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	2	-	1	-	-	-	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	2	-	-	-

< APPLIED PHYSICS>

< For I-I CSE& IT>
<ForI-IIEEE,ECE,CSE(DS)&CSE(AI&ML))>

COURSE CONTENT	
UNIT I	**WAVEOPTICS** **(10hrs)** **INTERFERENCE** Introduction-Principle of Superposition – Coherent Sources – Interference in parallel thin film(reflection geometry)- Newton's rings, Determination of Wavelength and Refractive Index & Applications. **DIFFRACTION** Introduction-Types of diffraction-Fraunhoffer diffraction due to single slit, Double slit, N Slits (Qualitative)-Rayleigh criterion of resolution and Resolving power of grating (Qualitative).
UNIT II	**LASERS** **(8 hrs)** Introduction-Characteristics–Spontaneous and Stimulated emission of radiation – population inversion - Pumping Schemes - Ruby laser – Helium Neon laser – Applications **FIBER OPTICS:** Introduction- Structure & Principle of Optical Fiber-Numerical Aperture and Acceptance Angle-classification of Optical fibers based on Refractive Index Profile and Modes- Block Diagram of optical fiber communication system- Advantages of Optical fibers- Applications.
UNIT III	**MAGNETICSPROPERTIES** **(12 hrs)** Introduction-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability-Origin of permanent magnetic moment - Classification of Magnetic materials Dia,Para,Ferro,Antiiferro and Ferri Magnetic materials-Weiss Domain Theory(Qualitative Treatment)- Hysteresis-B-H Curve-soft and hard magnetic materials & applications **DIELECTRICS** Introduction - Dielectric polarization–Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations- Electronic Ionic and Orientation polarizations (qualitative) – Lorentz Internal field – Claussius-Mossoti equation -Applications of dielectrics.
UNIT IV	**QUANTUMMECHANICS** **(9hrs)** Introduction – Matter waves – de Broglie's hypothesis–Interpretation of wave function – Schrödinger Time Independent and Time Dependent wave equations – Particle in a potential box **FREE ELECTRON THEORY** Classical Free Electron Theory(Qualitative with discussions of merit and demerits)-Quantum Free Electron Theory-Equation of conductivity based on quantum free electron theory-Fermi Dirac Distribution-Density of States-Fermi Energy
UNIT V	**BAND THEORYOFSOLIDS** **(9hrs)** Bloch's Theorem(Qualitative)-Kronig Penny Model(Qualitative)-E vs K diagram-V vs K diagram, Effective mass of electron-Classification of Crystalline Solids-Concept of hole **SEMICONDUCTOR PHYSICS** Introduction–Intrinsic Semi conductors - density of charge carriers- Electrical conductivity – Fermi level – extrinsic semiconductors - p-type & n-type - Density of charge carriers-Drift and Diffusion currents-Einstein's Equation -Hall effect - Applications of Hall effect

< APPLIED PHYSICS>

< For I-I CSE& IT>
<ForI-IIEEE,ECE,CSE(DS)&CSE(AI&ML))>

TEXT BOOKS	
1.	Engineering Physics by M.N.Avadhanalu,P.G.Kshirsagar& T V S Arun Murty,S Chand Pubication,11th Edition 2019
2.	"Engineering Physics" by M.R.Srinivasan, New Age international publishers
3.	Engineering Physics by P.K Palanisamy,Sci Tech Publication
REFERENCE BOOKS	
1.	Kettles Introduction to Solid state Physics-Charles Kittel,Wiley India Edition
2.	Solid State Physics ,AJ Dekker, I Edition,Macmillan Publishers India Private Limited
3	"Solid State Physics" by SO Pilai., - New age International Publishers
4.	Engineering Physics by DK Bhattacharya and Poonam Tandon,Oxford Press(2018)
WEB RESOURCES	
1.	https://nptel.ac.in/courses/122/107/122107035/# https://nptel.ac.in/courses/122/107/122107035/#
2.	https://pragatiengg.org/pluginfile.php/29143/mod_folder/content/0/UNIT%20IV%20LASERS%20.pptx?forcedownload=1https://nptel.ac.in/courses/104/104/104104085/ https://nptel.ac.in/courses/115/107/115107095/
3.	https://nptel.ac.in/courses/113/104/113104090/ https://youtu.be/DDLljK1ODeg
4.	https://study.com/academy/lesson/the-de-broglie-hypothesis-definition-significance.htmlhttps://nptel.ac.in/courses/115/101/115101107/ https://nptel.ac.in/courses/115/105/115105122/
5.	https://www.electronics-tutorials.ws/diode/diode_1.html https://nptel.ac.in/courses/115/105/115105099/ https://nptel.ac.in/courses/108/108/108108122/

DATA STRUCTURES THROUGH C
(For EEE)

Course Category	Professional Core	**Course Code**	20CS2T02
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Programming for Problem Solving using C	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Operations on linear data structures and their applications.
2	The various operations on linked lists.
3	The basic concepts of Trees, Traversal methods and operations.
4	Concepts of implementing graphs and its relevant algorithms
5	Sorting and searching algorithms.

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Develop Data structures concepts with arrays, stacks, queues.	K3
CO2	Apply concepts of Linked lists for stacks, queues and for developing applications.	K3
CO3	Solving real time problems with algorithms on Trees.	K3
CO4	Develop applications with algorithms on graphs.	K3
CO5	Make use of sorting and searching algorithms.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO 1	3	3	1	2	1								1	1	1
CO 2	3	3	1	1	1								1	1	1

CO 3	3	3	1	1	1								1	1	1
CO 4	3	3	1	1	1								1	1	1
CO 5	3	3	2	2	1	1							2	1	

COURSE CONTENT	
UNIT I	Unit-1: Linear Data Structures: Arrays, Stacks and Queues Data Structures -Operations- Abstract Data Types-Complexity of Algorithms-Time and SpaceArrays-Representation of Arrays-Linear Arrays-Insertion– Deletion and Traversal of a Linear Array-Array as an Abstract Data Type-Multi-Dimensional arrays-Strings-String OperationsStoring Strings- String as an Abstract Data Type Stack -Array Representation of Stack-Stack Abstract Data Type-Applications of Stacks: PrefixInfix and Postfix Arithmetic Expressions-Conversion-Evaluation of Postfix ExpressionsRecursion-Towers of Hanoi-Queues-Definition-Array Representation of Queue- The Queue Abstract Data Type-Circular Queues-Dequeues-Priority Queues.
UNIT II	Unit-II: Linked Lists Pointers-Pointer Arrays-Linked Lists-Node Representation-Single Linked List-Traversing and Searching a Single Linked List-Insertion into and Deletion from a Single Linked List-Header Linked Lists-Circularly Linked Lists-Doubly Linked Lists-Linked Stacks and QueuesPolynomials-Polynomial Representation-Sparse Matrices.
UNIT III	Unit-III: Trees Terminology-Representation of Trees-Binary Trees-Properties of Binary Trees-Binary Tree Representations-Binary Tree Traversal-Preorder-Inorder and Postorder Traversal-ThreadsThread Binary Trees-Balanced Binary Trees-Heaps-Max Heap-Insertion into and Deletion from a Max Heap-Binary Search Trees-Searching-Insertion andDeletion from a Binary Search TreeHeight of Binary Search Tree, m-way Search Trees, B-Trees.
UNIT IV	Unit-IV: Graphs Graph Theory Terminology-Graph Representation-Graph Operations-Depth First Search-Breadth First Search-Connected Components-Spanning Trees-Biconnected Components-Minimum Cost Spanning Trees-Kruskal's Algorithm-Prism's Algorithm- Shortest Paths-Transitive Closure-AllPairs Shortest Path-Warshall's Algorithm.
UNIT V	Unit-V: Searching and Sorting Searching -Linear Search-Binary Search-Fibonacci Search-Hashing-Sorting-Definition-Bubble Sort-Insertion sort-Selection Sort-Quick Sort-Merging-Merge Sort-Iterative and Recursive Merge Sort-Shell Sort-Radix Sort-Heap Sort.

TEXT BOOKS	
1.	1. Fundamentals of Data Structures in C, 2nd Edition, E.Horowitz, S.Sahni and Susan Anderson Freed, Universities Press Pvt. Ltd.
2.	2. Data Structures with C, Seymour Lipschutz, Schaum's Outlines, Tata McGraw Hill.
REFERENCE BOOKS	
1.	G.A.V Pai, Data Structures and Algorithms, Concepts, Techniques and Applications, Volume 1,1st Edition, Tata McGraw-Hill, 2008.
2.	Richard F. Gilbergand Behrouz A. Forouzan, "Data Structures, Pseudo code Approach with C", 2nd Edition, Cengage Learning India Edition, 2007
WEB RESOURCES	
1.	http://nptel.ac.in/courses/106102064/1
2.	http://www.academictutorials.com/data-structure/data-structure-linear.asp
3.	http://www.geeksforgeeks.org/data-structures

PRAGATI ENGINEERING COLLEGE : SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

I Year II semester

Electrical Circuits Analaysis-I

Course Category	Engineering Sciences	**Course Code**	**20EE2T02**
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NA**	**Internal Assessment**	**30**
		Semester End Examination	**70**
		Total Marks	**100**

COURSE OBJECTIVES	
1	To study the concepts of passive elements, types of sources and various network reduction techniques. To understand the applications of network topology to electrical circuits
2	To study the concept of magnetic coupled circuit.
3	To understand the behavior of RLC networks for sinusoidal excitations.
4	To Understand various forms of powers of R, L, C network with sinusoidal excitation. To study the performance of R-L, R-C and R-L-C circuits with variation of one of the parameters and to understand the concept of resonance
5	To understand the applications of network theorems for analysis of electrical networks.

COURSE OUTCOMES			
Upon successful completion of the course, the student will be able to:		**Cognitive Level**	
CO1	Analyze various electrical networks in presence of active and passive elements.	Analyzing	K4
CO2	Solve magnetic circuits with various dot conventions.	Understanding	K2
CO3	Analyze different periodic waveforms. Understand various forms of powers of R, L, C network with sinusoidal excitation	Analyzing	K4
CO4	Understand R, L, network with variation of any one of the parameters i.e R, L, C and f.	Understanding	K2
CO5	Understand Electrical networks by using principles of network theorems	Understanding	K2

Contribution of Course Outcomes towards achievement of Program Outcomes (1 _Low, 2 - Medium, 3 _High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	-	-	2	-	-	-	-	-	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	1	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	2	1
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	2

PRAGATI ENGINEERING COLLEGE : SURAMPALEM

(Autonomous)

ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE CONTENT	
UNIT 1	**Introduction to Electrical Circuits** Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent andindependent), Kirchhoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources., node and mesh analysis.
UNIT 2	**Magnetic Circuits** Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.
UNIT 3	**Single Phase A.C Systems** Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations. Node and mesh analysis. Steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power .
UNIT 4	**Resonance - Locus Diagrams** series and parallel resonance, selectively band width and Quality factor, locus diagram- RL, RC, RLC with R, L and C variables.
UNIT 5	**Network theorems (DC & AC Excitations)** Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

TEXT BOOKS	
1	Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley and Steven M.Durbin, Tata McGraw Hill Company, 9th Edition
2	Network Analysis by M.E.Van Valkenburg; Pearson publications Revised Third Edition
3	Fundamentals of Electrical Circuits by Charles K.Alexander and Matthew N.O.Sadiku, Tata McGraw Hill Education (India) 6th Edition.
4	Electrical Wiring ,Estimating & costing by S.L.Uppal Khanna Publishers
REFERENCE BOOKS	
1	Network Theory by N C Jagan& C Lakshminarayana, BS Publications.
2	Linear Circuit Analysis by De Carlo, Lin, Oxford publications Second Edition
3	Electric Circuits by David A. Bell, Oxford publications
4	Circuit Theory(Analysis and Synthesis) by A Chakrabarthi, Dhanpat Rai & Co. Revised Sixth Edition
5	A course in Electrical Installation, Estimation & costing by J.B.Gupta by katson books.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108102042/3
2	https://nptel.ac.in/courses/108/105/108105053/

PRAGATI ENGINEERING COLLEGE

(Approved by AICTE, Permanently Affiliated to JNTUK Kakinada & Accredited by NAAC with 'A' grade)
1-378, ADB Road, Surampalem-533 437, Near Peddapuram, E.G.Dist., A.P.
Ph: (08852) 252233, 252234, 252235 Fax: (08852) 252232

Learning is Supreme Deity

I Year II Semester

BASIC CIVIL AND MECHANICAL ENGINEERING

(Electrical and Electronics Engineering)

Course Category	ESC	**Course Code**	20ME2T03
Course Type	THEORY	**L-T-P-C**	3-0-0-3
Prerequisites	------	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: *The student able to*	
1	*The students will be able to understand and apply the knowledge of management functions like planning, scheduling, executing and controlling to construction projects.*
2	*The students will be able to implement the safety aspects during the execution of civil works*
3	*Understand metal forming processes and joining processes.*
4	*Understand various mechanical properties of materials, fluid properties and Turbines*
5	*Understand the working of Pumps and IC Engines.*

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	*Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering*	Understanding
CO2	*Explain different types of buildings, building components, building materials and building construction*	Remembering
CO3	*Identify various civilengineering structures* *Explain various metal forming processes and metal joining processes.*	Understanding
CO4	*Recall various mechanical properties of materials, fluid properties and working of turbines*	Remembering
CO5	*Explain the working of pumps and IC engines.*	Understanding

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	3	2	2	-	-	-	-	2	-
CO2	2	2	-	-	3	-	-	-	-	-	-	-	1	-
CO3	2	-	1	-	-	-	-	-	-	-	-	1	3	-
CO4	2	-	-	-	-	-	-	-	-	-	-	1	3	-
CO5	2	-	-	-	-	-	2	-	-	-	-	1	2	-

COURSE CONTENT

UNIT I

SCOPE OF CIVIL ENGINEERING

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

UNIT II

SURVEYING AND CIVIL ENGINEERING MATERIALS

Surveying: Objects –classification –principles –measurements of distances –angles –levelling – determination of areas–contours - examples. Civil Engineering Materials: Bricks stones sand cement concrete steel - timber

- modern materials.

UNIT III

CIVIL ENGINEERING STRUCTURES

Foundations:Types of foundations Requirement of good foundations. Civil Engineering Structures: Brick masonry – stonemasonry – beams – columns – lintels – roofing – flooring – plastering – floor area, carpet area and floor space index - introduction to highway and railway.

Metal joining: arc welding, resistance welding, gas welding, brazing and soldering Metal forming: forging – operations, rolling and extrusion principles

UNIT IV

Mechanical properties of metals-Elasticity and Plasticity: Simple stress and strains, Types of stresses and strains-Hook's law- Stress-strain diagram for mild steel-working stress- factor of safety-lateral strain,poisson s ratio.Physical properties of fluids: Specific gravity, viscosity and its significance, surface tension, capillarity.

Hydraulic Turbines: Classification-Difference between Impulse and Reaction Turbine.

UNIT V

Pumps: Classification of Pumps, Centrifugal Pump-Applications-Priming-Reciprocating Pumps, Single Acting & Double Acting-Comparison with Centrifugal Pump.

I.C Engine: Heat Engine Types of Heat Engine Classification of I.C. Engine-Valve Timing Diagram, Port Timing Diagram- Comparison of 2S & 4S Engines- Comparisonof Petrol Engine and Diesel Engine-Fuel System of a Petrol Engine-Ignition Systems.

TEXT BOOKS

1. Basic Civil and Mechanical Engineering Paperback – 1 January 2011 by S. Shanmugasundaram (Author), K. Mylsamy (Author)
2. A textbook of Strength of Materials, R.K.Bansal, Laxmi Publications.
3. Elements of Mechanical Engineering, M.L. Mathur, F.S.Metha&R.P.Tiwari Jain Brothers Publs., 2009.

REFERENCE BOOKS

1. Basic Mechanical Engineering, Venugopal K and Prabhu Raja V by Anuradha Publishers, Kumbakonam.
2. Production Technology by P.N.Rao by I& II McGraw-Hill publication.

WEB RESOURCES

4. https://www.youtube.com/watch?v=cxU1zUOpGLk
5. https://www.youtube.com/watch?v=xf6TbK68hHY

Learning is Supreme Deity

PRAGATI ENGINEERING COLLEGE

(Approved by AICTE, Permanently Affiliated to JNTUK Kakinada & Accredited by NAAC with 'A' grade)
1-378, ADB Road, Surampalem-533 437, Near Peddapuram, E.G.Dist., A.P.
Ph: (08852) 252233, 252234, 252235 Fax: (08852) 252232

DEPARTMENT OF MECHANICALENGINEERING

SYLLABUS TEMPLATE

I Year II Semester

BASIC CIVIL AND MECHANICAL ENGINEERING LAB

(Electrical and Electronics Engineering)

Course Category	ESC	**Course Code**	20ME2L02
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	-------	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: The student able to	
1	To make the student learn about the constructional features and operational details of various types of internal combustion engines.
2	To make the student learn about the constructional features, operational details of various types of hydraulic turbines
3	To practice the student about the fundamental of fluid dynamic equations and its applications fluid jets.
4	To train the student in the areas of types of hydro electric power plants, estimation and calculation of different loads by considering various factors.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Solve to arrive at finding constant speed and variable speed on IC engines and interpret their performance.	Understanding
CO2	Estimate energy distribution by conducting heat balance test on IC engines	Analysing
CO3	Determine flow discharge measuring device used in pipes channels and tanks.	Applying
CO4	Test for the performance of pumps and turbines	Applying

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	3	3	-	-	-	-	3	-	1	-
CO2	3	2	-	-	3	3	-	-	-	-	3	-	-	-
CO3	3	2	3	-	3	3	-	-	-	-	3	-	-	-
CO4	3	2	2	-	3	3	-	-	-	-	3	-	3	-

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COURSE CONTENT

Thermal Engineering Lab:

1. Valve time timing diagram on 4-S Diesel engine.
2. Valve time timing diagram on 4-S Petrol engine.
3. Port timing diagram on 2-S Petrol engine.
4. Study on Boiler models.
5. COP determination of Refrigeration tutor.
6. COP determination of Air conditioner tutor.

Hydraulic machinery Lab:

1. Determination of coefficient of discharge on Impact of Jets on Vanes apparatus.
2. Performance test on Pelton wheel.
3. Performance test on Francis turbine.
4. Performance test on Kaplan turbine.
5. Performance test on Single stage Centrifugal pump.
6. Performance test on Reciprocating pump.

List of Augmented Experiments:

(Student can perform any one of the following experiments)

1. Heat balance sheet on VCR engine
2. Determination of Loss of head due to sudden contraction and sudden enlargement.
3. Heat balance sheet on Multi cylinder Petrol engine.
4. Heat balance sheet on 4-S diesel engine.
5. Determination of coefficient of discharge on Venturimeter.
6. Determination of coefficient of discharge on Orificemeter.

Note: Any 10 experiments are to be conducted from the above

<APPLIED PHYSICS LABORATORY>

<For I-I CSE & IT>
<For I-II EEE,ECE,CSE(DS),CSE(AI & ML)>

Course Category	BASIC SCIENCES	**Course Code**	20BP2L02
Course Type	Lab	**L-T-P-C**	0 -0-3-1.5
Prerequisites	Intermediate Physics	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	The student will have exposure to experimental skills which is essential for an Engineering student.
2	To gain practical knowledge by applying the experimental results and correlate with the theoretical principles.
3	Apply the Analytical techniques and graphical analysis to the experimental data

COURSE OUTCOMES		**Cognitive Level**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the basics of Interference, Diffraction in Physics using instruments like Spectrometer, Travelling microscope.	Understanding(K2)
CO2	Determine the Magnetic and Dielectric constants of materials.	Application(K3)
CO3	Apply the basics of Current Electricity and Semiconductors in engineering application	Application(K3)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-

<APPLIED PHYSICS LABORATORY>

<For I-I CSE & IT>
<For I-II EEE,ECE,CSE(DS),CSE(AI & ML)>

COURSE CONTENT: (Any 10 of the following listed 15 experiments): 8 Regular mode and any two experiments in Virtual mode(Virtual Lab)	
1.	Determination of wavelength of laser Light using diffraction grating.
2.	Determination of wavelength of a light using Diffraction Grating-Normal incidence.
3.	Newton's rings –Determination of Radius of Curvature of Plano - Convex Lens.
4.	Determination of thickness of a spacer using wedge film and parallel interference fringes.
5.	Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
6.	Energy Band gap of a Semiconductor p - n junction.
7.	Characteristics of Thermistor – Temperature Coefficients
8.	Determination of dielectric constant by charging and discharging method
9.	Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
10.	Determination of Dispersive power of diffraction grating.
11.	To Study the V-I Characteristics and determine the breakdown voltage of a Zener Diode
12.	Determination of Hall Voltage and Hall coefficients of a given semiconductor using Hall effect.
13.	Determination of Acceleration due to gravity and Radius of gyration Using Compound Pendulum.
14.	Determination of Numerical Aperture and acceptance angle of an Optical Fiber
15.	Estimation of Planck's Constant using Photoelectric Effect.

TEXT BOOKS	
1.	**College customized manual**
WEB RESOURCES	
1.	**www.vlab.co.in (virtual lab link)**

DATA STRUCTURES TROUGH C LABORATORY
(FOR EEE)

Course Category:	Professional Core	**Course Code:**	20CS2L02
Course Type:	**LABORATORY**	**L-T-P-C:**	0-0-3-1.5
Prerequisites:	C	**ContinuousEvaluation:** **Semester endEvaluation:** **TotalMarks:**	30 70 100

COURSE OBJECTIVES	
1	To develop skills to design and analyze simple linear and non linear data structures.
2	To strengthen the ability to the students to identify and apply the suitable data structure for the given real world problem.
3	To gain knowledge in practical applications of data structures.

COURSEOUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply Linear data structures for solving real time applications	**K3**
CO2	Apply Non Linear data structures for solving real time applications	**K3**
CO3	Analyze search and sorting techniques for optimization	**K4**

Contribution of Course Outcomes towards achievement of Program Outcomes (1 _ Low, 2 - Medium, 3 _ High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2	3										2	1	1
CO2	3	3	3										1	1	1
CO3	3	3	2										1	1	1

COURSE CONTENT

LAB EXPERIMENTS

1 Implement operations on Strings.
2. Implement basic operations onStacks.
3. Implement basic operations onQueue.
4. Implement basic operations on CircularQueue.
5. Implement multi stack in a singlearray.
6. Implement List data structure using i) array ii) singly linkedlist.
7. Implement basic operations on doubly linkedlist.
8. Implementbasicoperations(insertion,deletion,search,findminandfindmax)onBinarySearch trees.
9. Implementation ofHeaps.
10. Implementation of Breadth First SearchTechniques.
11. Implementation of Depth First SearchTechniques.
12. Implementation of Prim'salgorithm.
13. Implementation of Kruskal'sAlgorithm.
14. Implementation of Linear search.
15. Implementation of Fibanoccisearch.
16. Implementation of Mergesort.
17. Implementation of Quicksort.

Constitution of India

Course Category	Humanities including Management	**Course Code:**	20HM2T05
Course Type	Theory	**Lecture-Tutorial-Practice**	2 -0 -0
Prerequisites		**Total Marks (Internal Assessment)**	100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	Understand the evolution of Constitution of India	Understanding
CO 2	Make use of one's Fundamental rights	Application
CO 3	Understand the functioning of the Union Government	Understanding
CO 4	Understand the functioning of the State and local self Government.	Understanding
CO 5	Understand the value of Indian Constitution in functioning of the country.	Understanding

Contribution of Course Outcomes towards achievement of Program

Outcomes: 1 – Low, 2 - Medium, 3 – High

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	0	0	0	0	0	3	0	3	0	1	0	2
CO2	0	0	0	0	0	1	0	2	1	1	0	1
CO3	0	0	0	0	0	1	0	1	1	1	0	0
CO4	0	0	0	0	0	1	0	1	1	1	0	0
CO5	0	0	0	0	0	1	1	1	1	1	0	2

Course Content:

Unit – I
Introduction to Indian constitution: Meaning of the term constitution - History and development –
Preamble of the Constitution – Constituent Assembly – The salient features of Indian Constitution.

Unit –II
Fundamental Rights: Individual and Collective Rights – Limitations of the fundamental Rights –
Fundamental Rights Vs Duties

Unit –III
UnionGovernment: UnionLegislature –
LokSabhaandRajyaSabha(powersandfunctions) Presidentof India(powersandfunctions)–PrimeministerofIndia(powersandfunctions)– UnionJudiciary(supreme court powers andfunctions).

Unit – IV State and Local self Government:
StateGovernment: StateLegislature(LegislativeAssembly/VidhanSabha,LegislativeCouncil/VidhanParishad)–Powersandfunctionsofstatelegislature– TheChiefMinisterofthestate(powersand functions)
Local Self Government: Election commission of India (Powers and Functions)- The Union Public Service Commission (Powers and Functions)

Unit – V Working of the Indian Constitution
ThevaluesoftheIndianConstitutionandUsheringofSocialRevolutioninIndia – NatureandRoleof HigherJudiciaryinIndia–Amendments(Recent)

Reference Books :
1. 'Indian Polity' byLaxmikanth

2. 'IndianAdministration'bySubhashKashyap

3. 'IndianConstitution'byD.D.Basu

4. 'IndianAdministration'byAvastiandAvasti

Web Resources:

1. https://www.clearias.com/historical-background-of-indian-constitution/
2. https://www.civilserviceindia.com/subject/General-Studies/notes/functions-and-responsibilities-of-the-union-and-the-states.html

3. https://www.tutorialspoint.com/indian_polity/indian_polity_how_constitution_works

II Year I semester

COMPLEX VARIABLES AND STATISTICAL METHODS

Course Category	Basic Sciences	**Course Code**	**20BM3T04**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Nil	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	To familiarize the complex variables
2	To familiarize the students with the foundations of probability and statistical methods.
3	To equip the students to solve application problems in their disciplines

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Find the differentiation and integration of complex functions used in engineering problems.	K2
CO2	Make use of the Cauchy residue theorem to evaluate certain integrals	K3
CO3	Apply discrete and continuous probability distributions	K3
CO4	Design the components of a classical hypothesis test	K4
CO5	Infer the statistical inferential methods based on small and large sampling tests	K3

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	1	-	-	-	-	-	-	-	-	-	1
CO2	3	3	2	1	-	-	-	-	-	-	-	-	-	2
CO3	3	3	1	1	-	-	-	-	-	-	-	-	-	2
CO4	3	3	3	1	-	-	-	-	-	-	-	-	-	2
CO5	3	3	2	1	-	-	-	-	-	-	-	-	-	1

COURSE CONTENT	
UNIT-I	**Functions of a complex variable and Complex integration**: Introduction – Continuity – Differentiability – Analyticity –Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method. Complex integration: Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs) and problems on above theorems
UNIT-II	**Series expansions and Residue Theorem:** Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series Types of Singularities: Isolated _ Essential _Pole of order m_ Residues _ Residue theorem (without proof) _ Evaluation of real integral of the types $\int_{-\infty}^{\infty}$ dx and $\int_{c}^{c+2\pi} f(\cos\theta, \sin\theta)d\theta$

UNIT-III	**Probability and Distributions**: Review of probability and Baye's theorem – Random variables – Discrete and Continuous random variables – Distribution functions – Probability mass function, Probability density function and Cumulative distribution functions – Mathematical Expectation and Variance – Binomial, Poisson, Uniform and Normal distributions.
UNIT-IV	**Sampling Theory:** Introduction –Population and Samples – Sampling distribution of Means and Variance (definition only) –Central limit theorem (without proof) –Representation of the normal theory distributions – Introduction to t, χ^2 and F-distributions –Point and Interval estimations –Maximum error of estimate.
UNIT-V	**Tests of Hypothesis:** Introduction – Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one mean and two means (Large and Small samples) – Tests on proportions.

TEXT BOOKS	
1.	**B. S. Grewal,** Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2.	**Miller and Freund's,** Probability and Statistics for Engineers,Pearson,7th edition, 2008.
REFERENCE BOOKS	
1.	**J. W. Brown and R. V. Churchill**, Complex Variables and Applications, 9th edition, Mc-Graw Hill, 2013.
2.	**S.C. Gupta and V.K. Kapoor**, Fundamentals of Mathematical Statistics, 11th edition, Sultan Chand & Sons Publications, 2012.
3.	**Jay l. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
4.	Shron **L.Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
5.	**Sheldon, M. Ross**, Introduction to probability and statistics Engineers and the Scientists, 4thEdition, Academic Foundation,2011

WEB RESOURCES	
1.	**UNIT I:** https://en.wikipedia.org/wiki/Complex_analysis
2.	**UNIT II:** https://en.wikipedia.org/wiki/Contour_integration http://mathonline.wikidot.com/complex-power-series
3.	**UNIT III:** https://en.wikipedia.org/wiki/Normal_distribution https://en.wikipedia.org/wiki/Sampling_(statistics) https://nptel.ac.in/courses/111104073/
4.	**UNIT IV:** https://en.wikipedia.org/wiki/Statistical_hypothesis_testing
5.	**UNIT V:** https://machinelearningmastery.com/statistical-hypothesis-tests/

II Year I semester

ELECTRONIC DEVICES AND CIRCUITS

Course Category	Engineering Science course	**Course Code**	**20EC3T05**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Engineering Physics	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	Learn and understand the basic concepts of semiconductor physics and study the physical phenomena of PN junction diode.
2	Understand the application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
3	Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
4	Learn and understand the purpose of transistor biasing and its significance.
5	Understand the small signal low frequency BJT and FET transistor amplifiers models and compare different configurations.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the basic concepts of semiconductor physics and understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation	K2
CO2	Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.	K2
CO3	Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.	K2
CO4	Apply the concepts of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.	K3
CO5	Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations	K3

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	-	-	-	-	-	-	-	2	2
CO2	3	3	2	-	1	-	-	-	-	-	-	-	2	2
CO3	3	3	-	1	-	-	-	-	-	-	-	-	2	2
CO4	3	3	2	-	1	-	-	-	-	-	2	-	2	2
CO5	3	3	2	2	-	-	-	-	-	-	-	2	2	2

COURSE CONTENT	
UNIT-I	**Review of Semiconductor Physics:** Insulators, Semiconductors, and Metals, classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semiconductors, extrinsic semiconductors, drift and diffusion, charge densities in semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors **Junction Diode Characteristics:** energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance.
UNIT-II	**Special Semiconductor Devices**: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics. **Rectifiers and Filters:** Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Stunt inductor), π- Filter, comparison of various filter circuits in terms of ripple factors
UNIT-III	**BJT:** Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values. **FET:** FET types, construction, operation, characteristics μ, gm, rd parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.
UNIT-IV	**Transistor Biasing and Thermal Stabilization:** Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability. FET Biasing- methods and stabilization.
UNIT-V	**Small Signal Low Frequency Transistor Amplifier Models:** **BJT:** Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers. **FET:** Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

TEXT BOOKS	
1.	Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, 2nd Edition,2007
2.	Electronics Devices &Circuit theory- Robert L.Boylestad and Loui Nashelsky, Pearson/Prentice hall, 10th Edition, 2009
REFERENCE BOOKS	
1.	Integrated Electronics-J. Millman, C. Halkias,Tata Mc-Graw Hill, 2nd Edition,2009
2.	Electronic Devices and Integrated Circuits – B.P. Singh, Rekha, Pearson publications
3.	Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4th Edition, 2008.

II Year I semester

ELECTRICAL CIRCUIT ANALYSIS–II

Course Category	Professional Core Course	**Course Code**	**20EE3T04**
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To Study the concepts of balanced and unbalanced three-phase circuits.
2	To study the transient behavior of electrical networks with DC excitations.
3	To study the transient behavior of electrical networks with AC excitations.
4	To Estimate various parameters of a two port network.
5	To generalize the significance of filters in electrical networks.

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the importance of 3-Phase circuits with star and delta connected balanced and unbalanced loads.	K2
CO2	Analyze the transient behavior of electrical networks with DC excitations.	K4
CO3	Analyze the transient behavior of electrical networks with AC excitations.	K4
CO4	Determine various network parameters of given two port network.	K4
CO5	Generalize the significance of filters in electrical networks.	K2

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO2	3	3	-	1	1	-	-	-	-	-	-	-	-	2
CO3	3	3	-	1	1	-	-	-	-	-	-	-	-	2
CO4	3	2	2	-	-	-	-	-	-	-	-	-	-	2
CO5	3	2	2	-	-	-	-	-	-	-	-	-	-	2

COURSE CONTENT	
UNIT 1	**Balanced and Unbalanced Three phase circuits** **Analysis of three phase balanced circuits:** Phase sequence, star and delta connection of sources and loads, relation between line and phase voltages and currents, analysis of balanced three phase circuits, measurement of active and reactive power. **Analysis of three phase unbalanced circuits:** Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power**.**
UNIT 2	**Transient Analysis in DC Circuits** Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using differential equations. Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using Laplace transforms.
UNIT 3	**Transient Analysis in AC circuits** Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using differential equations. Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using Laplace transforms.

UNIT 4	**Two Port Networks** Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, cascaded networks**.**
UNIT 5	**Filters** Need of Filters – Classification -Characteristic impedance- Low Pass Filter, High Pass Filter, Band Pass Filter, Band Stop or Band Elimination Filter, m-Derived Filter, Composite filters – Design of Filters.

TEXT BOOKS	
1	Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company,9th edition, 2018.
2	Network analysis: Van Valkenburg: Prentice-Hall of India Private Ltd, 3rd edition, 2019
REFERENCE BOOKS	
1	Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India), 6th edition, 2019.
2	Circuits by A. Bruce Carlson, Cengage Learning Publications, 1st edition, 2008.
3	Electric circuit by Joseph Edminister, schaum's outlines series, seventh edition, 2017
4	Electric Circuits by David A. Bell, Oxford publications, 7th edition, 2009.
5	Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi, DhanpatRai&Co, 7th- Revised edition, 2018).
WEB RESOURCES (Suggested)	
1	https://circuitglobe.com/circuit-analysis-of-3-phase-system-balanced-condition.html
2	https://nptel.ac.in/courses/108105053/pdf/L-10(GDR)(ET)%20((EE)NPTEL).pdf
3	https://www.tutorialspoint.com/network_theory/network_theory_twoport_networks
4	http://nptel.ac.in/courses/108105065/4
5	https://www.electronics-tutorials.ws/filter/filter_4.html

II Year I semester

TRANSFORMERS AND DC MACHINES

Course Category	Professional Core Course	**Course Code**	**20EE3T05**
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To predetermine the performance of single phase transformers with equivalent circuit Models.
2	To Understand the methods of testing of single-phase transformer.
3	To Understand the three phase transformers and achieve three phase to two phase Conversion and the concepts of electromechanical energy conversion..
4	To Understand the construction, principle of operation and performance of DC Machines
5	To Analyze the characteristics, performance, methods of speed control and testing Methods of DC motors.

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze the performance of single phase transformers by regulation, losses and efficiency of single phase transformers.	K4
CO2	Analyze the performance of Parallel transformers, control voltages with tap changing methods	K4
CO3	Apply the concept of three-phase to two-phase transformation andelectromechanical energy conversion.	K2
CO4	Mitigate the ill-effects of armature reaction and commutation in dc machines.	K4
CO5	Determine the torque production mechanism and control the speed of dc motors.	K2

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO2	3	2	1	-	-	-	-	-	-	-	-	-	2	1
CO3	1	2	2	-	-	-	-	-	-	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	1
CO5	3	2	-	1	-	-	-	-	-	-	-	-	-	2

COURSE CONTENT	
UNIT 1	**Single-phase Transformers** Types and constructional details – principle of operation –emf equation – operation on no load and on load – lagging, leading and unity power factors loads –phasor diagrams of transformers – equivalent circuit.
UNIT 2	**Performance and testing of transformers and auto transformers:** Regulation –losses and efficiency –effect of variation of frequency and supply voltage on losses –all day efficiency. Tests on single phase transformers –open circuit and short circuit tests – Sumpner's test – separation of losses –parallel operation with equal voltage ratios– auto transformer – equivalent circuit –comparison with two winding transformers.

UNIT 3	**3-Phase Transformer:** Polyphase connections- Y/Y, Y/ Δ, Δ/Y, Δ/ Δ and open Δ- third harmonics in phase voltages – three winding transformers- transients in switching –off load and on load tap changers- Scott connection. **Electromechanical Energy Conversion and introduction to DC machines** Principles of electromechanical energy conversion - singly excited and multi excited systems- calculation of force and torque using the concept of co-energy. Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques–characteristics of DC shunt generator –applications of DC Generators
UNIT 4	**Operation of DC motors** Back-emf and torque equations of dc motors – Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors – losses and efficiency – applications of dc motors. Necessity of a starter – starting by 3 point and 4-point starters.
UNIT 5	**Speed Control of motors and Testing of DC Machines** Speed control by armature voltage and field control – testing of DC machines – brake test, Swinburne's method – principle of regenerative or Hopkinson's method – retardation test – field's test- separation of losses.

TEXT BOOKS	
1	Electrical Machines by D. P.Kothari, I .J .Nagarth,McGraw Hill Publications, 4th edition, 2010.
2	Electric Machinery by A.E.Fitzgerald,Charleskingsley,StephenD.Umans, TMH, 6th edition, 2003.
REFERENCE BOOKS	
1	Electrical Machines by P.S. Bhimbra, Khanna Publishers, 7th edition, 2011.
2	Performance and design of AC machines – M.G. Say
3	The performance and design of direct current machines AE. Clayton , NN. Hancock by CBS publishers
4	Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education, 4th edition, 2010.
5	Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria& Sons, 1st edition, 2009
WEB RESOURCES (Suggested)	
1	http://www.electrical4u.com/principle-of-dc-generator/
2	http://www.electrical4u.com/single-three-phase-transformer-vs-bank-of-three-single-phase-transformers/
3	https://studyelectrical.com/2014/12/working-principle-of-dc-motor.html
4	https://www.electricaleasy.com/2014/05/three-phase-transformer-connections.html
5	https://www.allaboutcircuits.com/textbook/alternating-current/chpt-10/three-phase-transformer-circuits/

ELECTROMAGNETIC FIELDS **II Year I semester**

Course Category	Professional Core Course	**Course Code**	**20EE3T06**
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment**	**30**
		Semester End Examination	**70**
		Total Marks	**100**

COURSE OBJECTIVES	
1	To study the production of electric field and potentials due to different configurationsof static charges.
2	To study the properties of conductors and dielectrics, calculate the capacitance of different configurations,the concept of conduction and convection currentdensities.
3	To study the magnetic fields produced by currents in different configurations, application of Ampere's law and the Maxwell's second and third equations
4	To develop the concept of self and mutual inductances and the energy stored.
5	To study time varying and Maxwell's equations in different forms and Maxwell'sfourth equation for the induced emf.

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply the laws of Electrostatics to compute electric field Intensity.	K2
CO2	Analyze the behaviour of conductors, dielectrics and capacitors.	K2
CO3	Apply the laws of Magneto statics to calculate magnetic field intensity.	K2
CO4	Determineself and mutual inductances and the energy stored in the magnetic field.	K4
CO5	Apply the concepts of faradays laws,displacement current and Poynting vector.	K2

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	3	2	2	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	2	1	-	-	-	-	-	-	-	-	2
CO3	3	3	2	2	-	-	-	-	-	-	-	-	-	2
CO4	3	3	2	2	-	-	-	-	-	-	-	-	-	2
CO5	3	3	2	2	-	-	-	-	-	-	-	-	-	2

COURSE CONTENT	
UNIT 1	**Electrostatics:** Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge, work done in moving a point charge in an electrostatic field, electric potential – potential gradient, Gauss's law – Maxwell's first law, Laplace's and Poison's equations and solution of Laplace's equation in one variable.
UNIT 2	**Conductors –Dielectrics and Capacitance:** Electric dipole-dipole moment potential and EFI due to an electric dipole, Torque on an Electric dipole in an electric field, conductors and Insulators – their behaviour in electric field. Polarization, boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space. Capacitance of parallel plates, spherical dielectrics, energy stored and energy density in a static electric field, current density, conduction and convection current densities, Ohm's law in point form – equation of continuity.

UNIT 3	**Magneto statics, Ampere's Law and Force in magnetic fields:** Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Maxwell's second Equation, Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors.
UNIT 4	**Self and mutual inductance:** Self and mutual inductance – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.
UNIT 5	**Time Varying Fields:** Faraday's laws of electromagnetic induction – integral and point forms, Maxwell's fourth equation ,statically and dynamically induced EMF – modification of Maxwell's equations for time varying fields, displacement current, Poynting theorem and Poynting vector.

TEXT BOOKS	
1	"Engineering Electromagnetics" by William H. Hayt& John A. Buck Mc. Graw-Hill, 7th Editon.2006.
2	"Principles of Electro Magnetics" by Sadiku, Oxford Publications, 6th edition, 2015
REFERENCE BOOKS	
1	Introduction to Electro Dynamics by D J Griffiths, Prentice-Hall of India Pvt. Ltd, 2nd edition
2	Electromagnetic Field Theory (including Antennaes and wave propagation), by K.A. Gangadhar, P.M. Ramanthan ,16th edition, Khanna Publications, 2007.
3	Electromagnetic Field Theory by Yaduvir Singh, Pearson India, 1st edition, 2011.
4	Fundamentals of Engineering Electromagnetics by Sunil Bhooshan, Oxford University, Press, 2012.
5	Electromagnetics by Joseph A. Edminister, Schaum's Outline, 4th Edition,2014.
WEB RESOURCES (Suggested)	
1	http://bookboon.com/en/essential-electromagnetism-ebook
2	https://nptel.ac.in/downloads/115101005/
3	https://ocw.mit.edu/courses/physics/8-07-electromagnetism-ii-fall-2012/

II Year I semester

ELECTRICAL CIRCUITS LABORATORY

Course Category	Professional Core Course	**Course Code**	**20EE3L04**
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**15** **35** **50**

COURSE OBJECTIVES	
1	To verify and demonstrate variousNetwork theorems and resonance.
2	To draw the locus diagram of series circuits
3	To determine the various parameters of a two port networks
4	To determine self and mutual inductance of a magnetic circuit, parameters of a given coil.
5	To measure the power of three phase unbalanced circuit.

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Apply various Network theorems	K3
CO2	Determination of self and mutual inductances	K3
CO3	Two port parameters of a given electric circuits	K4
CO4	Draw locus diagrams	K2
CO5	Draw Waveforms and phasor diagrams for lagging and leading networks	K2

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3	1	-	-	-	-	-	3	2	1	-	1	1
CO2	3	3	1	-	-	-	-	-	3	2	1	-	1	1
CO3	3	3	1	1	-	-	-	-	3	2	1	-	1	1
CO4	3	3	1	-	-	-	-	-	3	2	1	-	1	1
CO5	3	3	1	-	-	-	-	-	3	2	1	-	1	1

xp. No.	**CONTENTS** **(only 10 experiments shall be conducted from the list below)**
1	Verification of Kirchhoff's circuit laws.
2	Verification of Superposition theorem
3	Verification of Thevenin's and Norton's Theorems
4	Verification of Maximum power transfer theorem
5	Verification of Compensation theorem
6	Verification of Reciprocity and Millmann's Theorems
7	Locus diagrams of R-Land R-C series circuits
8	Series and parallel resonance
9	Determination of self, mutual inductances and coefficient of coupling
10	Determination of Impedance (Z) and Admittance (Y) Parameters for a two port network
11	Determination of Transmission and Hybrid parameters
12	Determination of Parameters of a choke coil.
13	Determination of cold and hot resistance of an electric lamp.
14	Measurement of 3-phase power by two wattmeter method for unbalanced loads

II Year I semester

TRANSFORMERS AND DC MACHINES LABORATORY

Course Category	Lab Course Professional Core Course	**Course Code**	**20EE3L05**
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**15** **35** **50**

COURSE OBJECTIVES	
1	To Obtain the conversion of three phase supply to two phase supply by using transformers.
2	To Predetermine the efficiency, regulation and equivalent circuit of transformers and assess their performance.
3	To Plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.
4	To Determine the losses and efficiency of a DC machines
5	To Determine the performance Characteristics of a DC motor

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Obtain the conversion of three phase supply to two phase supply by using transformers.	K3
CO2	Predetermine the efficiency, regulation and equivalent circuit of transformers and assess their performance.	K3
CO3	Plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.	K2
CO4	Determine the losses and efficiency of a DC machines	K3
CO5	Determine the performance Characteristics of a DC motor	K3

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO2
CO1	2	2	2	-	-	-	-	-	-	-	-	-	1	-
CO2	2	1	1	-	-	-	-	-	-	-	-	-	1	1
CO3	3	2	-	1	-	1	-	-	-	-	-	-	-	1
CO4	2	2	1	1	-	-	1	-	-	-	-	-	1	1
CO5	2	1	-	-	-	-	-	-	-	-	-	1	1	1

Exp. No	CONTENTS (only 10 experiments shall be conducted from the list below)
1	Predetermination of efficiency, regulation and to obtain the parameters of the equivalent circuit of a single phase transformer by conducting OC & SC tests.
2	Predetermination of efficiency, regulation and to obtain the parameters of the equivalent circuit of a single phase transformer by conducting Sumpner's test
3	Conversion of three phase to two phase supply by using Scott connection of transformers
4	Parallel operation of Single phase Transformers under no-load and load conditions
5	Separation of core losses of a single phase transformer
6	Load test on single phase transformer.
7	Determination of critical field resistance and critical speed of DC shunt generator by using Magnetization characteristics .
8	Predetermination of efficiency of DC Machine by conducting Swinburne's test
9	Performance characteristics of a DC shunt motor by conducting Brake test.
10	Predetermination of efficiency of two DC shunt machines by conducting Hopkinson's test
11	Speed control of DC shunt motor by Field and armature Control methods
12	Determination of constant losses of DC shunt motor by conducting Retardation test
13	Separation of losses (Eddy current and Hysteresis) in a DC shunt motor.
14	Load Test on DC shunt Generator

II Year I semester

ELECTRONIC DEVICES AND CIRCUITS LABORATORY

Course Category	Engineering Science Course	**Course Code**	**20EC3L02**
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	EDC	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To plot the V-I characteristics of semi-conductor diodes, transistors.
2	To calculate ripple factor and efficiency of rectifiers
3	To plot the frequency response of different amplifiers and design of oscillator circuits

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basic knowledge and analyze the characteristics of P-N Diode, Transistor, FET, UJT and SCR.	K2
CO2	Calculate the ripple factor for half wave and full wave rectifiers with and without filters	K2
CO3	Analyze CE and CC amplifiers.	K3

Note: K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	2					1		2	1			1	1
CO2	1	1							2	1			1	1
CO3	1	1					1		2	1			1	1

LIST OF EXPERIMENTS:

PART A: identification of Components

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO

PART B: Any 10 of the following experiments are to be conducted

Experiment 1	P-N Junction Diode Characteristics for Ge and Si Part A: Forward bias (Calculation of forward resistance and cut-in voltage) Part B: Reverse bias (Calculation of reverse resistance)
Experiment 2	Zener Diode Characteristics Part A: V-I Characteristics-Reverse Bias (Calculation of reverse resistance and Breakdown voltage) Part B: Zener Diode as Voltage Regulator
Experiment 3	BJT Characteristics (CE Configuration) and calculation of Ri, Ro, Av and Ai. Part A: Input Characteristics Part B: Output Characteristics

Experiment 4	FET Characteristics (CS Configuration) and calculation of r_d, g_m and μ Part A: Drain Characteristics Part B: Transfer Characteristics
Experiment 5	SCR Characteristics
Experiment 6	UJT Characteristics
Experiment 7	Rectifiers Part A: Half-wave Rectifier Part B: Full-wave Rectifier
Experiment 8	Rectifiers With C and π Filter Part A: Half-wave Rectifier Part B: Full-wave Rectifier
Experiment 9	CRO Applications (Amplitude, Frequency, Phase shift, L-Figures, Gear Wheel Patterns)
Experiment 10	Design of CE Amplifier and calculate bandwidth
Experiment 11	Design of CC Amplifier and calculate bandwidth
Experiment 12	Design of CS Amplifier and calculate bandwidth

II Year I semester

DESIGN OF ELECTRICAL CIRCUITS USING ENGINEERING SOFTWARE TOOLS

Course Category	**Skilled oriented Course**	**Course Code**	**20EE3S01**
Course Type		**L-T-P-C**	**0-0-4-2**
Prerequisites	**NIL**	**Total Marks**	**50**

COURSE OBJECTIVES	
1	To Learn the fundamentals of MATLAB Tools
2	To generate various waveform signals and sequences
3	To verify and simulate various electrical circuits using Mesh and Nodal Analysis
4	To verify and simulate RLC series and parallel resonance.
5	To determine self and mutual inductance of a magnetic circuit, parameters of a given coil.

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Write the MATLAB programs to simulate the electrical circuit problems	K3
CO2	Simulate various circuits for electrical parameters	K3
CO3	Simulate various wave form for determination of wave form parameters	K3
CO4	Simulate various theorems ,RLC series and parallel resonance circuits for resonant parameters	K3
CO5	Simulate magnetic circuits for determination of self and mutual inductances	K3

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	1	-	-	-	3	2	1	1	1	1
CO2	3	2	2	1	1	-	-	-	3	2	1	1	1	1
CO3	3	2	2	1	1	-	-	-	3	2	1	1	1	1
CO4	3	2	2	1	1	-	-	-	3	2	1	1	1	1
CO5	3	2	2	1	1	-	-	-	3	2	1	1	1	1

Exp. No.	CONTENTS (only 10 experiments shall be conducted from the list below)
1	Generation of various signals and sequences (Periodic and Aperiodic), such as unit Impulse, Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp.
2	Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy, and Average Power
3	Verification of Kirchhoff's current law and voltage law using simulation tools
4	Verification of mesh analysis using simulation tools.
5	Verification of nodal analysis using simulation tools.
6	Determination of average value, rms value, form factor, peak factor of sinusoidal wave, square wave using simulation tools.
7	Verification of super position theorem using simulation tools.
8	Verification of reciprocity theorem using simulation tools.
9	Verification of maximum power transfer theorem using simulation tools.
10	Verification of Thevenin's theorem using simulation tools
11	Verification of Norton's theorem using simulation tools.
12	Verification of compensation theorem using simulation tools
13	Verification of Milliman's theorem using simulation tools
14	Verification of series resonance using simulation tools.
15	Verification of parallel resonance using simulation tools.
16	Verification of self inductance and mutual inductance by using simulation tools.

II Year I semester

PROFESSIONAL ETHICS & HUMAN VALUES

Course Category	Mandatory Course	**Course Code**	**20HM3T07**
Course Type	Theory	**L-T-P-C**	2-0-0-0
Prerequisites	NIL	**Internal Assessment**	100

COURSE OBJECTIVES	
The student will learn	
1	typical number base conversion, error coding techniques, Theorems and functions of Boolean algebra and behavior of logic gates.
2	Boolean function simplification using Karnaugh maps and Quine-McCluskey methods
3	the concepts of combinational circuits
4	the concepts of sequential circuits
5	The development of advanced sequential circuits.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand different concepts in Professional Ethics and Human Values.	K2
CO2	Apply ethical principles to resolve the problems that arise in work place.	K3
CO3	Make use of Engineers rights to fulfill their responsibilities.	K3
CO4	Understand the responsibility of an engineer in designing safety.	K2
CO5	Analyze the social media accounts in order to create and maintain a positive digital footprint.	K4

Note: K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO12**	**PSO 1**	**PSO 2**
CO1	0	0	2	0	0	3	2	3	0	2	0	2	0	0
CO2	0	0	2	0	0	3	2	3	0	1	0	2	0	0
CO3	0	0	2	0	0	3	2	3	0	2	0	2	0	0
CO4	0	0	2	0	0	3	2	3	0	2	0	2	0	0
CO5	0	0	2	0	0	3	2	3	0	1	0	2	0	0

COURSE CONTENT	
UNIT-I	**Professional Ethics and Human values:** Ethics -History of Ethics-Types of Ethics, Professional Ethics and its forms - Morals, Values – Integrity –Civic Virtue –Respect for others – Living Peacefully – Caring – Sharing – Honesty – Courage – Value time –Co-operation – Loyalty- Collegiality-Commitment – Empathy – Self-confidence – Spirituality- Character.
UNIT-II	**Engineering & Organization Ethics:** Engineering Ethics-Meaning & Purpose of Engineering Ethics- Consensus and Controversy–Work Place Ethics and Business Ethics –Ethics in HRM, Finance & Marketing– Ethical Theories-Meaning & Uses of Ethical Theories-Theories of moral Development-Kohlberg's Theory – Gilligan's Argument –Heinz's Dilemma

UNIT-III	**Engineers Responsibilities and Rights:** Key Characteristics of Engineering Professionals–Professional Roles to be played by an Engineer - Ethical egoism-Collective bargaining-Confidentiality- Acceptance of Bribes/Gifts when is a Gift and a Bribe-examples of Gifts v/s Bribes-Whistle Blowing and its types-when should it be attempted-preventing whistle blowing.
UNIT-IV	**Engineers' Responsibility for Safety and Risk:** Concept of Safety-Types of Safety, Risk-Types of Risks, Voluntary v/s Involuntary Risk- Short term v/s Long term Consequences- Expected Probability- Reversible Effects- Threshold Levels for Risk- Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.
UNIT-V	**Ethical issues in Social Media:** Social Media- Various Social Media Platforms: Google, Facebook, YouTube, Instagram -Social Media set-up and Uses-Ethical use of Social media-Effects of Social Media on Public- Social Media (vs) News- Social Media Fame and Reputation-Trolling, Harassing, and Hating on Social Media-Legal Aspects of Social Media.

TEXT BOOKS	
1.	"Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar- PHI Learning Pvt. Ltd-2009.
2.	"Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana- Maruthi Publications.
3.	"Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications
4.	"Professional Ethics and Human Values" by Prof.D.R.Kiran
5.	"Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication
6.	"Ethics in Engineering" by Mike W. Martin and Roland Schinzinger -Tata McGraw- Hill -2003
7.	"Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009

II Year II semester

PYTHON PROGRAMMING

Course Category	Engineering Sciences Course	**Course Code**	20CS4T03
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn	
1	To learn about Python programming language syntax, semantics, and the runtime environment.
2	To be familiarized with universal computer programming concepts like data types, containers.
3	To be familiarized with general computer programming concepts like conditional execution, loops & functions.
4	To be familiarized with general coding techniques and object-oriented programming

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Develop essential programming skills in computer programming concepts like data types, containers.	K3
CO2	Apply the basics of programming in the Python language.	K3
CO3	Solve coding tasks related conditional execution, loops.	K3
CO4	Solve coding tasks related to the fundamental notions and techniques used in object- oriented programming.	K3
CO5	Make use of Exceptions and GUI interfaces for developing applications	K3

Note: K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	1	1	-	-	-	-	-	-	1	3	3
CO2	3	2	1	1	1	-	-	-	-	-	-	1	3	3
CO3	3	2	1	1	1	-	-	-	-	-	-	1	3	3
CO4	3	2	2	3	3	-	-	-	-	-	-	1	3	3
CO5	3	2	2	3	3	-	-	-	-	-	-	1	3	3

COURSE CONTENT	
UNIT-I	Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

UNIT-II	Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement, Conditional Iteration The While Loop Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.
UNIT-III	List and Dictionaries: Lists, Defining Simple Functions, Dictionaries Design with Function**:** Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function Modules: Modules, Standard Modules, Packages.
UNIT-IV	File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline () and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations Object Oriented Programming**:** Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance , overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism.
UNIT-V	Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions. Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI - Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources. Programming**:** Introduction to Programming Concepts with Scratch.

TEXT BOOKS	
1.	Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2.	Introduction to Programming Using Python, Y. Daniel Liang, Pearson.
REFERENCE BOOKS	
1.	Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2.	Core Python Programming, Dr. R. Nageswara Rao, ISBN: 9789386052308, 3ed, Wiley Publication, 2019.
WEB RESOURCES	
1.	https://www.tutorialspoint.com/python3/python_tutorial.pdf

II Year II semester

DIGITAL ELECTRONICS

Course Category	Engineering Sciences Course	**Course Code**	**20EC4T11**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basics of Electronics and Logic Gates	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn	
1	typical number base conversion, error coding techniques, Theorems and functions of Boolean algebra and behavior of logic gates.
2	Boolean function simplification using Karnaugh maps and Quine-McCluskey methods
3	the concepts of combinational circuits
4	the concepts of sequential circuits
5	The development of advanced sequential circuits.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Classify different number systems and apply to generate various codes.	K2
CO2	Use the concept of Boolean algebra in minimization of switching functions.	K2
CO3	Design different types of combinational logic circuits.	K4
CO4	Apply the knowledge of flip-flops in designing of Registers and counters	K3
CO5	The operation and design methodology for synchronous sequential circuits and algorithmic state machines.	K3

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	-	-	-	-	-	-	-	-	2	2
CO2	2	3	2	1	-	-	-	-	-	-	-	-	2	2
CO3	2	2	3	2	-	-	-	-	-	-	-	-	2	2
CO4	2	2	3	2	-	-	-	-	-	-	-	-	2	2
CO5	2	2	3	2	-	-	-	-	-	-	-	-	2	2

COURSE CONTENT	
UNIT-I	**Review of Number Systems & Codes:** Representation of numbers of different radix, conversion from one radix to another radix, r-1's complements and r's complements of signed members. Gray code,4-bit codes; BCD,Excess-3, 2421, 84-2-1 code etc., Error detection & correction codes: parity checking, even parity, odd parity, Hamming code. Boolean theorems and logic operations: Boolean theorems, principle of complementation & duality, De-Morgan theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR,EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NO Realizations.
UNIT-II	**Minimization Techniques:** Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6variables) and tabular method. **Combinational Logic Circuits I:**Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit

UNIT-III	**Combinational Logic Circuits II :** Design of encoder, decoder, multiplexer and demultiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder **Introduction of PLD's:** PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions.
UNIT-IV	**Sequential Circuits-I:** Classification of sequential circuits (synchronous and asynchronous), operation of NAND& NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flipflop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip-flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.
UNIT-V	**Sequential Circuits -II:** Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization ofsequence generator and sequence detector circuits, Races and Hazards.

TEXT BOOKS	
1.	Switching and finite automata theory Zvi.KOHAVI, Niraj.K.Jha 3rdEdition,Cambridge UniversityPress,2009
2.	Digital Design by M.Morris Mano, Michael D Ciletti,4th editionPHIpublication,2008
REFERENCE BOOKS	
1.	Fundamentals of Logic Design by Charles H. Roth Jr,Jaico Publishers,2006
2.	Digital Design: Principles And Practices, john.F.Wakerly,4 thedition, Pearson Education
3.	Switching Theory and Logic Design by A. Anand Kumar, PHI Learning pvtltd,2016.

II Year II semester

POWER SYSTEMS-I

Course Category	Professional Core Course	**Course Code**	**20EE4T07**
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To study the principle of operation of different components of a thermal power stations.
2	To study the principle of operation of different components of a Nuclear power stations.
3	To study the constructional and operation of different components of an Air and Gas Insulated substations.
4	To study the constructional details of different types of cables.
5	To study different types of load curves and tariffs applicable to consumers.

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify the different components of thermal power plants.	K2
CO2	Identify the different components of nuclear Power plants.	K2
CO3	Distinguish between AC/DC distribution system and clarify different components of air and gas insulated substations.	K2
CO4	Categorize single core and three core cables with different insulating materials.	K2
CO5	Analyze the different economic factors of power generation and tariffs.	K4

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	1	1	-	-	-	-	-	-	-	-	1	1	1
CO2	3	1	1	-	-	-	-	-	-	-	-	1	1	1
CO3	3	1	1	-	-	-	-	-	-	-	-	2	1	1
CO4	3	2	2	-	-	-	-	-	-	-	-	1	2	2
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	2

COURSE CONTENT	
UNIT 1	**Hydroelectric Power Stations:** Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation **Thermal Power Stations** Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.
UNIT 2	**Nuclear Power Stations** Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

UNIT 3	**Classification of Air and Gas Insulated substations** **Air Insulated Substations** –indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment. Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams. **Gas Insulated Substations (GIS)** –advantages of gas insulated substations, constructional aspects of GIS, installation and maintenance of GIS, comparison of air insulated substations and gas insulated substations.
UNIT 4	**Underground Cables** Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables. Grading of cables: capacitance grading and intersheath grading.
UNIT 5	**Economic Aspects of Power Generation & Tariff** **Economic Aspects** –load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants. **Tariff Methods**–costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-rate, two-part, three–part, and power factor tariff methods.

TEXT BOOKS	
1	A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagarand A. Chakrabarti, DhanpatRai& Co. Pvt. Ltd, 2016.
2	Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa, New age International (P) Limited, Publishers, 3rd edition.
REFERENCE BOOKS	
1	Elements of Electrical Power Station Design by M V Deshpande, PHI, New Delhi, 2009.
2	Principles of power system by V.K.Mehta& Rohit Mehta, S.Chand Publications
3	Generation of Electrical Energy by B.R.GuptaS.Chand Publications 7th Edition.
WEB RESOURCES (Suggested)	
1	https://www.ntpc.co.in/en/power-generation
2	https://www.sciencedirect.com/topics/engineering/electric-power-distribution
3	https://energy.economictimes.indiatimes.com/tag/power+generation

II Year II semester

INDUCTION AND SYNCHRONOUS MACHINES

Course Category	Professional Core Course	**Course Code**	**20EE4T08**
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**Transformer and DC Machines**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	Understand the principle of operation and performance of 3-phase induction motor.
2	Quantify the performance of induction motor and induction generator in terms oftorque and slip.
3	To understand the torque producing mechanism of a singlephase induction motor.
4	To study the principle of emf generation, the effect of armature reaction and predetermination of voltage regulation ,parallel operation and control of real and reactive powers for synchronous generators.
5	To understand the operation, performance and starting methods of synchronous motors.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the operation and performance of three phase induction motor.	K2
CO2	Analyze the performance of induction motor and induction generator.	K4
CO3	Implement different methods of starting of three phase and single phase induction motors.	K2
CO4	Develop winding design and predetermine the regulation of synchronous generators.	K4
CO5	Explain hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor.	K2

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	2
CO2	1	1	2	1	-	-	-	-	-	-	-	-	-	2
CO3	3	1	2	-	-	-	-	-	-	-	1	-	1	2
CO4	2	2	2	-	-	-	-	-	-	-	-	-	-	2
CO5	2	2	2	-	-	-	-	-	-	-	-	-	1	1

COURSE CONTENT	
UNIT 1	**3-phase induction motors** Construction details of squirrel cage and slip ring induction motors –production of rotating magnetic field principle of operation Equivalent circuit phasor diagram- slip speed-rotor emf and rotor frequency rotor current and pf at standstill and during running conditions rotor power input, rotor copper loss and mechanical power developed and their interrelationship.
UNIT 2	**Characteristics and testing of induction motors** Torque equation expressions for maximum torque and starting torque torque slip characteristic double cage and deep bar rotors–crawling and cogging –speed control of induction motor with V/f control method no load and blocked rotor tests circle diagram for predetermination of performance–induction generator operation (Qualitative treatment only)

UNIT 3	**Starting methods of 3-phase induction motors** Methods of starting of three phase Induction motors: DOL, Auto transformer, Star-Delta and rotor resistance methods. **Single phase induction motors**: Constructional features- equivalent circuit- problem of starting-double revolving field theory-Methods of starting. AC series motors.
UNIT 4	**Synchronous generator:** Constructional features of non-salient and salient pole machines types of armature windings – distribution, pitch and winding factors – E.M.F equation improvements of waveform and armature reaction phasor diagrams - voltage regulation by synchronous impedance method – MMF method and Potier triangle method two reaction analysis of salient pole machines and phasor diagram. Parallel operation with infinite bus and other alternators – synchronizing power – load sharing – control of real and reactive power – numerical problems.
UNIT 5	**Synchronous motor** Synchronous motor principle and theory of operation – phasor diagram – starting torque – variation of current and power factor with excitation – capability curves - synchronous condenser – mathematical analysis for power developed – hunting and its suppression – methods of starting – applications.

TEXT BOOKS	
1	Electrical Machines by P.S. Bhimbra, Khanna Publishers
2	Electric Machinery by A.E.Fitzgerald, Charles Kingsley, Stephen D.Umans, TMH
REFERENCE BOOKS	
1	Performance and design of AC machines – M.G. Say
2	Alternating Current Machines by A.F.Puchstein, T.C. Lloyd, A.G. Conrad, ASIA Publishing House
3	Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education, 2010.
4	Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition
5	Theory & Performance of Electrical Machines by J. B. Guptha, S. K. Kataria& Sons, 4th Edition.
WEB RESOURCES (Suggested)	
1	http://www.electricaleasy.com/
2	http://electrical-engineering-portal.com/rotating-magnetic-field-ac-machines
3	http://nptel.ac.in/courses/108106072/pdf/2_6.pdf

II Year II semester

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Course Category	**Humanities including Management**	**Course Code**	**20HM4T01**
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Make use of the concepts of managerial economics and demand in managerial decision making and predicting demand for goods and services	K3
CO2	Assess the functional relation among production, cost of production, cost concepts and Break-Even Analysis.	K5
CO3	Classify market structures for price and output decisions and Appraise the forms of business organizations and trade cycles in economic growth.	K2
CO4	Make use of the final accounting statements in financial decision making	K3
CO5	Apply capital budgeting techniques in financial decision making	K3

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PS01**	**PS02**
CO1	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	1	-	-	-	-	-	-	-	-	3	-	-	-
CO3	-	1	-	-	-	-	-	-	2	-	-	1	-	-
CO4	-	0	-	-	-	-	-	-	-	-	3	2	-	-
CO5	-	3	-	-	-	-	-	-	-	-	3	2	-	-

COURSE CONTENT	
UNIT 1	**Introduction to Managerial Economics and demand Analysis:** Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects-Basic Economic Tools used in Managerial Economics-Concepts of Demand-Types-Determinants-Law of Demand its Exceptions-Elasticity of Demand-Types and Measurement- Demand forecasting and Methods of demand forecasting (Opinion survey methods, Trend line by observation, least squares method and barometric techniques)
UNIT 2	**Production and Cost Analysis:** Production function- Law of Variable proportions- Iso-quants and Isocosts- Laws of Returns to Scale-Cobb-Douglas Production function-Economies of Scale-Cost Concepts- Fixed vs Variable Costs-Out of Pocket Costs vs Imputed Costs-Cost Volume Profit analysis-Determination of Break-Even Point (Simple Problems).
UNIT 3	**Introduction to Markets, Pricing Policies and Types of Business Organizations:** Market Structures: Perfect Competition, Monopoly, Monopolistic and Oligopoly Features – Price and Output Determination. **Pricing Policies**: Methods of Pricing: Limit Pricing, Market Skimming Pricing, Internet Pricing: Flat Rate Pricing, Usage sensitive, Transaction based pricing, Priority Pricing. **Types of Business Organization and Business Cycles:** Features and Evaluation of Sole Trader – Partnership – Joint Stock Company – State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycles.

UNIT 4	**Introduction to Accounting and Capital Budgeting:** Introduction to Double Entry Systems-Journal-Ledger- Trail Balance - Preparation of Final Accounts (Simple Problems)
UNIT 5	**Capital Budgeting**: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Need for Capital Budgeting-Techniques of Capital Budgeting-Traditional and Modern Methods(Simple Problems)

TEXT BOOKS	
1	Dr. A. R. Aryasri – Managerial Economics and Financial Analysis – TMH- 2018
2	Dr. N. Appa Rao, Dr. P. Vijay Kumar - 'Managerial Economics and Financial Analysis' - Cengage Publications – 2012
REFERENCE BOOKS	
1	V. Maheswari -Managerial Economics - Sultan Chand & Sons – 2014.
2	Suma Damodaran - Managerial Economics - Oxford - 2011.
3	Vanitha Agarwal - Managerial Economics - Pearson Publications- 2011.
4	V.Maheswari - Financial Accounting- Vikas Publications - 2018
5	S. A. Siddiqui & A. S. Siddiqui - Managerial Economics and Financial Analysis - New Age International Publishers - 2012
WEB RESOURCES (Suggested)	
1	https://economictimes.indiatimes.com/definition/law-of-supply
2	https://sites.google.com/site/economicsbasics/managerial-theories-of-the-firm
3	https://www.managementstudyguide.com/capitalization.htm

II Year II semester

PYTHON PROGRAMMING LABORATORY

Course Category	Engineering Sciences	**Course Code**	20CS4L03
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**15** **35** **50**

COURSE OBJECTIVES	
1	To acquire programming skills in core Python and to acquire Object Oriented Skills in Python
2	To develop the skill of designing Graphical user Interfaces in Python
3	To develop the ability to write database applications in Python

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Write, Test and Debug Python Programs and Use Conditionals and Loops for Python Programs	K4
CO2	Use functions and represent Compound data using Lists, Tuples and Dictionaries	K3
CO3	Use various applications using python	K3

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	1	1	1	-	-	-	-	-	2	3	3	2
CO2	3	2	1	1	1	-	-	-	-	-	2	3	3	2
CO3	3	2	1	1	1	-	-	-	-	-	2	3	3	2

COURSE CONTENTS

1) Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2) Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
3) Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
4) Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
5) Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
6) Write a function called *first_diff*that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
7) Write a function called *number_of_factors*that takes an integer and returns how many factors the number has.
8) Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise.
9) Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.

10) Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
11) Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.
(a) Do this using the sort method. (b) Do this without using the sort method.
12) Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.

13) Write a Python Program to implement the inheritance
14) Write a program to demonstrate Try/except/else.
15) Write a program to demonstrate try/finally and with/as.

II Year II semester

INDUCTION AND SYNCHRONOUS MACHINES LABORATORY

Course Category	Professional Core	**Course Code**	**20EE4L07**
Course Type	Laboratory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment**	**15**
		Semester End Examination	**35**
		Total Marks	**50**

COURSE OBJECTIVES	
1	Speed control methods of three-phase induction motors.
2	Performance characteristics of three-phase and single-phase induction motors.
3	Principles of power factor improvement of single-phase induction motor.
4	Voltage regulation calculations of three–phase alternator by various methods.
5	Performance curves of three-phase synchronous motor.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Assess the performance of single phase and three phase induction motors.	K4
CO2	Control the speed of three phase induction motor.	K4
CO3	Predetermine the regulation of three–phase alternator by various methods.	K2
CO4	Find the Xd/Xqratio of alternator and asses the performance of three–phase synchronous motor.	K4
CO5	Determine the performance of single phase AC series motor.	K2

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	1	1
CO2	2	1	-	1	-	-	-	-	-	-	-	1	-	1
CO3	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	1	-
CO5	1	2	1	-	-	-	-	-	-	-	-	-	-	-

Exp. No.	**CONTENTS** (only 10 experiments shall be conducted from the list below)
1	Performance characteristics of a three-phase Induction Motor by conducting Brake test
2	Determination of equivalent circuit parameters, efficiency and regulation of a three phase Induction motor by conducting No–load & Blocked rotor tests
3	Determination of Regulation of a three–phase alternator by using synchronous impedance &m.m.f. methods
4	Determination of Regulation of a three–phase alternator by using Potiertriangle method
5	Determination of V and Inverted V curves of a three phase synchronous motor.
6	Determination of X_d and X_q of a salient pole synchronous machine
7	Speed control of three phase induction motor by V/f method.
8	Determination of equivalent circuit parameters of single phase induction motor
9	Determination of efficiency of three-phase alternator by loading with three phase induction motor.
10	Power factor improvement of single-phase induction motor by using capacitors.
11	Parallel operation of three-phase alternator under no-load and load conditions
12	Determination of efficiency of a single-phase AC series Motor by conducting Brake test.
13	Starting of single-phase Induction motor by using capacitor start and capacitor start run methods.
14	Determination of efficiency of a single-phase Induction Motor by conducting Brake test.

II Year II semester

DIGITAL ELECTRONICS LABORATORY

Course Category	Engineering Sciences	**Course Code**	**20EC4L06**
Course Type	Laboratory	**L-T-P-C**	0-0-3-1.5
Prerequisites	Basics of Digital Electronics	**Internal Assessment** **Semester End Examination** **Total Marks**	15 35 50

COURSE OBJECTIVES	
1	To verify the truth table of logic gates
2	To verify the function of combinational of logic circuits using truth tables
3	To verify the function of sequential of logic circuits using truth tables

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	To understand the concepts of Logic gates	K2
CO2	To understand concepts of combinational circuits.	K2
CO3	To understand sequential circuits by learning flip-flops and their applications.	K3

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	-	-	-	-	1	-	2	1	-	-	1	1
CO2	1	1	-	-	-	-	-	-	2	1	-	-	1	1
CO3	1	1	-	-	-	-	1	-	2	1	-	-	1	1

LIST OF EXPERIMENTS: (Any 10 of the following experiments are to be conducted)	
Experiment 1	Verification of truth tables of Logic gates Two input (i) OR (ii) AND (iii) NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
Experiment 2	Design a simple combinational circuit with three variables with minimal SOP expression and verification of truth table
Experiment 3	Verification of functional table of 3-to-8-line Decoder / Demultiplexer
Experiment 4	4 variable logic function verification using 8 to 1 multiplexer.
Experiment 5	Design full adder circuit and verify its functional table.
Experiment 6	Verification of functional tables of (i) J K Edge triggered Flip _ Flop (ii) J K Master Slave Flip _ Flop (iii) D Flip _ Flop
Experiment 7	Design a four-bit ring counter using D Flip _ Flops / JK Flip Flop and verify the output
Experiment 8	Design a four-bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify output
Experiment 9	(a) Design Four-bit buffer register using D Flip _ Flops / JK Flip-Flops and verify output. (b) Design four bits shift right register using D Flip-Flops / JK Flip-Flops and verify output.
Experiment 10	Design a synchronous sequential circuit to convert 16KHz square wave frequency to 2 KHz and sketch the input and output waveforms.
Experiment 11	Design an asynchronous sequential circuit to convert 16KHz square wave frequency to 2 KHz and sketch the input and output waveforms.
Experiment 12	(a) Draw the circuit diagram of a single bit comparator and test the output (b) Testing of 7 segment Display with common cathode.

II Year II semester

INTERNET OF THINGS FOR ELECTRICAL APPLICATIONS

Course Category	Skill Oriented	**Course Code**	20EC4S03
Course Type		**L-T-P-C**	0-0-4-2
Prerequisites	Embedded Systems	**Total Marks**	50

COURSE OBJECTIVES	
1	To understand fundamentals of various technologies of Internet of Things.
2	To know various communication technologies and the connectivity of devices using web and internet in the IoT environment.
3	To understand the implementation of IoT by studying case studies like Smart Home, Smart city, etc.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	apply various technologies of Internet of Things to real time applications.	K2
CO2	apply various communication technologies and connect the devices using web and internet in the IoT environment.	K3
CO3	implement IoT to study Smart Home, Smart city, etc	K2

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of ProgramOutcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	3	2	-	2	-	-	-	-	-	-	-	1	2
CO2	2	2	2	-	3	-	-	-	-	-	-	-	2	1
CO3	1	2	3	-	2	-	-	-	-	-	-	-	2	2

List of Experiments: (Any TEN of the following Experiments are to be conducted)

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface temperature sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface Organic Light Emitting Diode (OLED) with Arduino/Raspberry Pi
6. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
8. Write a program on Arduino/Raspberry Pi to upload and retrieve temperature and humidity data to thing speak cloud.
9. 7 Segment Display
10. Analog Input & Digital Output
11. Night Light Controlled & Monitoring System
12. Fire Alarm Using Arduino
13. IR Remote Control for Home Appliances
14. A Heart Rate Monitoring System
15. Alexa based Home Automation System

ENVIRONMENTAL SCIENCE | **II Year II semester**

Course Category	Basic Sciences	**Course Code**	**20BE4T01**
Course Type	Theory	**L-T-P-C**	2 – 0 – 0 – 0
Prerequisites	Basic Knowledge in Environment and protection.	**Internal Assessment**	100

Course objective: To make students to get awareness on environment and to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

COURSE OUTCOMES		**Cognitive level**
Upon successful completion of the course, the student will be able to:		
CO1	Gain a higher level of personal involvement and interest in understanding and solving environmental problems.	K2
CO2	Comprehend environmental problems from multiple perspectives with emphasis on human modern lifestyles and developmental activities	K2
CO3	Demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century	K2
CO4	Recognize the interconnectedness of human dependence on the earth's ecosystems	K2
CO5	Influence their society in proper utilization of goods and services	K2

Note:K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO12**	**PS O1**	**PS O2**
CO1	1	-	1	-	-	1	2	-	-	-	1	-	-	-
CO2	-	1	-	-	-	-	1	-	-	-	-	-	-	-
CO3	-	-	-	-	2	-	1	-	-	-	-	-	-	-
CO4	-	-	-	-	1	1	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	3	1	-	-	-	-	-	-

COURSE CONTENT	
UNIT 1	**Multidisciplinary nature of Environmental Studies** Definition, Scope and Importance-International Efforts & Indian Environmentalists **Natural Resources** Forest resources : deforestation – Mining, dams and other effects on forest and tribal people. Water resources :Use and over utilization of surface and groundwater. Food resources: World food problems, effects of modern agriculture, fertilizer-pesticide problems. Energy resources: renewable and nonrenewable energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.
UNIT 2	Ecosystems, Biodiversity and its conservation Definition of Ecosystem and its structure, Functions Biodiversity Definition-Value of

	biodiversity, India as a mega-diversity nation, Threats to biodiversity, Conservation of biodiversity, Endangered and endemic species of India
UNIT 3	Environmental Pollution and Solid Waste Management Definition, Cause, Effects of Air pollution, Water pollution, Noise pollution, Radioactive pollution, Role of an individual in prevention of pollution. Solid Waste Management: Sources, effects and control measures of urban and industrial waste, e-waste management
UNIT 4	Social Issues and the Environment Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act-Issues involved in enforcement of environmental legislation, Rain water harvesting, Global Environmental challenges-case studies
UNIT 5	Human population and the Environment Population growth, Women and child welfare, Role of Information technology in environment and human health. Impact Assessment and its significances, stages of EIA Field work: A mini project related to Environmental issues / to visit a local polluted site (Submission of project by every student)

TEXT BOOKS

1. Environmental Studies for undergraduate courses by ErachBharucha,UGC.

2. A Textbook of Environmental Studies by Dr.S.AzeemUnnisa,Acadamic publishing company.

3.Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani;Pearson Education, Chennai

REFERENCE BOOKS

1. Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar, Cengage learning.

2.Glimpses of Environment by K.V.S.G. Murali Krishna Published by Environmental Protection Society, Kakinada, A.P.

3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi

4.Environmental Studies by PiyushMalaviya, Pratibha Singh, Anoopsingh: Acme Learning, NewDelhi.

5.An Introduction to Environmental Pollution by Dr.B.k.Sharma AND Dr.(Miss)H.kaur,Goel publishing House ,a unit of Krishna Prakasham Media (p) LH,Meerut India

WEB RESOURCES

1.UNIT-1: MULTI DISPLINARY NATURE OF ENVIRONMENT and NATURAL RESOURCES

http://www.defra.gov.uk/environment/climatechange
https://www.climatesolutions.org
https://en.wikibooks.org/wiki/Ecology/Ecosystems

2.UNIT-2:ECOSYSTEM, BIODIVERSITY AND ITS CONSERVATION

http://conbio.net/vl/ and www.biodiversitya-z.org/content/biodiversity

3.UNIT-3: ENVIRONMENTAL POLLUTION

https://www.omicsonline.org/environment-pollution-climate-change.php and
https://www.britannica.com/technology/solid-waste-management

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

Power Systems-II

Course Category	Professional Core Courses	**Course Code**	20EE5T09
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To understand the concepts of GMD/GMR and to compute inductance/capacitance of transmission lines
2	To distinguish the short and medium length transmission lines, their models and performance
3	To understand the performance and modeling of long transmission lines
4	To learn the effect of travelling waves on transmission lines
5	To learn the concepts of corona and the factors effecting corona
6	To understand sag and tension computation of transmission lines as well as to learn the performance of overhead insulators

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Calculate parameters of transmission lines for different circuit configurations	K3
CO2	Determine the performance of short, medium and long transmission lines	K3
CO3	Analyze the effect of travelling waves on transmission lines	K4
CO4	Analyze the effect of corona	K4
CO5	Calculate sag/tension of transmission lines and performance of line insulators	K3
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	3	2	-	2		-	-	-	-	-	-	-	2	2
CO3	3	2	-	2		-	-	-	-	-	-	-	1	2
CO4	3	1	2	1	-	-	-	-	-	-	-	-	2	2
CO5	3	1	1	-	-	-	-	-	-	-	-	-	1	2

COURSE CONTENT	
UNIT 1	**Transmission Line Parameters** Conductor materials – Types of conductors – Calculation of resistance for solid conductors – Skin and Proximity effects – Calculation of inductance for Single-phase and Three-phase– Single and double circuit lines– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors – 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 without and with Bundled conductors.
UNIT 2	**Performance Analysis of Transmission Lines** Classification of Transmission Lines – Short, medium, long lines and their model

	representation –Nominal-T, Nominal-Pie and A, B, C, D Constants for symmetrical and Asymmetrical Networks. Rigorous Solution for long line equations –Representation of Long lines – Equivalent T and Equivalent Pie network models - Surge Impedance and Surge Impedance Loading (SIL) of Long Lines - Regulation and efficiency for all types of lines – Ferranti effect.
UNIT 3	**Power System Transients** Types of System Transients – Propagation of Surges – Attenuation–Distortion– Reflection and Refraction Coefficients. Termination of lines with different types of conditions – Open Circuited Line–Short Circuited Line – T-Junction – Lumped Reactive Junctions.
UNIT 4	**Corona** Description of the phenomenon – Types of Corona - critical voltages and power loss – Advantages and Disadvantages of Corona - Factors affecting corona - Radio Interference.
UNIT 5	**Sag and Tension Calculations and Overhead Line Insulators:** 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 Types of Insulators – String efficiency and Methods for improvement - Voltage distribution– Calculation of string efficiency – Capacitance grading and Static Shielding.

TEXT BOOKS	
1	Electrical Power Systems – by C.L.Wadhwa, New Age International (P) Limited, 1998
2	Power System Engineering by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 3rd Edition
REFERENCE BOOKS	
1	Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4thedition
2	Power System Analysis and Design by B.R.Gupta, Wheeler Publishing
3	A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar A.Chakrabarthy, Dhanpat Rai Co Pvt. Ltd.2016
4	Electrical Power Systems by P.S.R. Murthy, B.S. Publications, 2017
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108/102/108102047/
2	https://circuitglobe.com/calculation-of-sag-and-tension.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

Power Electronics

III Year I semester

Course Category	Professional Core Courses	**Course Code**	20EE5T10
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To know the characteristics of various power semiconductor devices
2	To learn the operation of single phase full–wave converters and perform harmonic analysis of input current
3	To learn the operation of three phase full–wave converters and AC/AC converters
4	To learn the operation of different types of DC-DC converters
5	To learn the operation of PWM inverters for voltage control and harmonic mitigation

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate the static and dynamic characteristics of SCR, Power-MOSFET and Power-IGBT	K2
CO2	Analyze the operation of phase controlled rectifiers	K4
CO3	Analyze the operation of three-phase full–wave converters, AC Voltage Controllers and Cyclo converters	K4
CO4	Examine the operation and design of different types of DC-DC converters	K2
CO5	Analyze the operation of PWM inverters for voltage control and harmonic mitigation	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	1	2	-	-	-	-	-	-	-	-	-	-	3	-
CO2	1	2	-		-	-	-	-	-	-	-	-	3	-
CO3	2	2	-	-	2	-	-	-	-	-	-	-	3	1
CO4	2	2	-	2	2	-	-	-	-	-	-	-	3	-
CO5	1	2	-	2	-	-	-	-	-	-	-	-	3	-

COURSE CONTENT	
UNIT 1	**Power Semi-Conductor Devices** Silicon controlled rectifier (SCR) – Two transistor analogy - Static and Dynamic characteristics – Turn on and Turn off Methods - Triggering Methods (R, RC and UJT) – Snubber circuit design. Static and Dynamic Characteristics of Power MOSFET and Power IGBT– Gate Driver Circuits for Power MOSFET and IGBT - Numerical problems.
UNIT 2	**Single-phase AC-DC Converters** Single-phase fully controlled mid-point and bridge converter with R load, RL load and RLE load - Continuous and Discontinuous conduction - Effect of source inductance in Single-

	phase fully controlled bridge rectifier – Expression for output voltages – Single-phase Semi-Converter with R load-RL load and RLE load – Continuous and Discontinuous conduction - Harmonic Analysis – Dual converter its mode of operation - Numerical Problems.
UNIT 3	**Three-phase AC-DC Converters & AC – AC Converters** Three-phase fully controlled rectifier with R and RL load - Three-phase semi converter with R and RL load - Expression for Output Voltage - Harmonic Analysis - Three-phase Dual Converters - Numerical Problems. AC-AC power control by phase control with R and RL loads - Expression for rms output voltage – Single-phase step down and step up Cycloconverter - Numerical Problems.
UNIT 4	**DC–DC Converters** Operation of Basic Chopper – Analysis of Buck, Boost and Buck-Boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) - Output voltage equations using volt-sec balance in CCM & DCM – Expressions for output voltage ripple and inductor current ripple – control techniques – Introduction to PWM control - Numerical Problems.
UNIT 5	**DC–AC Converters** Introduction - Single-phase half-bridge and full-bridge inverters with R and RL loads – Phase Displacement Control – PWM with bipolar voltage switching, PWM with unipolar voltage switching - Three-phase square wave inverters - 120^0 conduction and 180^0 conduction modes of operation - Sinusoidal Pulse Width Modulation - Current Source Inverter (CSI) - Numerical Problems.

TEXT BOOKS	
1	Power Electronics: Converters, Applications and Design by Ned Mohan, Tore M Undeland, William P Robbins, John Wiley & Sons
2	Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
3	Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009.
REFERENCE BOOKS	
1	Elements of Power Electronics–Philip T.Krein. Oxford University Press; Second edition
2	Power Electronics – by P.S.Bhimbra, Khanna Publishers
3	Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 1996
4	Power Electronics: by Daniel W.Hart, Mc Graw Hill
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108/102/108102145/
2	https://nptel.ac.in/courses/108/101/108101038/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

Control Systems

Course Category	Professional Core Courses	**Course Code**	20EE5T11
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
2	To analyze the time response of first and second order systems and improvement of performance PI, PD, PID controllers. To investigate the stability of closed loop systems using Routh's stability criterion and root locus method.
3	To understand basic aspects of design and compensation of LTI systems using Bode diagrams
4	To learn Frequency Response approaches for the analysis of LTI systems using Bode plots, polar plots and Nyquist stability criterion.
5	To learn state space approach for analysis of LTI systems and understand the concepts of controllability and observability

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.	K4
CO2	Determine time response specifications of second order systems and absolute and relative stability of LTI systems using Routh's stability criterion and root locus method	K2
CO3	Analyze the stability of LTI systems using frequency response methods	K4
CO4	Design Lag, Lead, Lag-Lead compensators to improve system performance using Bode diagrams	K4
CO5	Represent physical systems as state models and determine the response. Understand the concepts of controllability and observability	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	3	2	1	-	-	-	-	-	-	-	-	-	2
CO2	3	3	2	1		-	-	-	-	-	-	-	1	2
CO3	3	2	2	2	-	-	-	-	-	-	-	-	-	2
CO4	3	2	2	2	-	-	-	-	-	-	-	-	1	2
CO5	3	3	2	1	-	-	-	-	-	-	-	-	-	2

COURSE CONTENT	
UNIT 1	**Mathematical Modelling of Control Systems** Classification of control systems - open loop and closed loop control systems and their differences - Feedback characteristics - transfer function of linear system, differential

	equations of electrical networks- translational and rotational mechanical systems - transfer function of Armature voltage controlled DC servo motor ,AC Servo Motor - block diagram algebra - signal flow graph – reduction using Mason's gain formula.
UNIT 2	**Time Response Analysis and Controllers** Standard test signals – time response of first and second order systems – time domain specifications - steady state errors and error constants - effects of proportional (P) - proportional integral (PI) - proportional derivative (PD) - proportional integral derivative (PID) systems. **Stability Assessment Techniques** The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems) - Effect of addition of Poles and Zeros to the transfer function.
UNIT 3	**Frequency Response Analysis** Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram –Polar plots, Nyquist stability criterion- stability analysis using Bode plots (phase margin and gain margin).
UNIT 4	**Classical Control Design Techniques** Lag, lead, lag-lead compensators - physical realisation - design of compensators using Bode plots.
UNIT 5	**State Space Analysis of Linear Time Invariant (LTI) Systems** Concepts of state - state variables and state model - state space representation of transfer function - diagonalization using linear transformation - solving the time invariant state equations - State Transition Matrix and its properties- concepts of controllability and observability.

TEXT BOOKS	
1	Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India
2	Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition
REFERENCE BOOKS	
1	Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition
2	Control Systems Engineering by Norman S. Nise, Wiley Publications, 7th edition
3	Control Systems by Manik Dhanesh N, Cengage publications
4	Control Systems Engineering by I.J.Nagarath and M.Gopal, New age International Publications, 5th Edition
WEB RESOURCES (Suggested)	
1	www.electrical4u.com/control systems
2	www.tutorialspoint.com/control_systems/control_systems_bode_plots

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

SURVEYING
(Open Elective – I)

Course Category	Open Elective	**Course Code**	**20CE5T01**
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	Introduce the students to basic principles of surveying.
2	Demonstrate the basic surveying skills.
3	Perform various methods of linear and angles measurements.
4	Enable the students to use surveying equipment's
5	Integrate the knowledge and produce topographical map.

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Illustrate the fundamentals in chain and plane table surveying.
CO2	Identify the angles on filed by compass survey.
CO3	Apply knowledge of leveling in surveying.
CO4	Measure the horizontal and vertical angles by using Theodolite and Total Station instruments.
CO5	Estimate the volume and area of irregular boundaries of filed.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	--	--	1	--	--	--	--	3	--	--	2	3	--	3
CO2	3	3	1	2	--	--	--	--	2	--	--	3	3	--	3
CO3	2	--	--	3	--	--	--	--	3	--	--	--	2	--	2
CO4	2	3	1	3	3	--	--	--	3	--	--	3	3	--	3
CO5	3	3	3	3	--	--	--	--	--	--	--	3	3	3	3

COURSE CONTENT	
UNIT I	**INTRODUCTION** Definition-Uses of surveying, Objectives, Principles and Classifications of Surveying – Errors in survey measurements. **DISTANCEMEASUREMENTCONVENTIONS AND METHODS** Use of chain and tape, Errors and corrections to linear measurements, overview of plane table surveying.

UNIT II	**COMPASS SURVEY** Definition- Principles of Compass survey - Meridians, Azimuths and Bearings, declination. Computation of angle - Purpose and types of Traversing - traverse adjustments – Local attraction.
UNIT III	**LEVELING** Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling. **CONTOURING** Characteristics and uses of contours- methods of conducting contour surveys and their plotting.
UNIT IV	**THEODOLITE** Theodolite, description, principles - uses – temporary and permanent adjustments, measurement of horizontal and vertical angles. Principles of Electronic Theodolite – Omitted Measurements. Introduction to geodetic surveying - Total Station and Global Positioning System. **CURVES** Types of curves, design and setting out. **TACHEOMETRIC SURVEYING** Stadia and tangential methods of Tachometry. **MODERN SURVEYING METHODS** Principle and types of E.D.M. Instruments, Total station advantages and Applications. Introduction to Global Positioning System.
UNIT V	**COMPUTATION OF AREAS AND VOLUMES** Computation of areas along irregular boundaries and regular boundaries. Embankments and cutting for a level section and two- level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

TEXT BOOKS	
1.	Surveying (Vol No.1, 2 &3) by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd, New Delhi.
2.	Text book of Surveying by C. Venkataramaiah, University press, India (P) limited.
REFERENCE BOOKS	
1.	Text book of Surveying by S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2.	Text book of Surveying by Arora (Vol No. 1&2), Standard Book House, Delhi.
WEB RESOURCES	
1.	https://lecturenotes.in/notes/2827-note-for-surveying-1-s-1-by-swadhina-priyadarsini
2.	https://nptel.ac.in/courses/105107122/1
3.	https://nptel.ac.in/courses/105107158/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

OPERATIONS RESEARCH
(Open Elective – I)

Course Category	Open Elective	**Course Code**	20ME5T21
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	Applications of operations research through LPP.
2	Formulation of objective function through transportation and assignment problems.
3	How to sequence the jobs and machines while processing and Replacement of machine/equipment.
4	The applications of waiting line problems and operations research through DPP.
5	Deterministic and stochastic models.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Formulate the objective function by linear programming problem and solution through various models.	K3
CO2	Evaluate optimal solutions to the objective function with the knowledge of transportation and assignment problems.	K3
CO3	Apply the sequencing of the jobs on a machine and items replacements	K4
CO4	Apply the principle of dynamic programming and service rate.	K3
CO5	Apply the inventory models in balancing the stock and demand ratio for profits	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	3	2	3	-	-	-	-	-	3	-	3	1
CO2	3	3	3	1	3	-	-	-	-	-	3	-	3	1
CO3	3	3	3	1	3	-	-	-	-	-	3	-	3	1
CO4	3	3	3	2	3	-	-	-	-	-	3	-	3	2
CO5	3	3	3	1	3	-	-	-	-	-	3	-	3	2

COURSE CONTENT

UNIT I

INTRODUCTION: Development – definition– characteristics and phases – types of operation research models – applications.

ALLOCATION: Linear programming problem formulation – graphical solution – simplex method – artificial variables techniques -two–phase method, big-M method – duality principle.

UNIT II

TRANSPORTATION PROBLEM: Formulation – optimal solution, unbalanced transportation problem – degeneracy,

ASSIGNMENT PROBLEM – formulation – optimal solution - variants of assignment problem- travelling salesman problem.

UNIT III

SEQUENCING – Introduction – flow –shop sequencing –*n* jobs through two machines – *n* jobs through three machines – job shop sequencing – two jobs through 'm' machines.

REPLACEMENT: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

UNIT IV

WAITING LINES: Introduction – single channel – poison arrivals –exponential service times – with infinite population and finite population models– multichannel – poison arrivals – exponential service times with infinite population single channel poison arrivals.

DYNAMIC PROGRAMMING: Introduction – Bellman's principle of optimality – applications of dynamic programming- capital budgeting problem – shortest path problem – linear programming problem.

UNIT V

INVENTORY: Introduction – single item – deterministic models –purchase inventory models with one price break and multiple price breaks – shortages are not allowed – stochastic models – demand may be discrete variable or continuous variable – instantaneous production. Instantaneous demand and continuous demand and no set up cost. ABC & VED Analysis.

TEXT BOOKS

1. Operations Research / S.D.Sharma-Kedarnath
2. Operations Research/S Kalavathy / Vikas Publishers

REFERENCE BOOKS

1. Operations Research / A.M.Natarajan, P. Balasubramani, A.Tamilarasi / Pearson Education.
2. Operations Research / R.Pannerselvam,PHI Publications.
3. Operations Research / Wagner/ PHI Publications.
4. Operations Research / DS Cheema/University Science Press
5. Operations Research / Ravindran, Philips, Solberg / Wiley publishers.

WEB RESOURCES

1. http://www.nptelvideos.in/2012/12/fundamentals-of-operations-research.html
2. https://nptel.ac.in/courses/110106062

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

Principles of Communication Engineering
(Open Elective – I)

Course Category	Open Elective	**Course Code**	20EC5T15
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Signals and Systems	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will learn	
1	The Fundamentals of Analog Communication Systems
2	The Generation and Detection of Angle Modulation Techniques
3	The Digital Modulation Techniques
4	The knowledge in measurement of information and various codes for communication systems
5	Fundamentals of Microwave, Satellite, Optical and Mobile Communications

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the basics of Analog communication system	K2
CO2	Understand the Angle Modulation Techniques	K2
CO3	Understand the basics of Analog communication system	K2
CO4	Apply the knowledge of digital electronics and understand the error control coding techniques.	K3
CO5	Understand different types of communication systems and its requirements.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	2	-	-	-	-	-	-	-	-	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-
CO4	2	2	2	1	-	-	-	-	-	-	-	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-

COURSE CONTENT	
UNIT I	**Basic blocks of Communication System**. Analog Modulation-Principles of Amplitude Modulation, DSBSC, SSB-SC and VSB-SC, AM transmitters and

	receivers
UNIT II	**Angle Modulation-Frequency and Phase Modulation**. Transmission Band width of FM signals, Methods of generation and detection, FM Transmitters and Receivers.
UNIT III	**Sampling theorem, Pulse Modulation Techniques**-PAM, PWM and PPM concept, PCM System, Delta Modulation, Digital Modulation Techniques-(ASK, FSK, PSK, QPSK).
UNIT IV	**Error control coding techniques**–Basics of Information Theory, Linear block codes-Encoder and decoder, Hamming Code, Cyclic codes–Encoder, Syndrome Calculator, Convolution codes.
UNIT V	**Modern Communication Systems–**Microwave communication systems, Optical communication system, Satellite communication system, Mobile communication system.

TEXT BOOKS	
1	Communication Systems (Analog And Digital) | Sanjay Sharma, S.K.Kataria& Sons, 2013
2	CommunicationSystems,SimonHaykins,JohnWiley,3rdEdition,1995
REFERENCE BOOKS	
1	Shulin Daniel, 'Error Control Coding', Pearson, 2ndEdition,2011.
2	B.P.Lathi and ZhiDing, 'Modern Digital and Analog Communication Systems', OUPUSA Publications, 4thEdition,2009.
WEB RESOURCES	
1	https://nptel.ac.in/courses/117105143/15
2	http://www.nptelvideos.in/2012/12/digital-communication.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

Deep Learning
(Open Elective – I)

Course Category	Professional Core	**Course Code**	20AM5T04
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Machine Learning	**Internal Assessment** **Semester End Examination Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	Learn deep learning methods for working with sequential data.
2	Learn deep recurrent and memory networks.
3	Learn deep Turing machines.
4	Apply such deep learning mechanisms to various learning problems.
5	Know the open issues in deep learning, and have a grasp of the current research directions.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Demonstrate the fundamental concepts learning techniques of ArtificialIntelligence, Machine Learning and Deep Learning.	K1
CO2	Discuss the Neural Network training, various random models**.**	K2
CO3	Explain the Techniques of Keras, TensorFlow, Theano and CNTK.	K3
CO4	Classify the Concepts of CNN and RNN.	K4
CO5	Implement Interactive Applications of Deep Learning.	K5

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create**.**

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	3	3	2	1	1	--	--	--	--	--	--	2	2	2	3
CO2	2	2	2	1	1	--	--	--	--	--	--	2	1	1	2
CO3	2	1	1	2	2	--	--	--	--	--	--	1	1	1	2
CO4	2	2	2	1	1	--	--	--	--	--	--	1	1	1	2
CO5	3	2	1	1	1	--	--	--	--	--	--	1	1	1	3

COURSE CONTENT	
UNIT-I	**Fundamentals of Deep Learning**: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, **Fundamentals of Machine Learning**: Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. [**Text Book 2**]
UNIT-II	**Introducing Deep Learning**: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. [**Ref Book 1**]

UNIT-III	**Neural Networks**: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, Setting up Deep Learning Workstation, Classifying Movie Reviews, Binary Classification, Classifying newswires, Multiclass Classification. [**Text Book 2**]
UNIT-IV	**Convolutional Neural Networks**: Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation. **Recurrent Neural Networks**: Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. [**Ref Book 1**]
UNIT-V	**Interactive Applications of Deep Learning**: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. [**Text Book 1**] **Deep Learning Research**: Autoencoders, Deep Generative Models: Boltzmann Machines Restricted Boltzmann Machines, Deep Belief Networks. [**Text Book 1**]

TEXT BOOKS	
1.	Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2.	Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications, ISBN: 9781617294433.
REFERENCE BOOKS	
1.	Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821
2.	Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc., ISBN: 9781492041412
3.	Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
4.	Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013.
5.	Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.
WEB RESOURCES:	
1	Swayam NPTEL: Deep Learning: https://onlinecourses.nptel.ac.in/noc22_cs22/preview

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

Entrepreneurship
(Open Elective – I)

Course Category	Humanities including Management	**Course Code**	20HM5T03
Course Type	Theory	**Lecture-Tutorial-Practice**	3 -0 -0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	Understand different Entrepreneurial traits.	Understanding
CO 2	Identify and compare the financial institutions supporting entrepreneurship.	Analyze
CO 3	Understand the functioning and problems faced by MSMEs (Micro Small Medium Enterprises)	Understanding
CO 4	Identify Entrepreneurial opportunities for women.	Applying
CO 5	Analyze different market, technical factors and prepare a project report based on guidelines.	Analyzing

Contribution of Course Outcomes towards achievement of Program											
Outcomes: 1 – Low, 2 - Medium, 3 – High											
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
CO	0	0	0	0	0	1	0	3	2	1	3	3
CO	0	0	0	0	0	1	0	3	0	2	3	1
CO	0	0	0	0	0	1	1	3	1	1	0	3
CO	0	0	0	0	0	1	0	3	1	1	0	3
CO	0	1	1	0	0	1	2	3	1	3	3	3

Course Content :

Unit – I Introduction to Entrepreneurship
Introduction to Entrepreneurship: Definition of Entrepreneur Entrepreneurial Traits. Entrepreneur vs. Manager, Creating and Starting the venture: Sources of new ideas, methods of generating ideas, creative problem solving – Writing Business Plan, Evaluating Business Plans.

UNIT-II Institutional and financial support to Entrepreneurship
Institutional/financial support: Schemes and functions of Directorate of Industries, IFCI, District Industries Centers (DICs), Industrial Development Corporation (IDC), State Financial Corporation (SFCs), Small Scale Industries Development Corporations (SSIDCs). Khadi and Village Industries Commission (KVIC), Technical Consultancy Organization (TCO), Small Industries Service Institute (SISI), National Small Industries Corporation (NSIC), Small Industries Development Bank of India (SIDBI).(short answers only), Start up culture.

UNIT III Micro, Small and Medium Enterprises:
Importance and role of MSMEs in economic development, Types of MSMEs, Policies and their support to MSMEs growth and growth strategies.

Sickness in small business and remedies – small entrepreneurs in International business.

Unit – IV Women Entrepreneurship and Start up Culture
Role & importance, profile of women Entrepreneur, problems of women Entrepreneurs, women Entrepreneurship Development in India - Steps taken by the Government to promote women entrepreneurship in India, Associations supporting women entrepreneurs. Successful Entrepreneurs (case studies).

Unit-V: Project Formulation and Appraisal
Preparation of Project Report –Content; Guidelines for Report preparation – Project Appraisal techniques –economic – Steps Analysis; Financial Analysis; Market Analysis; Technical Feasibility.

Textbooks:
1. Vasanth Desai – Fundamentals of Entrepreneurship and Small business management – Himalaya publishing house – 2019

2. Robert Hisrich, Michael Peters, Dean A. Sheperd, Sabyasachi Sinha – Entrepreneurship - TMH - 2020.

Reference Books :

1. Vasant Desai – Entrepreneurship Management - Himalaya Publishing House- 2018.

2. Robert J.Calvin - Entrepreneurial Management – TMH - 2009.

3. Gurmeet Naroola - The entrepreneurial Connection – TMH - 2009.

4. Aruna Kaulgud - Entrepreneurship Management - Vikas publishing house - 2009.

Web Resources:
1. https://nptel.ac.in/courses/110105067/50
2. http://www.yourarticlelibrary.com/project-management/5-methods-of-project-appraisal-explained/40771
3. https://springhouse.in/government-schemes-every-entrepreneur/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

Linear IC Applications
(Professional Elective – I)

Course Category	Professional Core	**Course Code**	20EC5T12
Course Type	THEORY	**L-T-P-C**	3-0-0-3
Pre-requisites	Electronic devices and Circuits, Digital Electronics	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
The student will:	
1	To understand the basic operation &performance parameters of differential amplifiers.
2	To understand & learn the measuring techniques of performance parameters of Op-Amp
3	To learn the linear and non-linear applications of operational amplifiers.
4	To understand the analysis & design of different types of active filters using op-amps
5	To learn the internal structure, operation and applications of different analog ICs
6	To Acquire skills required for designing and testing integrated circuits

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Design circuits using operational amplifiers for various applications.	K3
CO2	Analyze and design amplifiers and active filters using Op-amp.	K4
CO3	Diagnose and trouble-shoot linear electronic circuits.	K2
CO4	Understand the gain-bandwidth concept and frequency response of the amplifier configurations.	K2
CO5	Understand thoroughly the operational amplifiers with linear integrated circuits.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	-	-	-	-	-	-	2	1
CO2	1	2	3	2	-	-	-	-	-	-	-	-	1	2
CO3	1	2	3	2	-	-	-	-	-	-	-	-	1	2
CO4	1	1	2	1	-	-	-	-	-	-	-	-	1	2
CO5	1	1	2	1	-	-	-	-	-	-	-	-	2	1

COURSE CONTENT

UNIT-I	**Introduction** Internal Block Diagram of various stages of Op-Amp and Roll of each Stage. Differential Amplifier using BJTs and With RE DC and AC Analysis, Basic Current Mirror Circuit, Improved Version of current mirror circuit, current repeated circuit, Wilson current source. OP-Amp Block Diagram (Symbolic Representation), Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slowrate, CMRR ,PSRR.etc, Measurements of Op-Amp Parameters. Three-Terminal Voltage Regulators 78xx& 79xx Series, current Booster, adjustable voltage, Dual Power Supply with 78xx &79xx, Review on IC packages, technologies and fabrication.
UNIT-II	**LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS** Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier, AC amplifier, V to I, I to V converters, Buffers. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers, Precision rectifiers.
UNIT-III	**ACTIVE FILTERS, ANALOG MULTIPLIERS AND MODULATORS** Design & Analysis of Butterworth active filters–1storder, 2nd order LPF, HPF filters. Bandpass, Band reject and all pass filters. Four Quadrant Multiplier, IC 1496, Sample & Hold circuits.
UNIT-IV	**TIMERS & PHASE LOCKED LOOPS** Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators. Applications of PLL
UNIT-V	**DIGITAL TO ANALOG AND ANALOG TO DIGITALCONVERTERS** Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC.DAC and ADC Specifications, Specifications AD 574 (12-bit ADC).

TEXT BOOKS	
1.	Linear Integrated Circuits - D. Roy Choudhury, New Age International (p)Ltd, 2nd Edition,2003.
2.	Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.
REFERENCE BOOKS	
1.	Operational Amplifiers & Linear Integrated Circuits - Sanjay Sharma, SK Kataria & Sons; 2nd Edition, 2010
2.	Operational Amplifiers & Linear Integrated Circuits - R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition, 2000.
3.	Operational Amplifiers & Linear ICs - David A Bell, Oxford Uni. Press, 3rd Edition, 2011.
WEB RESOURCES:	
1	http://nptel.ac.in/courses/1171070

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

Utilization of Electrical Energy
(Professional Elective – I)

Course Category	Professional Core Courses	**Course Code**	20EE5T12
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To study the basic principles of illumination and its measurements and to design the different types lighting systems.
2	To acquaint with the different types of heating and welding techniques.
3	To understand the operating principles and characteristics of various motors with respect to speed, temperature and loading conditions.
4	To understand the basic principles of electric traction including speed–time curves of different traction services and calculation of braking, acceleration and other related parameters.
5	To Introduce the concepts of various types of energy storage systems.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Identify various illumination methods produced by different illuminating sources.	K3
CO2	Identify a suitable motor for electric drives and industrial applications	K3
CO3	Identify most appropriate heating and welding techniques for suitable applications.	K3
CO4	Distinguish various traction systems and determine the tractive effort and specific energy consumption.	K4
CO5	Validate the necessity and usage of different energy storage schemes for different applications and comparisons.	K3
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	-	2	-	-	-	-	-	-	-	-	1	1	1
CO2	3	2	2	-	-	-	-	-	-	-	-	-	2	2
CO3	3	2	1	-	-	-	-	-	-	-	-	-	2	1
CO4	3	1	1	-	-	-	-	-	-	-	-	1	2	2
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	2

COURSE CONTENT	
UNIT 1	**Illumination fundamentals** Introduction - terms used in illumination–Laws of illumination–Polar curves–Integrating sphere–Lux meter–Sources of light. **Various Illumination Methods** Discharge lamps - MV and SV lamps – Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Types and design of lighting and flood lighting–LED lighting - Energy conservation.
UNIT 2	**Selection of Motors** Choice of Motor - Type of Electric Drives - Starting And Running Characteristics – Speed Control–Temperature Rise – Applications of Electric Drives–Types of Industrial Loads–Continuous–Intermittent And Variable Loads–Load Equalization - Introduction To Energy Efficient Motors.
UNIT 3	**Electric Heating** Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating. **Electric Welding** Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding.
UNIT 4	**Electric Traction** System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves. Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking retardation adhesive weight and coefficient of adhesion-Numerical problems
UNIT 5	**Introduction to Energy Storage Systems** Need For Energy Storage - Types of Energy Storage-Thermal - Electrical - Magnetic And Chemical Storage Systems - Comparison of Energy Storage Technologies-Applications.

TEXT BOOKS	
1	Utilization of Electric Energy – by E. Opens haw Taylor - Orient Longman.
2	Art & Science of Utilization of electrical Energy – by Partab - Dhanpat Rai& Sons
3	"Thermal energy storage systems and applications"-by Ibrahim Dincer and Mark A.Rosen. John Wiley and Sons 2002
REFERENCE BOOKS	
1	Utilization of Electrical Power including Electric drives and Electric traction – by N.V. Suryanarayana - New Age International (P) Limited - Publishers - 1996.
2	Generation - Distribution and Utilization of electrical Energy – by C.L. Wadhwa - New Age International (P) Limited - Publishers - 1997.
WEB RESOURCES (Suggested)	
1	https://www.youtube.com/watch?v=ftr5QB91LDw
2	https://nptel.ac.in/courses/108/105/108105060/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

Computer Architecture and Organization
(Professional Elective – I)

Course Category	Professional Elective	**Course Code**	20EC5T18
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	STLD	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	the basic concepts and structure of computers &different types of instructions
2	different types of addressing modes and architectures
3	the basics of hardwired and micro-programmed control of the CPU, pipelined architectures, Hazards and Superscalar Operations.
4	the performance of various classes of Memories, build large memories using small memories for better performance
5	various modes of data transfer and multiprocessing systems

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Examine functional units and instruction set of computer	K3
CO2	Know the different type of Architectures	K4
CO3	Design micro programmed control unit and know the techniques for improving computer performance	K4
CO4	Learn memory systems & its management	K2
CO5	Demonstrate the interfacing of various I/O devices & multi processors	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**2**	**1**	-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-
CO2	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	1
CO3	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	1	**2**
CO4	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	1
CO5	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-

COURSE CONTENT	
UNIT I	**BASIC STRUCTURE OF COMPUTERS** Structure and function, Designing for performance, Components of a computer system, Arithmetic and Logic Unit **TYPES OF INSTRUCTIONS** Instruction types - Data transfer and manipulation instructions, Arithmetic instructions, Logic instructions, Shift and Rotate instructions, conditional branches with various examples
UNIT II	**CENTRAL PROCESSING UNIT**

	Instruction formats, Addressing modes, Instruction sequencing, Instruction set architecture design and hardware/software interface, Basic I/O operations &load/store architectures. CISC and RISC architectures. Organization of single- and multi-cycle RISC microprocessors Data path and control logic.
UNIT III	**CONTROL UNIT** Control memory, Address sequencing, computer configuration, microinstructions, micro program sequencing, wide branch addressing, and microinstructions with next-address field. Symbolic microinstructions, symbolic micro program, control unit operations, Design of control unit **TECHNIQUES FOR IMPROVING COMPUTER PERFORMANCE** Pipelining and interleaving, pipelining impact on the ISA and system architecture, speed up achieved through pipelining, pipeline hazards and forwarding, interlocks, and branch delay slots. Parallel processing, RISC pipeline, vector processing and array processing, Super scalar design
UNIT IV	**MEMORY SYSTEMS AND MANAGEMENT** Basic memory circuits, ROM, RAM, EEPROM, Flash Memory, Cache memory, memory hierarchies, Caches- organization, size, implementation and Improve memory performance with caches, mapping functions, interleaving, replacement algorithm, write policy and no of caches. Secondary storage: Magnetic Hard Disk, Optical Disks, Solid State Disks and Arrays, Redundant arrays of inexpensive disks (RAID). Virtualization and sharing computers – Memory management, virtual memory, time sharing and process management
UNIT V	**INPUT/OUTPUT ORGANIZATION AND MULTI PROCESSING SYSTEMS** Peripheral devices, I/O devices/modules –Access, interfaces, asynchronous data transfer, modes of transfer – programmed, interrupt driven and DMA. Interrupt hardware – Enabling and disabling, handling multiple devices, I/O processors, Data communication processor. Buses – Synchronous Bus, Asynchronous bus, Interface Circuits, Standard I/O interface – PCI, USB etc. Multiprocessing systems – Multiprocessor and its characteristics, interconnection structures for multiprocessors, inter processor communication and synchronization

TEXT BOOKS	
1.	Computer Organization, Carl Hamacher, ZvonksVranesic, Safea Zaky, 5/e, McGraw Hill.
2.	Computer System Architecture, M.Morris Mano, 3/e, Pearson/PHI
REFERENCE BOOKS	
1.	Structured Computer Organization – Andrew S. Tanenbaum, 4/e, PHI/Pearson
2.	Computer Organization and Architecture – William Stallings, 6/e, Pearson/PHI
3.	Computer Organization and Architecture-John P.Hayes, 5th edition, MC GrawHill

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

OPTIMIZATION TECHNIQUES
(Professional Elective – I)

Course Category	Professional Elective	**Course Code**	20ME5T29
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
To make the students learn about	
1	Classical optimization techniques
2	Numerical methods for optimization
3	Genetic algorithm and Genetic programming
4	Multi-Objective Genetic algorithm
5	Optimization in design and manufacturing systems

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze the Classical optimization techniques for single and multi-variable problems with and with and without constraints.	K4
CO2	Apply numerical methods for optimization of manufacturing related problems	K3
CO3	Apply the Principles of genetic algorithm and genetic programming to manufacturing related problems	K3
CO4	Analyze the Multi-Objective Genetic algorithm for industrial problems	K4
CO5	Solve engineering problems by using optimization techniques in design and manufacturing systems	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	3	2	2	1	-	-	-	-	-	-	-	2	1
CO2	2	3	2	2	1	-	-	-	-	-	-	1	2	1
CO3	2	3	2	2	1	-	-	-	-	-	-	1	2	1
CO4	2	3	2	2	1	-	-	-	-	-	-	1	2	1
CO5	2	3	2	2	1	-	-	-	-	-	-	1	2	1

COURSE CONTENT

UNIT I

CLASSICAL OPTIMIZATION TECHNIQUES: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions, merits and demerits of classical optimization techniques.

UNIT II

NUMERICAL METHODS FOR OPTIMIZATION: Nelder Mead's Simplex search method, Gradient of a function, Steepest descent method, Newton's method, Pattern search methods, conjugate method, types of penalty methods for handling constraints, advantages of numerical methods.

UNIT III

GENETIC ALGORITHM (GA): Differences and similarities between conventional and evolutionary algorithms, working principle, reproduction, crossover, mutation, termination criteria, different reproduction and crossover operators, GA for constrained optimization, draw backs of GA.
GENETIC PROGRAMMING (GP): Principles of genetic programming, terminal sets, functional sets, differences between GA & GP, random population generation, solving differential equations using GP.

UNIT IV

MULTI-OBJECTIVE GA: Pareto's analysis, non-dominated front, multi – objective GA, Non-dominated sorted GA, convergence criterion, applications of multi-objective problems.

UNIT V

APPLICATIONS OF OPTIMIZATION IN DESIGN AND MANUFACTURING SYSTEMS: Some typical applications like optimization of path synthesis of a four-bar mechanism, minimization of weight of a cantilever beam, optimization of springs and gears, general optimization model of a machining process, optimization of arc welding parameters, and general procedure in optimizing machining operations sequence.

TEXT BOOKS

1. Engineering Optimization Theory & Practice, Singiresu S. Rao New Age International Publishers, Ltd.
2. Optimization for Engineering Design, Kalyanmoy Deb, PHI Publishers.

REFERENCE BOOKS

1. Genetic algorithms in Search, Optimization, and Machine learning, D.E.Goldberg, Addison-Wesley Publishers
2. Multi objective Genetic algorithms, Kalyanmoy Deb, PHI Publishers
3. Optimal design, Jasbir Arora, Mc Graw Hill (International) Publishers
4. Optimum Design of Mechanical Elements, Ray C. Johnson, John Wiley & sons, Inc., New York.

WEB RESOURCES

1. https://nptel.ac.in/courses/111/105/111105039/
2. https://nptel.ac.in/courses/106/108/106108056/
3. https://nptel.ac.in/courses/112/105/112105235/
4. https://onlinecourses.nptel.ac.in/noc21_me43/preview
5. https://www.nptel.ac.in/content/syllabus_pdf/112103301.pdf

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

III Year I semester

Control Systems Laboratory

Course Category	Lab Course	**Course Code**	20EE5L08
Course Type	Laboratory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**15** **35** **50**

COURSE OBJECTIVES	
1	To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors and Synchros.
2	To understand time and frequency responses of control system with and without controllers and compensators.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze the performance and working Magnetic amplifier, D.C and A.C. servo motors and synchros, transfer function of D.C Motor	K4
CO2	Design P,PI,PD and PID controllers, lag, lead and lag–lead compensators	K4
CO3	Determine the stability in time and frequency domain.	K4
CO4	Determine the temperature control of an oven using PID controller	K4
CO5	Examine different logic gates and Boolean expressions using PLC and test the controllability and observability.	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	2	1	-	-	-	-	-	-	2	2	-	-	1	1
CO2	3	2	2	1	-	-	-	-	2	2	-	1	2	2
CO3	3	3	-	-	-	-	-	-	2	2	-	1	1	2
CO4	2	1	-	-	-	-	-	-	2	2	-	-	1	-
CO5	3	3	2	1	2	-	-	-	2	2	-	1	2	2

Exp. No	**CONTENTS** **(Any 10 of the following experiments are to be conducted)**
1	Time response of Second order system
2	Characteristics of Synchros
3	Effect of P, PD, PI, PID Controller on a second order systems
4	Design of Lag and lead compensation – Magnitude and phase plot
5	Transfer function of DC motor

6	Temperature controller using PID
7	Characteristics of magnetic amplifiers
8	Characteristics of AC servo motor
9	Characteristics of DC servo motor
10	Root locus and Bode Plot for the transfer functions of systems up to 2^{nd} order using MATLAB.
11	Controllability and Observability Test using MAT LAB
12	Bode Plot, Root locus, Nyquist Plots for the transfer functions of systems up to 5^{th} order using MATLAB.
13	Block Diagram Representation of Field Controlled DC Servo Motor using SIMULINK

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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III Year I semester

Power Electronics Laboratory

Course Category	Lab Course	**Course Code**	20EE5L09
Course Type	Laboratory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**15** **35** **50**

COURSE OBJECTIVES	
1	To learn the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
2	To analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.
3	To understand the operation of AC voltage regulator with resistive and inductive loads.
4	To understand the working of Buck converter and Boost converter.
5	To understand the working of a single-phase & three-phase inverters.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze characteristics of various power electronic devices and design firing circuits for SCR.	K2
CO2	Analyze the performance of single–phase dual, three–phase full–wave bridge converters and dual converter with both resistive and inductive loads.	K4
CO3	Examine the operation of Single-phase AC voltage regulator and Cyclo converter with resistive and inductive loads.	K4
CO4	Differentiate the working and control of Buck converter and Boost converter.	K2
CO5	Differentiate the working & control of Square wave inverter and PWM inverter.	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	-	-	-	-	-	-	-	2	2	-	-	2	-
CO2	1	-	-	-	-	-	-	-	1	2	-	-	2	1
CO3	1	-	-	-	-	-	-	-	2	2	-	-	2	1
CO4	1	-	-	-	-	-	-	-	1	2	-	-	2	1
CO5	1	-	-	-	-	-	-	-	2	2	-	-	1	-

Exp. No.	CONTENTS (Any 10 of the following experiments are to be conducted)
1	Characteristics of SCR - Power MOSFET & Power IGBT
2	R - RC & UJT firing circuits for SCR
3	Single -Phase semi-converter with R & RL loads.
4	Single -Phase full-converter with R & RL loads.
5	Three- Phase full-converter with R & RL loads.
6	Single-phase dual converter in circulating current & non circulating current mode of operation.
7	Single-Phase AC Voltage Regulator with R & RL Loads.
8	Single-phase step down Cyclo converter with R & RL Loads.
9	Boost converter in Continuous Conduction Mode operation.
10	Buck converter in Continuous Conduction Mode operation.
11	Single -Phase square wave bridge inverter with R & RL Loads.
12	Single - Phase PWM inverter.
13	Three-phase bridge inverter with 120^0 and 180^0 conduction mode
14	SPWM control of Three-phase bridge inverter

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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III Year I semester

Soft skills and inter personal communication
(Skill Oriented Course)

Course Category	Humanities	**Course Code**	**20HE5S01**
Course Type	Skill Oriented Course	**L-T-P-C**	1 – 0 – 2 – 2
Prerequisites	Life skills for better life	**Internal Assessment** **Semester End Exam** **Total Marks**	00 50 50

COURSE OUTCOMES		**Cognitive Level**
Upon successful completion of the course, the student will be able to:		
CO1	Empowers the personality traits which help for the setting goal and improving quality of life.	**K -2**
CO2	Enhances the required methods and strategies to develop public speaking skills among the learners.	**K -1**
CO3	Builds the confidence in verbal and non-verbal communication besides life skills.	**K -2**
CO4	Strengthens various inter and intra personal abilities to lead better personal and professional career.	**K -2**
CO5	Improves the innate abilities which help for decision-making and problem-solving with emotional intelligence.	**K -1**

(K1 – Remember, K2 – Understand, K-3 Apply, K4 -Analysis, K5 – Evaluate, K6 – Create)

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	1	-	-	-	1
CO2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	1	-	1	-
CO5	-	-	-	-	-	-	-	-	-	-	-	1

	Syllabus
UNIT - I	1. Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. 2. Self-Discovery:Discovering the Self; Setting Goals; Beliefs, Values, Attitude, Virtue. 3. Positivity and Motivation: Developing Positive Thinkingand Attitude; Driving out Negativity; Meaning andTheories of Motivation; Enhancing Motivation Levels.
UNIT-II	1. Interpersonal Communication: Interpersonal relations; communication models,process and barriers; team communication; developing interpersonal relationshipsthrough effective communication; listening 2. skills; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation. 3. Public Speaking:Skills, Methods, Strategies and Essential tips for effective public speaking.

	4. Non-Verbal Communication: Importance and Elements; Body Language.
UNIT-III	1. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, OvercomingNervousness. 2. Group Discussion: Importance, Planning, Elements, Skills assessed; effectivelydisagreeing, Initiating, Summarizingand Attaining the Objective. 3. Interview Skills: Interviewer and Interviewee – in-depth perspectives. Before, During and After the Interview. Tips for Success. 4. Teamwork and Leadership Skills: Concept of Teams;Building effective teams; Concept of Leadership and honing Leadership skills
UNIT - IV	1. Etiquette and Manners – Social and Business. 2. Time Management – Concept, Essentials, Tips. 3. Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills. 4. Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types ofLeaders; Leadership Behaviour; Assertiveness Skills.
UNIT- V	1. Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence 2. Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods 3. Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. 4. Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models andImpact of Stress; Measurement and Management of Stress.

Text books :	
1.	Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
2.	English and Soft Skills – S.P.Dhanavel, Orient BlackswanIndia, 2010

WEB RESOURCES	
1.	https://nptel.ac.in/courses/109107121/
2.	https://www.goskills.com/Soft-Skills

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Microprocessors & Microcontrollers

Course Category	Professional Core	**Course Code**	20EC6T24
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	STLD, Computer Fundamentals	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSEOBJECTIVES	
1	To Study architecture and memory organization of 8086.
2	To Study the interfacing of 8086 with Peripheral devices (I/Odevices).
3	To learn the features of Advanced microprocessors 80286, 80386, 80486, Pentium
4	To Learn the programming concepts of 8051 microcontroller.
5	To Study architecture and features of PIC Microcontroller.

COURSEOUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Demonstrate the concepts of architecture and key features, addressing modes & Instruction sets of microprocessors.	K2
CO2	Understand Interfacing for I/O devices like Stepper motor, LED displays with 8086.	K2
CO3	Understand the advances in Microprocessors (80386 & 80486) and their architectural differences.	K2
CO4	Apply the concepts of 8051 microcontroller for simple applications.	K3
CO5	Illustrate the concepts of PIC microcontroller in embedded real time project applications.	K2

K1:Remember,K2:Understand,K3:Apply,K4:Analyze,K5:Evaluate,K6:Create.

Contribution of Course Outcomes towards achievement of Program Outcomes(1 –Low, 2-Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	2	-	-	-	-	-	-	-	-	1	1	2
CO2	2	2	2	-	-	-	-	-	-	-	-	2	1	2
CO3	2	1	2	-	-	-	-	-	-	-	-	2	2	2
CO4	2	1	2	-	-	-	-	-	-	-	-	1	2	2
CO5	2	2	2	-	-	-	-	-	-	-	-	1	2	2

COURSECONTENT	
UNITI	**Introduction to Microprocessor Architecture:** Introduction and evolution of Microprocessors– An overview of 8085 Microprocessor, Architecture of 8086– Register Organization of 8086–Memory organization of 8086– General bus operation of 8086 Minimum and Maximum Mode Operations: Addressing modes of 8086 Instruction set, Assembler Directives, Simple Programs, Minimum and Maximum mode operations of 8086–8086 Control signal interfacing–Read and write cycle timing diagrams.

UNITII	**I/OInterface:**8255-PPI-Architecture of 8255, Modes of operation, Inter facing I/O devices to 8086 using 8255, Interfacing A to D converters, Interfacing D to A converters, Stepper motor inter facing, Static memory interfacing with 8086, DMA controller(8257) Architecture, Interfacing, 8257 DMA controller, Programmable Interrupt Controller(8259), Command words and operating modes of 8259,Interfacing of 8259, Keyboard/display controller(8279), Stepper Motor
UNITIII	**ADVANCEDMICROPROCESSORS:** Introduction to 80286, programming concepts, special purpose registers, memory organization, Real and Protected mode, virtual mode, memory paging mechanism of 80386, Salient features of Pentium, architectural differences between 80386 and 80486 microprocessors. Salient features of RISC, CISC Processors. The Pentium Family and Core 2 Microprocessors: Introduction to the Pentium Processor, Pentium II Microprocessor, Pentium III, Pentium IVandCore2Processors.
UNITIV	**Introduction to 8051 Micro Controller**: Overview of 8051 Micro Controller, Architecture, Register set, I/O ports and Memory Organization, Interrupts, Timers and Counters, Serial Communication. Applications in power systems.
UNITV	**PICMICROCONTROLLER:** Introduction, characteristics of PIC microcontroller, PIC micro controller families, memory organization, parallel and serial input and output, timers, Interrupts, PIC 16F877 architecture, instruction set of the PIC16F877. **ARM Architectures and Processors:** ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces.

TEXT BOOKS	
1	Advanced Microprocessor and Peripherals, A.K Ray, K.M. Bhurchandhi, Tata McGraw Hill Publications, 2000.
2	PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18, -Muhammad Ali Mazidi, Rolind D.Mckinay , Danny causey-Pearson Publisher 21st Impression.
3	The8051 Microcontroller Architecture, Programming and Applications, Kenneth. J. Ayala, Thomson Publishers, 2nd Edition.
REFERENCE BOOKS	
1	Microprocessors and Interfacing, DouglasV Hall, McGrawHill, 2nd Edition.
2	The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by Joseph You
WEBRESOURCES	
1	https://www.nptel.ac.in/downloads/ 106108100/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Electrical Measurements and Instrumentation

Course Category	Professional Core Courses	**Course Code**	20EE6T14
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To understand and analyze the factors that affects the various measuring units.
2	To choose the appropriate meters for measuring of voltage, current, power, power factor and energy qualities & understand the concept of standardization.
3	Describe the operating principle of AC & DC bridges for measurement of resistance, inductance and capacitance.
4	To understand the concept of the transducer and their effectiveness in converting from one form to the other form for the ease of calculating and measuring purposes.
5	To understand the operating principles of basic building blocks of digital systems, record and display units.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the construction and working of various types of analog instruments.	K2
CO2	Describe the construction and working of wattmeter and power factor meters	K2
CO3	Know the construction and working various bridges for the measurement resistance - inductance and capacitance	K2
CO4	Know the operational concepts of various transducers	K2
CO5	Know the construction and operation digital meters	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	1	-	-	-	-	-	-	-	-	-	1	2	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO3	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO4	3	2	-	-	-	-	-	-	-	-	-	1	2	2
CO5	3	2	-	-	-	-	-	-	-	-	-	1	2	2

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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COURSE CONTENT	
UNIT 1	**Analog Ammeter and Voltmeters** Classification – deflecting - control and damping torques - – PMMC - moving iron type and electrostatic instruments - Construction - Torque equation - Range extension - Errors and compensations - advantages and disadvantages. Instrument transformers: Current Transformer and Potential Transformer-construction - theory - errors-Numerical Problems.
UNIT 2	**Analog Wattmeter's and Power Factor Meters** Electrodynamometer type wattmeter (LPF and UPF) - Power factor meters: Dynamometer and M.I type (Single phase and Three phase) - Construction - theory - torque equation - advantages and disadvantages. Potentiometers: Introduction to DC and AC Potentiometers – Construction-working – Applications - Numerical Problems.
UNIT 3	**Measurements of Electrical parameters** **DC Bridges:** Method of measuring low - medium and high resistance - sensitivity of Wheat stone's bridge - Kelvin's double bridge for measuring low resistance - Loss of charge method for measurement of high resistance - Megger – measurement of earth resistance - Numerical Problems. **AC Bridges:** Measurement of inductance and quality factor - - Maxwell's bridge - - Hay's bridge - - Anderson's bridge. Measurement of capacitance and loss angle - - Desauty's bridge - Schering Bridge - Wien's bridge - Wagner's earthing device - - Numerical Problems
UNIT 4	**Transducers** Definition - Classification - Resistive - Inductive and Capacitive Transducer - LVDT - Strain Gauge - Thermistors - Thermocouples - Piezo electric and Photo Diode Transducers - Hall effect sensors- Numerical Problems.
UNIT 5	**Digital meters** Digital Voltmeters – Successive approximation DVM - Ramp type DVM and Integrating type DVM – Digital frequency meter - Digital multimeter - Digital tachometer - Digital Energy Meter - Q meter - Power Analyzer. CRO- measurement of phase difference & Frequency using lissajious patterns - Numerical Problems.

TEXT BOOKS	
1	Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis - 5th Edition - Wheeler Publishing.
2	Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D. Cooper - PHI - 5th Edition - 2002
REFERENCE BOOKS	
1	Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications - 19th revised edition - 2011.
2	Electrical and Electronic Measurements and instrumentation by R.K.Rajput - S.Chand - 3rd edition.
3	Electrical Measurements by Buckingham and Price - Prentice – Hall
4	Electrical Measurements by Forest K. Harris. John Wiley and Sons
WEB RESOURCES (Suggested)	
1	https://onlinecourses.nptel.ac.in/noc19_ee44/preview
2	https://www.codrey.com/electrical/types-of-electrical-and-electronic-instruments/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Power System Analysis

Course Category	**PCC**	**Course Code**	20EE6T15
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment**	**30**
		Semester End Examination	**70**
		Total Marks	**100**

COURSE OBJECTIVES	
1	To develop the impedance diagram (p.u) and formation of Y_{bus}
2	To learn the different load flow methods.
3	To learn the Z_{bus} building algorithm.
4	To learn short circuit calculation for symmetrical faults
5	To learn the effect of unsymmetrical faults and their effects.
	To learn the stability of power systems and method to improve stability

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Formulate incidence, network matrices, per unit impedance diagrams and Y-bus matrix.	K2
CO2	Analyze the behavior of the power system under steady state conditions using various load flow methods.	K4
CO3	Form Z_{bus} for a power system networks and analyse the behavior of the power system under short circuit conditions	K4
CO4	determine the sequence components for power system and analyse the effects of asymmetrical faults.	K4
CO5	Suggest the methods for improving the stability of the power system under various operating conditions.	K3
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	1	1	-	-	-	-	-	-	-	-	-	2	1
CO2	2	2	1	1	1	-	-	-	-	-	-	-	2	1
CO3	1	2	1	1	-	-	-	-	-	-	1	-	2	-
CO4	2	2	2	2	-	-	-	-	-	-	-	-	2	1
CO5	2	2	1	-	-	-	-	-	-	-	-	-	2	1

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE CONTENT	
UNIT 1	**Circuit Topology & Per Unit Representation** Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y_{bus} matrix by singular transformation and direct inspection methods – Per Unit Quantities–Single line diagram – Impedance diagram of a power system – Numerical Problems.
UNIT 2	**Power Flow Studies** Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) – Decoupled and Fast Decoupled methods – Algorithmic approach – Numerical Problems on 3–bus system only.
UNIT 3	**Z-Bus Algorithm & Symmetrical Fault Analysis** Formation of Z_{bus}**:** Algorithm for the Modification of Z_{bus} Matrix (without mutual impedance) – Numerical Problems. **Symmetrical Fault Analysis:** Reactance's of Synchronous Machine – Three Phase Short Circuit Currents - Short circuit MVA calculations for Power Systems – Numerical Problems.
UNIT 4	**Symmetrical Components** Definition of symmetrical components – symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances and Sequence networks: Synchronous generator – Transmission line and transformers – Numerical Problems. **Unsymmetrical Fault analysis** Various types of faults: LG– LL– LLG and LLL on unloaded alternator-Numerical problems.
UNIT 5	**Power System Stability Analysis** Elementary concepts of Steady state – Dynamic and Transient Stabilities – Swing equation – Steady state stability – Equal area criterion of stability – Applications of Equal area criterion – Factors affecting transient stability – Methods to improve steady state and transient stability – Numerical problems.

TEXT BOOKS	
1	Power System Analysis by Grainger and Stevenson - Tata McGraw Hill.2003
2	Modern Power system Analysis – by I.J.Nagrath & D .P.Kothari: Tata McGraw–Hill Publishing Company - 3rd edition - 2007.
REFERENCE BOOKS	
1	Power System Analysis – by A.R.Bergen - Prentice Hall - 2nd edition - 2009.
2	Power System Analysis by HadiSaadat – Tata McGraw–Hill 3rd edition - 2010.
3	Power System Analysis by B.R.Gupta - A H Wheeler Publishing Company Limited - 1998.
4	Power System Analysis and Design by J.Duncan Glover - M.S.Sarma - T.J.Overbye – Cengage Learning publications - 5th edition - 2011.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/117/105/117105140/
2	https://onlinecourses.nptel.ac.in/noc20_ee72/preview

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

SIGNALS & SYSTEMS
(Professional Elective – II)

Course Category	Professional Core	**Course Code**	20EC6T25
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Transform techniques	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	Representation and classification of signals and systems, Representation of signals using Fourier series
2	Representations of signals using Fourier transform properties of Fourier transform and sampling theorem for band limited signals.
3	Time - Domain and Frequency Domain aspects of signals and systems
4	Representation of signals in S-Domain using Laplace transform and ROC
5	Z-Transform of sequences, properties of Z-Transform

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Characterize the signals and systems and analyze the continuous-time signals and continuous-time systems using Fourier series	K1
CO2	To analyze Fourier transform and its applications. apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruction.	K2
CO3	Understand the concepts of different types of systems and convolution, correlation operations	K2
CO4	To apply the concepts of Laplace transform for different types of signals along with ROC	K3
CO5	Apply z-transform to analyze discrete-time signals and systems.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2											2	1
CO2	2	2											2	1
CO3	2	2											2	1
CO4	2	2											2	1
CO5	2	2											2	1

COURSE CONTENT	
UNIT I	**INTRODUCTION:** Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on Signals and Systems. Basic Signals (impulse

	function, step function, signum function, ramp function, Complex exponential and sinusoidal signals). Representation of periodic signals in frequency domain using Fourier series.
UNIT II	**FOURIER TRANSFORM and SAMPLING THEOREM:** Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, **SAMPLING THEOREM:** Graphical and analytical proof for Band Limited Signals, impulse sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing.
UNIT III	**ANALYSIS OF LINEAR SYSTEMS:** Linear system, impulse response, Linear time invariant (LTI) system, Linear time variant (LTV) system, Transfer functions of a LTI system. Filter characteristics of linear systems, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Concept of convolution in time domain and frequency domain using integral equations. Cross-correlation and auto-correlation of functions, properties of correlation function. Relation between convolution and correlation, Extraction of signal from noise by filtering
UNIT IV	**LAPLACE TRANSFORMS :** Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Relation between L.T's, and F.T. of a signal.
UNIT V	**Z–TRANSFORMS** Fundamental difference between continuous-time and discrete-time signals, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS	
1.	Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn 2018.
2.	Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
3.	Signals & Systems- Narayan Iyer and K Satya Prasad, Cenage Pub 2011
REFERENCE BOOKS	
1.	Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2.	Signals and Systems – A. Anand Kumar PHI, 2nd Edn 2012
3.	Signals and Systems – Signals and Systems – M.J. Roberts,3rd Edition,MC Graw-Hill,2019
4.	Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.
5.	Signals and Systems – T K Rawat , Oxford University press, 2011
WEB RESOURCES	
1.	https://nptel.ac.in/downloads/117101055/
2.	http://fourier.eng.hmc.edu/e102/lectures/FourierTransforms/
3.	http://fourier.eng.hmc.edu/e102/lectures/Laplace_Transform/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Electric Drives
(Professional Elective – II)

Course Category	Professional Core Courses	**Course Code**	20EE6T16
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To learn the fundamentals of electric drive and different electric braking methods.
2	To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
3	To discuss the DC-DCconverter control of dc motors.
4	To understand the concept of speed control of induction motor by using AC voltage controllers, voltage source inverters and slip power recovery scheme.
5	To learn the speed control mechanism of synchronous motors

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the fundamentals of electric drive and different electric braking methods	K2
CO2	Analyze the operation of three phase converter fed dc motors and four quadrant operations of dc motors using dual converters.	K4
CO3	Describe the DC-DC converter fed control of dc motors in various quadrants of operation	K2
CO4	Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters and differentiate the stator side control and rotor side control	K3
CO5	Learn the concepts of speed control of synchronous motor with different methods.	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	-	-	-	-	-	-	-	-	-	1	2	1
CO2	2	2	1	-	-	-	-	-	-	-	-	1	2	1
CO3	2	2	-		-	-	-	-	-	-	-	1	2	1
CO4	2	2	2	-	-	-	-	-	-	-	-	1	2	1
CO5	2	2	-	-	-	-	-	-	-	-	-	1	2	1

COURSE CONTENT	
UNIT 1	**Fundamentals of Electric Drives** Electric drive and its components– Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods**:** Dynamic – Plugging – Regenerative methods.
UNIT 2	**Controlled Converter Fed DC Motor Drives** 3-phase half and fully-controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics – Dual converter fed DC motor drives -Numerical problems.
UNIT 3	**DC–DC Converters Fed DC Motor Drives** Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current operation - Output voltage and current waveforms – Speed–torque expressions and characteristics – Closed loop operation (qualitative treatment only).
UNIT 4	**Stator and Rotor side control of 3-phase Induction motor Drive** Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – Closed loop V/f control of induction motor drives (qualitative treatment only). Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics.
UNIT 5	**Control of Synchronous Motor Drives** Separate control of synchronous motor – self-control of synchronous motor employing load commutated thyristor inverter - closed loop control of synchronous motor drive (qualitative treatment only)– PMSM (Basic operation only).

TEXT BOOKS	
1	Fundamentals of Electric Drives – by G K Dubey - Narosa Publications - 2nd edition – 2002.
2	Power Semiconductor Drives - by S.B.Dewan - G.R.Slemon - A.Straughen - Wiley India - 1984.
REFERENCE BOOKS	
1	Electric Motors and Drives Fundamentals - Types and Applications - by Austin Hughes and Bill Drury - Newnes.4th edition - 2013.
2	Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications - 1987.
3	Power Electronic Circuits - Devices and applications by M.H.Rashid - PHI - 3rd edition - 2009.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108/108/108108077/
2	https://www.youtube.com/watch?v=2Gjs7IPOCXs

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Advanced Control Systems
(Professional Elective – II)

Course Category	Professional Core Courses	**Course Code**	20EE6T17
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To familiarize the state space representation in controllable, observable, diagonal and Jordan canonical forms.
2	Introduce the concept of controllability and observability tests through canonical forms and design of state feedback controller by pole placement technique and State Observer design.
3	Analysis of a nonlinear system using describing function approach.
4	Illustrate the Lypanov's method of stability analysis for linear and non-linear continuous time autonomous systems.
5	Formulation of Euler Laugrange equation for the optimization of typical functional and solutions.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze different canonical forms - solution of State equation.	K4
CO2	Design of control system using the pole placement technique is given after introducing the concept of controllability and observability.	K4
CO3	Analyze nonlinear system using describing function technique and phase plane analysis	K4
CO4	Examine the stability analysis using Lyapunov method.	K4
CO5	Illustrate the Minimization of functional using calculus of variation - state and quadratic regulator problems.	K3
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	1	-	-	-	-	-	-	1	2	2
CO2	3	2	2	1	1	-	-	-	-	-	-	1	2	2
CO3	1	2	1	-	-	-	-	-	-	-	-	1	1	1
CO4	2	2	1	-	-	-	-	-	-	-	-	1	1	1
CO5	2	1	1	-	-	-	-	-	-	-	-	-	1	1

COURSE CONTENT	
UNIT 1	**State Space Analysis** State Space Representation – Canonical forms – Controllable canonical form – Observable canonical form - Jordan Canonical Form - Solution of state equation – State transition matrix.
UNIT 2	**Controllability - Observability and Design of State Feedback Control** Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controllability and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability – Design of state feedback control through pole placement.

UNIT 3	**Nonlinear Systems** Introduction to nonlinear systems - Types of nonlinearities. Introduction to phase–plane analysis - Singular points; Describing function - basic concepts - Describing functions of non- linearities.
UNIT 4	**Stability analysis by Lyapunov Method** Stability in the sense of Lyapunov – Lyapunov's stability and Lyapunov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.
UNIT 5	**Calculus of Variations** Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints –Euler lagrangine equation.

TEXT BOOKS	
1	Modern Control Engineering – by K. Ogata - Prentice Hall of India - 3rd edition - 1998
2	Automatic Control Systems by B.C. Kuo - Prentice Hall Publication
REFERENCE BOOKS	
1	Modern Control System Theory – by M. Gopal - New Age International Publishers - 2nd edition - 1996
2	Control Systems Engineering by I.J. Nagarath and M.Gopal - New Age International (P) Ltd.
3	Digital Control and State Variable Methods – by M. Gopal - Tata Mc Graw–Hill Companies - 1997.
4	Systems and Control by Stainslaw H. Zak - Oxford Press - 2003.
5	Optimal control theory: an Introduction by Donald E.Kirk by Dover publications.
WEB RESOURCES (Suggested)	
1	https://www.electrical4u.com/state
2	https://en.wikipedia.org/wiki/Observability

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Power System Operation and Control
(Professional Elective – II)

Course Category	Professional Core Courses	**Course Code**	20EE6T18
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To understand optimal dispatch of generation with and without losses.
2	To understand the optimal scheduling of hydro thermal systems and optimal unit commitment problem
3	To model power-frequency dynamics for studying the load frequency control for single area system with and without controllers.
4	To study the load frequency control for two area system with and without controllers.
5	To understand the reactive power control and compensation of transmission lines.
	To understand optimal dispatch of generation with and without losses.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Assess the optimum allocation of generation among Generators for economic operation of the power system	K3
CO2	Estimate the optimal scheduling of hydro thermal systems and solve optimal unit commitment problem.	K3
CO3	Analyze the importance of the frequency and modeling of power plant	K4
CO4	Apply the importance of PID controllers in single area and two area systems.	K3
CO5	Identify suitable compensating equipment for reactive power control.	K3
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	2	1	-	-	-	-	-	-	-	-	-	2	1
CO2	1	2	2	-	-	-	-	-	-	-	-	-	2	1
CO3	2	1	1	1	-	-	-	-	-	-	-	-	2	1
CO4	3	3	2	-	-	-	-	-	-	-	-	-	1	1
CO5	2	2	1	-	-	-	-	-	-	-	-	-	2	1

COURSE CONTENT	
UNIT 1	**Economic Operation of Power Systems** Optimal operation of Generators in Thermal power stations - – Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.
UNIT 2	**Hydrothermal Scheduling** Mathematical Formulation – Solution Technique. **Unit Commitment**

	Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.
UNIT 3	**Load Frequency Control-I** Modelling of steam turbine – Generator – Mathematical modelling of speed governing system – Transfer function – Necessity of keeping frequency constant. Definitions of Control area – Single area control system – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation – Steady state response.
UNIT 4	**Load Frequency Control-II** Block diagram development of Load Frequency Control of two area system uncontrolled case and controlled case – Tie-line bias control – Load Frequency Control and Economic dispatch control.
UNIT 5	**Compensation in Power Systems** Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation – Specifications of load compensator – compensated transmission lines. Introduction of FACTS devices – Need of FACTS controllers – Types of FACTS devices.

TEXT BOOKS	
1	Power Generation - Operation and Control by Allen J Wood - Bruce F WollenBerg 3rd Edition - Wiley Publication 2014.
2	Electric Energy systems Theory – by O.I.Elgerd - Tata McGraw–hill Publishing Company Ltd. - Second edition.
3	Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw Hill Publishing Company Ltd - 2nd edition.
REFERENCE BOOKS	
1	Power System Analysis and Stability by S.S.Vadhera - Khanna Publications - 4th edition - 2005.
2	Power System Analysis by Grainger and Stevenson - Tata McGraw Hill.
3	Power System Analysis by HadiSaadat – – Tata McGraw–Hill 3rd edition - 2010.
4	Power System stability & control - Prabha Kundur - TMH - 1994.
WEB RESOURCES (Suggested)	
1	http://nptel.ac.in/downloads/108101040/
2	http://home.engineering.iastate.edu/~jdm/ee553/HydroThermal.pdf

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Disaster Management
(Open Elective – II)

Course Category	Open Elective	**Course Code**	20CE6T35
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	----------	**Internal AssessmentSemester End Examination Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To provide basic conceptual understanding of disasters.
2	To understand approaches of Disaster Management.
3	To build skills to respond to disaster.
4	To understand to reduce the intensity of future disasters.
5	To understand the Restoration of human life in the region.

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Knowledge on characteristics of natural disasters
CO2	Planning on approaches of Disaster Management
CO3	Ability to plan and design the new skills in disaster response
CO4	Role of remote sensing system in disaster area response
CO5	Knowledge on the Restoration of human life in the region.

COURSE CONTENT	
UNIT I	**Natural Hazards and Disaster Management:** Introduction of DM – Inter disciplinary nature of the subject– Disaster Management cycle – Five priorities for action. Case study methods of the following: Vegetal Cover floods, droughts – Earthquakes – landslides – global warming, cyclones & Tsunamis – Post Tsunami hazards along the Indian coast.
UNIT II	**Man Made Disaster and Their Management Along With Case Study Methods Of The Following:** Fire hazards – transport hazard dynamics – solid waste management – post disaster – bio terrorism -threat in mega cities, rail and aircraft accidents, ground water, industries - Emerging infectious diseases and Aids and their management.
UNIT III	**Risk and Vulnerability:** Building codes and land use planning – Social Vulnerability – Environmental vulnerability – Macro-economic management and sustainable development, Climate change risk rendition – Financial management of disaster – related losses
UNIT IV	**Role of Technology in Disaster Managements:** Disaster management for infra structures, taxonomy of infra structure – treatment plants and process facilities- electrical substations- roads and bridges mitigation programme for earth quakes – flowchart, geospatial information in agriculture drought assessment - Multimedia Technology in disaster risk management and training - Transformable Indigenous Knowledge in disaster reduction – Role of RS & GIS

UNIT V	**Multi-sectional Issues, Education and Community Preparedness:** Impact of disaster on poverty and deprivation - Climate change adaptation and human health - Exposure, health hazards and environmental risk-Forest management and disaster risk reduction -The Red cross and red crescent movement - Corporate sector and disaster risk reduction- Education in disaster risk reduction Essentials of school disaster education - Community capacity and disaster resilience-Community based disaster recovery - Community based disaster management and social capital-Designing resilience- building community capacity for action

TEXT BOOKS	
1.	"Disaster Management guide lines", GOI-UND Disaster Risk program (2009-2012)
2.	Modh S. (2010) "Managing Natural Disasters", Mac Millan publishers India LTD.
REFERENCE BOOKS	
1.	Murty D.B.N. (2012) "Disaster Management", Deep and Deep Publication PVT.Ltd. New Delhi
WEB RESOURCES	
1	https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Introduction to Automobile Engineering
(Open Elective – II)

Course Category	Open Elective	**Course Code**	20ME6T25
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To learn functions of different components in Automobiles
2	To impart knowledge on Transmission systems and Steering Systems.
3	To impart the knowledge on ignition system & suspension systems.
4	To impart the knowledge of Braking system and Engine specification.
5	To understand the concept of safety and Engine emission control systems

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the function of various components of automobile.	K2
CO2	Identify the merits and demerits of the various transmission and steering systems.	K2
CO3	Describe the concept of Ignition and Suspension systems.	K2
CO4	Explain the features of Braking system and Engine specification.	K3
CO5	Analyze the Engine emission control standards.	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	3	-	-	-	-	2	2	-	-	-	-	-	2	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO3	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO4	3	2	1	1	-	2	2	-	-	-	-	-	2	1
CO5	2	2	1	-	-	-	2	-	-	-	-	1	3	-

COURSE CONTENT

UNIT I

INTRODUCTION: Components of four-wheeler automobile-chassis and body-power unit-types of automobile engines, engine construction, oil filters, oil pumps, air filters, Fuel pump, nozzle, Types of carburetors.

UNIT II

TRANSMISSION SYSTEM: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, Propeller shaft-Hotch-Kiss drive, Torque tube drive, universal joint, differential rear axles-types-wheels and tires.

STEERING SYSTEM: Steering geometry-camber, castor, king pin rake, combined angle toe-in, center point steering. steering gears – types, steering linkages.

UNIT III

IGNITION SYSTEM: Function of an ignition system, auto transformer, electronic ignition using contact triggers-spark advance and retard mechanism.

SUSPENSION SYSTEM: Objects of suspension systems-rigid axle suspension system, torsion bar, shock absorber, independent suspension system.

UNIT IV

BRAKING SYSTEM: Mechanical brake system, hydraulic brake system, master cylinder, pneumatic and vacuum brakes.

ENGINE SPECIFICATION: Introduction-engine specifications with regard to power, speed, torque, no. of cylinders and arrangement.

UNIT V

SAFETY SYSTEMS: Introduction, safety systems - seat belt, air bags, bumper, wind shield, suspension sensors, traction control, mirrors.

ENGINE EMISSION CONTROL: Introduction-types of pollutants, mechanism of formation, concentration measurement, methods of controlling-engine modification.

TEXT BOOKS

1. Automotive Mechanics / Heitner.
2. Automobile Engineering / William Crouse, TMH Distributors.
3. Automobile Engineering- P.S Gill, S.K. Kataria& Sons, New Delhi.

REFERENCE BOOKS

1. Automotive Engines Theory and Servicing, James D. Halderman and Chase D. Mitchell Jr., Pearson education inc.
2. Automotive Engineering / Newton Steeds & Garrett.
3. Automotive Mechanics – Vol. 1 & Vol. 2 / Kripal Singh, standard publishers.

WEB RESOURCES

1. https://nptel.ac.in/courses/107/106/107106080/
2. http://gabook.cyou/file/nptel-automobile-engineering
3. https://nptel.ac.in/courses/107/106/107106088/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Sensors and Transducers
(Open Elective – II)

Course Category	Open Elective	**Course Code**	20EC6T26
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	control systems	**Internal Assessment** **Semester End Examination** **Total Marks**	25 75 100

COURSE OBJECTIVES: By studying this course the student will learn	
1	the principle of various Transducers and their construction
2	the transducer construction, classification, principle of operation and characteristics
3	about transducers for measurement of physical parameters
4	Temperature measurement using transducers
5	Applications and principles of operation, standards and units of measurements

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	discuss role of transducers and Sensor in instrumentation	K1
CO2	Descriptive view for the transducer construction, classification, principle of operation and characteristics.	K2
CO3	Gain knowledge about transducers for measurement of displacement, strain, velocity, analyze transducers for measurement of pressure , force and flow	K3
CO4	analyze transducers for measurement of Temperature	K4
CO5	Analyze sensors used in industrial applications	K4

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2		1							
CO2	1	2	2		1							
CO3	2	2	2		2							
CO4	2	3	2		2							
CO5	3	3	3		2							

COURSE CONTENT	
UNIT I	**Introduction:** Functional elements of an instrument, generalized performance characteristics of instruments – static characteristics, dynamic characteristics. Zero order, first order, second order instruments – step response, ramp response and impulse response. Response of general form of instruments to periodic input and to transient input
UNIT II	**Transducers for motion and dimensional measurements:** Relative displacement, translation and rotational resistive potentiometers, resistance strain gauges, LVDT, synchros, capacitance transducers, Piezo-electric transducers, electro-optical devices, nozzle – flapper transducers, digital displacement transducers, ultrasonic transducers, Gyroscopic sensors

UNIT III	**Transducers For Force Measurement**: Bonded strain gauge transducers, Photo-electric transducers, variable reluctance pickup, torque measurement dynamometers. **Transducers For Flow Measurement:** Hot wire and hot-film anemometers, Electro-magnetic flow meters, laser Doppler velocity meter **Transducers For Pressure Measurement:** Manometers, elastic transducers, liquid systems, gas systems, very high pressure transducers.
UNIT IV	**Transducers For Temperature Measurement:** Thermal expansion methods, Thermometers (liquid in glass), pressure thermometers, Thermocouples, Materials configuration and techniques. Resistance thermometers, Thermistors, junction semiconductors, Sensors, Radiation methods, Optical pyrometers, Dynamic response of temperature sensors heat flux Sensors, Transducers for liquid level measurement, humidity, silicon and quartz sensors, fiber optic sensors.
UNIT V	**Smart sensors:** Introduction – Primary Sensors – Excitation – Amplification – Filters – Converters – Compensation– Information Coding/Processing - Data Communication – 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

TEXT BOOKS	
1.	Sensors and Transducers, D. Paranaiba ,PHI Learning Private Limited.
2.	Mechatronics,W. Bolton ,Pearson Education Limited.
REFERENCE BOOKS	
1.	Transducers and Instrumentation, by D.V.S. Murthy (PHI)
2.	Instrumentation Measurement & Analysis, by B.C. Nakra, K.K. Choudry, (TMH)
WEB RESOURCES	
1.	https://youtu.be/hv-aBonZMRQ
2.	https://www.youtube.com/watch?v=qSa3GNjIyy0

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Computer Forensics
(Open Elective – II)

Course Category	Professional Core	**Course Code**	20CS6T15
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	Identify Security Risks And Take Preventive Steps
2	Understand the Forensics Fundamentals
3	Understand the Evidence Capturing Process

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Understand the Cybercrime Fundamentals	K2
CO2	List the types of attacks on networks	K4
CO3	Analyze various tools available for Cybercrime Investigation	K4
CO4	Summarize the Computer Forensics and Investigation Fundamentals and tools	K2
CO5	Analyze the legal perspectives of Cybercrime	K4

K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2
CO2	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2
CO3	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2
CO4	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2
CO5	3	2	2	2	2	1	0	2	0	0	0	0	2	2	2

COURSE CONTENT	
UNIT I	**Introduction to Cybercrime:** Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.
UNIT II	**Tools and Methods :** Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

UNIT III	**Cyber Crime Investigation:** Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.
UNIT IV	**Computer Forensics and Investigations:** Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating andTesting Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.
UNIT V	**Cyber Crime Legal Perspectives:** Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act-ITA2000, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime andPunishment, Cyberlaw, Technology and Students: Indian Scenario.

TEXT BOOKS	
1.	Sunit Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY,First Edition 2011.
2.	Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
REFERENCE BOOKS	
1.	Michael T. Simpson, Kent Backman and James E. Corley, "Hands on Ethical Hacking and Network Defence", Cengage, 2019.
2.	Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi,First Edition,2015
3.	Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar "Cyber Security and Cyber Laws" , Cengage,First Edition,2018.
WEB RESOURCES	
1.	CERT-In Guidelines- http://www.cert-in.org.in/
2.	https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3.	https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4.	Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu License: Creative Commons BY-NC-SA.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Electrical Measurements and Instrumentation Laboratory

Course Category	Lab Course	**Course Code**	20EE6L10
Course Type	Laboratory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**15** **35** **50**

COURSE OBJECTIVES	
1	To understand students how different types of meters work and their construction.
2	To make the students understand how to measure resistance, inductance and capacitance by AC & DC bridges.
3	To understand the testing of CT and PT
4	To Understand and the characteristics of Thermo couples, LVDT, Capacitive transducer, piezoelectric transducer.
5	To understand the measurement of strain and choke coil parameters.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know about the phantom loading and Learn the calibration process	K2
CO2	Gain the skill knowledge of various brides and their applications	K2
CO3	Measure the electrical parameters voltage - current - power - energy and electrical characteristics of resistance - inductance and capacitance.	K3
CO4	Measure the strains - frequency and phase difference and Know the characteristics of transducers	K3
CO5	Learn the usage of CT's - PT's for measurement purpose.	K3
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	1	-	-	-	-	-	-	-	-	-	-	1	1
CO2	2	1	-		-	-	-	-	-	-	-	1	1	1
CO3	2	1	1	-	-	-	-	-	-	-	-	1	1	2
CO4	2	1	-	-	-	-	-	-	-	-	-	-	1	2
CO5	2	1	1	-	-	-	-	-	-	-	-	1	1	2

Exp. No.	**CONTENTS** **(Any 10 of the following experiments are to be conducted)**
1	Calibration of dynamometer wattmeter using phantom loading
2	Measurement of resistance using Kelvin's double Bridge and Determination of its tolerance.
3	Measurement of Capacitance using Schering Bridge.
4	Measurement of Inductance using Anderson Bridge.
5	Calibration of LPF Wattmeter by direct loading.
6	Measurement of 3 phase reactive power using single wattmeter method for a balanced load.
7	Testing of C.T. using mutual inductor – Measurement of % ratio error and phase angle of given C.T. by Null deflection method.
8	P.T. testing by comparison – V.G as Null detector – Measurement of % ratio error and phase angle of the given P.T.
9	Determination of the characteristics of a Thermocouple.
10	Determination of the characteristics of a LVDT.
11	Determination of the characteristics for a capacitive transducer
12	Measurement of strain for a bridge strain gauge.
13	Measurement of Choke coil parameters and single phase power using three voltmeter and three ammeter methods.
14	Calibration of single phase Energy Meter.
15	Dielectric oil Test using HV Kit.
16	Calibration of DC ammeter and voltmeter using Crompton DC Potentiometer.
17	AC Potentiometer: Polar Form / Cartesian Form - Calibration of AC voltmeter - Parameters of choke.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Power Systems and Simulation Laboratory

Course Category	Lab Course	**Course Code**	20EE6L11
Course Type	Laboratory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**15** **35** **50**

COURSE OBJECTIVES	
1	To impart the practical knowledge of functioning of various power system components and determination of various parameters and simulation of load flows, transient stability, LFC and Economic dispatch.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Estimate the sequence impedances of 3-phase Transformer and Alternators	K4
CO2	Analyze the performance of transmission lines	K4
CO3	Analyze and simulate power flow methods in power systems	K4
CO4	Analyze and simulate the performance of PI controller for load frequency control.	K4
CO5	Analyze and simulate stability studies of power systems	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	1	-	-	-	-	-	-	-	-	-	1	1
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	1
CO3	3	2	1	-	-	-	-	-	-	-	-	-	1	-
CO4	3	2	1	-	-	-	-	-	-	-	-	-	1	1
CO5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

Exp. No.	CONTENTS (Any 10 of the following experiments are to be conducted)
1	Sequence impedances of 3 phase Transformer.
2	Sequence impedances of 3 phase Alternator by Fault Analysis.
3	Sequence impedances of 3 phase Alternator by Direct method.
4	ABCD parameters of Transmission line.
5	Load flow studies using Gauss-seidel method
6	Load flow studies using N-R method..
7	Load frequency control of two area with &without control
8	Economic load dispatch with & without losses
9	Transient analysis of single machine connected to infinite bus(SMIB).
10	Modeling of transformer and simulation of lossy transmission line.
11	Calibration of Tong Tester
12	Analysis of three phase circuit representing the generator transmission line and load. Plot three phase currents & neutral current.
13	Fast Decoupled flow analysis using MATLAB.
14	Short Circuit analysis for line to ground fault and line to line fault using MATLAB.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Skill Advanced Course:
Machine Learning with Python-I
(Skill Oriented Course)

Course Category	SOC	**Course Code**	20AM6SO3
Course Type	Laboratory	**L-T-P-C**	1-0-2-2
Prerequisites	Python Programming	**Internal Assessment** **Semester End Examination** **Total Marks**	00 50 50

COURSE OBJECTIVES	
The student will:	
1	This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Implement procedures for the machine learning algorithms.	K1
CO2	Design and Develop Python programs for various Learning algorithms	K2
CO3	Apply appropriate data sets to the Machine Learning algorithms	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	--	--	--	--	--	--	--	--	2	2	2
CO2	3	2	1	--	--	--	--	--	--	--	--	1	1	1
CO3	3	2	1	--	--	--	--	--	--	--	--	--	1	1

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluateML models.

List of Experiments	
1	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2	For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3	Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4	Exercises to solve the real-world problems using the following machine learning method - LinearRegression.
5	Exercises to solve the real-world problems using the following machine learning method - Logistic Regression.
6	Exercises to solve the real-world problems using the following machine learning method - Binary Classifier.
7	Develop a program for Bias and Variance.
8	Develop a program for Remove duplicates and Cross Validation.
9	Write a program to implement Categorical Encoding.
10	Write a program to implement One-hot Encoding.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

III Year II semester

Research Methodology

Course Category	Humanities including Management	**Course Code**	20HM6T10
Course Type	Theory	**Lecture-Tutorial-Practice**	2 -0 -0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	 100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	understand some basic concepts of research and its methodologies and develop the basic framework of research process	Understanding
CO 2	Identify research problem and identify various sources of information for literature review	Analyzing
CO 3	Understand the concept of Research Design and develop a proper research plan	Understanding
CO 4	Identify various sources of information for Data collection and Understand and apply statistical techniques for better decision making	applying
CO 5	Formulate Research Report and Research proposal to solve a particular problem.	Evaluating

Contribution of Course Outcomes towards achievement of Program

Outcomes: 1 – Low, 2 - Medium, 3 – High

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO1	0	0	0	0	0	2	0	2	0	1	0	2
CO2	0	0	0	0	0	1	0	2	1	1	0	1
CO3	0	0	0	0	0	1	0	1	1	1	0	0
CO4	0	0	0	0	0	1	0	1	1	1	0	0
CO5	0	0	0	0	0	1	1	1	1	1	0	2

Course Content :

Unit – I

Introduction: Nature and Importance of Research, Aims of social research, Types of Research, Research Approaches, Ethical issues in Research, Research Methods verses Methodology, Criteria of Good Research, Steps in Research process.

Unit –II

Defining the Research Problem and Literature survey: Definition of Research Problem, Problem Formulation, Necessity of Defining the Problem, Technique involved in Defining a Problem,

Importance of Literature Survey, Sources of Information, Assessment of Quality of Journals and Articles, Information through Internet.

Unit –III

Research Design: Meaning of Research Design, Need of Research Design, Important concepts related to Design, Different Research Designs Selection of an appropriate survey Research Design, The nature of field work and Field work management Self-administered Questionnaires , Developing a Research Plan

Unit – IV

Data collection and statistical Inference: Collection of Primary Data, Secondary Data, Methods of Data Collection, Need For Sampling, Sampling Design, Formulation of Hypothesis –Tests of Hypothesis - Introduction to Null hypothesis vs. Alternative Hypothesis, Parametric vs. Non-Parametric Tests, Procedure for testing of Hypothesis, Tests of significance for Small Samples, Application, t-test, Chi Square test

Unit – V

Research Report Writing and Research Proposal: Format of the Research report, References/Bibliography, Technical paper writing, Journal Report Writing, Making Presentation, Writing a Research Proposal and Research Report, Writing Research Grant Proposal.

Reference Books

1. C.R Kothari, Research Methodology, Methods & Technique; New Age International Publishers
2. R. Ganesan, Research Methodology for Engineers, MJP Publishers.
3. Ratan Khananabis and Suvasis Saha, Research Methodology, Universities Press, Hyderabad.
4. Y. P. Agarwal, Statistical Methods: Concepts, Application and Computation, Sterling Publs., Pvt., Ltd., New Delhi.
5. Vijay Upagade and Aravind Shende, Research Methodology, S. Chand & Company Ltd., New Delhi.
6. G. Nageswara Rao, Research Methodology and Quantitative methods, BS Publications, Hyderabad.
7. Naval Bajjai “Business Research Methods” Pearson .

Web Resources

https://www.indeed.com/career-advice/career-development/research-design

https://online.hbs.edu/blog/post/data-collection-methods

https://imotions.com/blog/statistical-tools/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

DIGITA LSIGNAL PROCESSING
(Professional Elective – III)

IV Year I semester

Course Category	Core	**Course Code**	20EC7T30
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Signals and systems	**Internal Assessment Semester** **End Examination** **Total Marks**	30 70 100

COURSEOBJECTIVES	
1	Analyze the discrete-time signals and systems in time and frequency domains.
2	Know the importance of FFT algorithm for computation of Discrete Fourier Transform
3	Understand the various implementations of digital filter structures
4	Learn the FIR and IIR Filter design procedures
5	Learn the concepts of DSP Processors

COURSEOUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Formulate engineering problems in terms of DSP operations. Analyze digital signals and systems	K4
CO2	Analyzed is discrete time signals in frequency domain	K4
CO3	Design IIR digital filters and implement with different structures	K6
CO4	Design IIR digital filters and implement with different structures	K6
CO5	Understand the key architectural	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1–Low, 2-Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	-	-	2	-	-	-	-	-	-	-	2	2
CO2	2	2	-	-	2	-	-	-	-	-	-	-	2	2
CO3	2	2	2	-	2	-	-	-	-	-	-	-	2	2
CO4	2	2	2	-	2	-	-	-	-	-	-	-	2	2
CO5	**2**	1	-	-	-	-	-	-	-	-	-	-	2	2

COURSECONTENT	
UNITI	**INTRODUCTION:** Introduction to Digital Signal Processing: Discrete time signals and sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems. Review of Z-transforms: Applications of Z –transforms, solution of difference equations.
UNITII	**DISCRETE FOURIER SERIES & FOURIER TRANSFORMS:** Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT)- Radix- 2 decimation- in- time and decimation-in frequency FFT

	Algorithms, Inverse FFT,
UNITIII	**DESIGNOF IIRDIGITAL FILTERS& REALIZATIONS:** Analog filter approximations –Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems, Transposed forms.
UNITIV	**DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS:** Characteristics of FIR Digital Filters, Frequency response. Design of FIR Digital Filters using Window technique and Frequency Sampling technique, Comparison of IIR & FIR filters. Basic structures of FIR systems.
UNITV	**INTRODUCTIONTODSPPROCESSORS:**IntroductiontoprogrammableDSPs:Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in P-DSPs, Multiple Access Memory, Multi ported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals. **ArchitectureofARMprocessors:**TechnicaldetailsofARMProcessors,Introductionto Cortex-M3 and cortex M4 processors - Processor type, processor architecture, instruction set, block diagram, memory systems.

TEXTBOOKS	
1.	Digital Signal Processing, Principles, Algorithms, and Applications--JohnG.Proakis, Dimitris G.Manolakis,4th edition,PHI,2013.
2.	DigitalSignalProcessors,Architecture,ProgrammingandApplications–B.Venkataramani, M.Bhaskar,TATAMcGrawHill,2002.
3.	Digital Signal Processing Using theARMCortexM4, DonaldS.Reay,2015.
REFERENCEBOOKS	
1.	Discrete Time Signal Processing –A. V. OppenheimandR.W.Schaffer, 4th edition, PHI, 2007.
2.	Digital Signal Processing—Tarun kumar Rawat, 1st edition, Oxford,2015.
3.	Digital signal Processing –A Anand Kumar,Eastrn economyedition, PHI, 2013.
WEBRESOURCES	
1.	www.nptelvideos.in/2012/12/digitalsignalprocessing.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Renewable and Distributed Energy Technologies
(Professional Elective – III)

Course Category	Professional Core Courses	**Course Code**	20EE7T20
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To understand the basic concepts on wind energy systems with concept on aerodynamics, horizontal and vertical axis wind turbines.
2	To understand the various relations between speed, power and energy in the wind systems.
3	It provides the knowledge in fundamentals of solar energy systems, various components of solar thermal systems, applications in the relevant fields and design of PV systems.
4	To understand the Hydel system components and their design concepts. To get an idea on different other sources like tidal, geothermal and gas based units.
5	To understand the use of various renewable sources as distributed generators.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate basic concepts of renewable and distributed source	K3
CO2	Demonstrate the components of wind energy conversion systems	K3
CO3	Model PV systems and analyze MPPT Techniques.	K4
CO4	Illustrate the concept of Energy Production from Hydro - Tidal and Geothermal.	K3
CO5	Distinguish between standalone and grid connected DG systems and design hybrid renewable energy systems.	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	1	-	-	-	-	-	-	-	-	-	1	1	1
CO2	2	1	-	-	-	-	1	-	-	-	-	1	1	1
CO3	2	1	1	-	-	-	1	-	-	-	-	1	1	1
CO4	2	1	-	-	-	-	1	-	-	-	-	1	1	1
CO5	2	1	1	-	-	-	-	-	-	-	-	1	1	1

COURSE CONTENT	
UNIT 1	**Brief idea on renewable and distributed sources** - their usefulness and advantages; Wind Energy Systems: Estimates of wind energy potential - wind maps - Instrumentation for wind velocity measurements - Aerodynamic and mechanical aspects of wind machine design - Conversion to electrical energy - Aspects of location of wind farms.

UNIT 2	**Wind speed and energy** - Speed and power relations - Power extraction from wind - Tip speed ratio (TSR) - Functional structure of wind energy conversion systems - Pitch and speed control - Power-speed-TSR characteristics - Fixed speed and variable speed wind turbine control - Power optimization - Electrical generators - Self-Excited and Doubly-Fed Induction Generators operation and control.
UNIT 3	**Solar PV Systems:** Present and new technological developments in photovoltaic - estimation of solar irradiance - components of solar energy systems - solar-thermal system applications to power generation - heating - Types of PV systems - Modelling of PV cell - current-voltage and power-voltage characteristics - Effects of temperature - Solar array simulator - Sun tracking - Peak power operations - PV system - MPPT techniques - Effects of partial shading on the characteristic curves and associated MPPT techniques - Solar park design outline.
UNIT 4	**Hydel Power:** Water power estimates - use of hydrographs - hydraulic turbine - characteristics and part load performance - design of wheels - draft tubes and penstocks - plant layouts; Brief idea of other sources viz. - tidal - geothermal - gas-based - etc.
UNIT 5	**Requirements of hybrid/combined use of different renewable and distributed sources -** Need of energy storage; Control of frequency and voltage of distributed generation in Stand-alone and Grid-connected mode - use of energy storage and power electronics interfaces for the connection to grid and loads - Design and optimization of size of renewable sources and storages.

TEXT BOOKS	
1	Math J. Bollen - Fainan Hassan 'Integration of Distributed Generation in the Power System' - IEEE Press - 2011.
2	Loi Lei Lai and Tze Fun Chan 'Distributed Generation: Induction and Permanent Magnet Generators' - Wiley-IEEE Press - 2007.
REFERENCE BOOKS	
1	Studies' Craig Anderson and Rudolf I. Howard 'Wind and Hydropower Integration: Concepts - Considerations and Case - Nova Publisher - 2012.
2	Amanda E. Niemi and Cory M. Fincher 'Hydropower from Small and Low-Head Hydro Technologies' - Nova Publisher - 2011.
3	D. Yogi Goswami - Frank Kreith and Jan F. Kreider 'Principles of Solar Engineering' - Taylor & Francis 2000.
4	G. N. Tiwari 'Solar Energy Technology' - Nova Science Publishers - 2005.
5	Math J. Bollen - Fainan Hassan 'Integration of Distributed Generation in the Power System' - IEEE Press - 2011.
6	S. Heier and R. Waddington 'Grid Intergration of Wind Energy Conversion Systems' – Wiley - 2006.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/121/106/121106014/
2	https://nptel.ac.in/courses/108/107/108107112/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Flexible AC Transmission Systems
(Professional Elective – III)

Course Category	Professional Core Courses	**Course Code**	20EE7T21
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To learn the basics of power flow control in transmission lines using FACTS controllers
2	To explain operation and control of voltage source converter.
3	To learn the method of shunt compensation using static VAR compensators.
4	To learn the methods of compensation using series compensators
5	To explain operation of Unified Power Flow Controller (UPFC) and Interline Power flow Controller (IPFC).

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the concepts of facts controller and power flow control in transmission line.	K2
CO2	Demonstrate operation and control of voltage source converter and know the concepts current source converter.	K2
CO3	Analyze compensation by using different compensators to improve stability and reduce power oscillations in the transmission lines.	K4
CO4	Know the concepts methods of compensations using series compensators.	K2
CO5	Analyze operation of Unified Power Flow Controller (UPFC) and Interline power flow controller (IPFC).	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	3	2	-	-	1	-	-	-	-	-	-	1	2	2
CO3	3	2	-		1	-	-	-	-	-	-	1	2	3
CO4	3	2	-	-	1	-	-	-	-	-	-	1	2	2
CO5	2	2	-	-	1	-	-	-	-	-	-	1	2	1

COURSE CONTENT	
UNIT 1	**Introduction to FACTS** Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and current rating – Losses and speed of switching – Parameter trade–off devices.

UNIT 2	**Voltage source and Current source converters** Voltage source converter (VSC) – Single phase full-wave bridge converter – Square wave voltage harmonics for a single–phase bridge converter – Three–phase full-wave bridge converter - Transformer connections for 12 pulse operation. Current Source Converter (CSC)-Three–phase current source converter – Comparison of current source converter with voltage source converter.
UNIT 3	**Shunt Compensators** Objectives – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping. **Variable Impedance Type VAR Generator**: Thyristor Switched/Controlled Reactor (TSR/TCR) – Thyristor Switched Capacitor (TSC) – Fixed Capacitor–Thyristor Controlled Reactor (FC-TCR) - Thyristor Switched Capacitor and Thyristor Controlled Reactor (TSC–TCR) - Switching Converter type VAR generator. Principle of operation and comparison of SVC and STATCOM.
UNIT 4	**Series Compensators** Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. Variable Impedance type series compensators – GTO Thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC) - Switching Converter type Series Compensation – Static Synchronous Series Compensator.
UNIT 5	**Combined Compensators** Schematic and basic operating principles of unified power flow controller (UPFC) and Interline power flow controller (IPFC) – Controller applications of transmission lines.

TEXT BOOKS	
1	Understanding FACTS" N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition is available:— Standard Publications, 2001.
2	HVDC & FACTS Controllers: applications of static converters in power systems- Vijay K.Sood- Springer publishers
REFERENCE BOOKS	
1	"Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
2	Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.MohanMathur and Rajiv k.Varma, Wiley.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108/107/108107114/
2	https://www.digimat.in/nptel/courses/video/108107114/L01.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Power Systems Deregulation
(Professional Elective – III)

Course Category	Professional Core Courses	**Course Code**	20EE7T22
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To provide in-depth knowledge of operation of deregulated electricity market systems
2	To calculate Available Transfer Capability (ATC) using different mechanisms
3	To examine typical issues in electricity markets and how these are handled world –wide in various markets.
4	To learn importance effects and classification of congestion management methods
5	To know the information about various ancillary services and markets in national international scenario

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the essential and operation of deregulated electricity market systems	K2
CO2	Learn about the different structure model.	K2
CO3	Analyze various types of electricity market operational and control issues using new mathematical models	K4
CO4	Analyze LMP's wheeling transactions and congestion management	K4
CO5	Analyze impact of ancillary services.	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)													
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	-	-	-	-	-	-	1	2	-
CO2	3	2	1	-	-	-	-	-	-	-	-	1	2	-
CO3	3	2	2	1	-	-	-	-	-	-	-	1	2	-
CO4	3	2	1	1	-	-	-	-	-	-	-	1	2	-
CO5	3	2	2	1	-	-	-	-	-	-	-	1	2	-

COURSE CONTENT	
UNIT 1	**Need and conditions for deregulation.** Introduction of Market structure - Market Architecture - Spot market - forward markets and settlements. Review of Concepts marginal cost of generation - least-cost operation - incremental cost of generation. Power System Operation - Power Exchange.
UNIT 2	**Electricity sector structures and Ownership /management** - the forms of Ownership and management. Different structure model like Monopoly model - Purchasing agency model - wholesale competition model - Retail competition model - Definition of Available Transfer Capability (ATC) - computation of ATC.
UNIT 3	**Framework and methods for the analysis of Bilateral and pool markets** - LMP based markets. Auction models and price formation - price based unit commitment - country

	practices.
UNIT 4	**Transmission network and market power.** Power wheeling transactions and marginal costing - transmission costing. Congestion management methods- market splitting - counter-trading; Effect of congestion on LMPs- country practices.
UNIT 5	**Ancillary Services and System Security in Deregulation.** Classifications and definitions - AS management in various markets- country practices. Technical - economic - & regulatory issues involved in the deregulation of the power industry.

TEXT BOOKS	
1	Power System Economics: Designing markets for electricity - Steven Stoft - wiley publishers - 2002.
2	Operation of restructured power systems - K. Bhattacharya - M.H.J. Bollen and J.E. Daalder – Springer - 2012.
REFERENCE BOOKS	
1	Power generation - operation and control - -J. Wood and B. F. Wollenberg - Wiley – 1998.
2	Market operations in electric power systems - M. Shahidehpour - H. Yaminand Z. Li – Wiley -2003.
3	Fundamentals of power system economics - S. Kirschen and G. Strbac - Wiley - 2nd edition - 2018.
4	Optimization principles: Practical Applications to the Operation and Markets of the Electric Power Industry - N. S. Rau - IEEE Press series on Power Engineering.
5	"Competition and Choice in Electricity" by Sally Hunt and Graham Shuttleworth - Wiley publishers - 1997.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108101005
2	http://www.nptel.ac.in/courses/108101040/Module%207/L02Power%20System%20Restructuring%20Models.pdf

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Hybrid Electric Vehicles
(Professional Elective – IV)

Course Category	Professional Core Courses	**Course Code**	20EE7T23
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To familiarize the students with the need and advantages of electric and hybrid electric vehicles.
2	To know various architectures of hybrid electric vehicles.
3	To understand the power management of plug in electric vehicles.
4	To study and understand different power converters used in electrical vehicles.
5	To familiarize with different batteries and other storage systems.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Know the concept of electric vehicles and hybrid electric vehicle	K2
CO2	Familiar with different configuration of hybrid electric vehicles.	K2
CO3	Choose an effective motor for EV and HEV application	K3
CO4	Understand the power converters used in hybrid electric vehicles	K2
CO5	Know different batteries and other energy storage systems.	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	-	-	-	-	2	1	-	-	-	-	2	1	1
CO2	2	1	1	-	-	1	1	-	-	-	-	2	1	2
CO3	3	2	2	2	-	-	1	-	-	-	-	1	2	2
CO4	3	3	2	2	-	-	1	-	-	-	-	-	2	2
CO5	2	1	1	-	-	-	2	-	-	-	-	2	1	1

COURSE CONTENT	
UNIT 1	**Introduction** Fundamentals of vehicle - components of conventional vehicle and propulsion load; Drive cycles and drive terrain; Concept of electric vehicle and hybrid electric vehicle; History of hybrid vehicles - advantages and applications of Electric and Hybrid Electric Vehicles.
UNIT 2	**Hybridization of Automobile** Architectures of HEVs - series and parallel HEVs - complex HEVs. Plug-in hybrid vehicle(PHEV) - constituents of PHEV - comparison of HEV and PHEV; Extended range hybrid electric vehicles(EREVs) - blended PHEVs - Fuel Cell vehicles and its constituents.

UNIT 3	**Special Machines for EV and HEVs** Characteristics of traction drive - requirement of electric motors for EV/HEVs. Induction Motor drives - their control and applications in EV/HEVs. Permanent magnet Synchronous motor: configuration - control and applications in EV/HEVs. Brushless DC Motors: Advantages - control of application in EV/HEVs. Switch reluctance motors: Merits limitations - converter configuration - control of SRM for EV/HEVs.
UNIT 4	**Power Electronics in HEVs** Boost and Buck-Boost converters - Multi Quadrant DC-DC converters - DC-AC Inverter for EV and HEV applications - Three Phase DC-AC inverters - Voltage control of DC-AC inverters using PWM - EV and PHEV battery chargers.
UNIT 5	**Energy Sources for HEVs** Energy Storage - Battery based energy storage and simplified models of battery - fuel cells - their characteristics and simplified models - super capacitor based energy storage - its analysis and simplified models - flywheels and their modeling for energy storage in EV/HEV - Hybridization of various energy storage devices.

TEXT BOOKS	
1	Ali Emadi - Advanced Electric Drive Vehicles - CRC Press - 2014.
2	Iqbal Hussein - Electric and Hybrid Vehicles: Design Fundamentals - CRC Press - 2003.
REFERENCE BOOKS	
1	MehrdadEhsani - YimiGao - Sebastian E. Gay - Ali Emadi - Modern Electric - Hybrid Electric and Fuel Cell Vehicles: Fundamentals - Theory and Design - CRC Press - 2004.
2	James Larminie - John Lowry - Electric Vehicle Technology Explained - Wiley - 2003.
3	H. Partab: Modern Electric Traction - DhanpatRai& Co - 2007.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108103009
2	https://www.sciencedirect.com/topics/engineering/hybrid-electric-vehicle

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

High Voltage Engineering
(Professional Elective – IV)

Course Category	Professional Core Courses	**Course Code**	20EE7T24
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To understand HV breakdown phenomena in gases.
2	To understand the breakdown phenomenon of liquids and solid dielectrics.
3	To acquaint with the generating principle of operation and design of HVDC, AC voltages.
4	To understand the generating principles of Impulse voltages & currents.
5	To understand various techniques for AC, DC and Impulse measurements of high voltages and currents.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Recognize the dielectric properties of gaseous materials used in HV equipment.	K2
CO2	Differentiate the break down phenomenon in liquid and solid dielectric materials.	K3
CO3	Acquaint with the techniques of generation of high AC and DC voltages	K4
CO4	Acquaint with the techniques of generation of high Impulse voltages and currents.	K4
CO5	Getting the knowledge of measurement of high AC - DC - Impulse voltages and currents.	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	1	1	-	-	-	-	-	-	-	-	2	1
CO2	1	2	1	1	-	-	-	-	-	-	-	-	2	1
CO3	3	1	1		-	-	-	-	-	-	-	-	2	1
CO4	2	2	2	-	-	-	-	-	-	-	-	-	2	1
CO5	3	2	3	-	-	-	-	-	-	-	-	-	2	1

COURSE CONTENT	
UNIT 1	**Break down phenomenon in Gases:** Insulating Materials: Types - applications and properties. Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases and its limitations – Streamers Theory of break down – Paschen's law- Paschens curve.
UNIT 2	**Break down phenomenon in Liquids:** Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquids. **Break down phenomenon in Solids:** Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown –Breakdown of composite solid dielectrics.
UNIT 3	**Generation of High DC voltages:** Voltage Doubler Circuit - Voltage Multiplier Circuit – Vande- Graaff Generator.

	Generation of High AC voltages: Cascaded Transformers – Resonant Transformers –Tesla Coil
UNIT 4	**Generation of Impulse voltages:** Specifications of impulse wave – Analysis of RLC circuit only- Marx Circuit. **Generation of Impulse currents:** Definitions – Circuits for producing Impulse current waves – Wave shape control - Tripping and control of impulse generators.
UNIT 5	**Measurement of High DC & AC Voltages:** Resistance potential divider - Generating Voltmeter - Capacitor Voltage Transformer (CVT) - Electrostatic Voltmeters – Sphere Gaps. **Measurement of Impulse Voltages & Currents:** Potential dividers with CRO - Hall Generator - Rogowski Coils.

TEXT BOOKS	
1	High Voltage Engineering: Fundamentals by E.Kuffel - W.S.Zaengl - J.Kuffel by Elsevier - 2nd Edition.
2	High Voltage Engineering and Technology by Ryan - IET Publishers - 2nd edition.
REFERENCE BOOKS	
1	High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications - 3rd Edition.
2	High Voltage Engineering by C.L.Wadhwa - New Age Internationals (P) Limited –1997.
3	High Voltage Insulation Engineering by Ravindra Arora - Wolfgang Mosch - New Age International (P) Limited - 1995.
WEB RESOURCES (Suggested)	
1	https://nptel.ac.in/courses/108/108/108108099/
2	https://www.youtube.com/watch?v=0as-VQq9igA

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

Programmable Logic Controllers and Applications
(Professional Elective – IV)

IV Year I semester

Course Category	Professional Core Courses	**Course Code**	20EE7T25
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To understand the various components of PLC systems and ladder diagrams.
2	To know the programming instructions and registers in the PLC.
3	To understand the use and applications of timer and counter functions.
4	To familiar the data handling function and this application.
5	To understand and implementation of analog operations and PID modules.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate I/O modules of PLC systems and ladder diagram	K4
CO2	Demonstrate various types registers and programming instructions.	K2
CO3	Examine various types of PLC functions and its applications.	K4
CO4	Assess different data handling functions and its applications.	K4
CO5	Describe the analog operations and PID modules.	K2
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	2	1	2	-	-	-	-	-	-	-	1	2	2
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-	2
CO3	3	2	1	2	-	-	-	-	-	-	-	1	2	2
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	1	-	-	-	-	-	-	-	-	-	1	1

COURSE CONTENT	
UNIT 1	**Introduction to PLC systems:** I/O modules and interfacing - CPU processor - programming Equipment - programming formats - construction of PLC ladder diagrams - Devices connected to I/O Modules. Digital logic gates - programming in the Boolean algebra system - conversion examples Ladder Diagrams for process control: Ladder diagrams & sequence listings - ladder diagram construction and flowchart for spray process system.
UNIT 2	**PLC Programming:** Input instructions - outputs - operational procedures - programming examples using contacts and coils. Drill press operation. **PLC Registers:** Characteristics of Registers - module addressing - holding registers - Input Registers - Output Registers.
UNIT 3	**PLC Functions**: Timer functions & Industrial applications - counters - counter function industrial applications - Arithmetic functions - Number comparison functions - number conversion functions.

UNIT 4	**Data Handling functions:** SKIP - Master control Relay - Jump - Move - FIFO - FAL - ONS - CLR & Sweep functions and their applications. Bit Pattern and changing a bit shift register - sequence functions and applications - controlling of two-axis & three axis Robots with PLC - Matrix functions.
UNIT 5	**Analog PLC operation:** Analog modules & systems - Analog signal processing - Multi bit Data Processing - Analog output Application Examples - PID principles - position indicator with PID control - PID Modules - PID tuning - PID functions.

TEXT BOOKS	
1	Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss - Fifth Edition - PHI
2	Programmable Logic Controllers- Programming Method and Applications –J.R. Hackworth &F.D Hackworth Jr. –Pearson - 2004
REFERENCE BOOKS	
1	Introduction to Programmable Logic Controllers- Gary A. Dunning - 3rd edition - Cengage Learning - 2005.
2	Programmable Logic Controllers –W. Bolton - 5th Edition - Elsevier publisher - 2009
WEB RESOURCES (Suggested)	
1	https://www.electrical4u.com/programmable-logic-controllers/
2	https://www.digimat.in/nptel/courses/video/112104289/L33.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Cloud Computing
(Professional Elective – IV)

Course Category	Professional Core	**Course Code**	20CS7T12
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To explain the evolving computer model caned cloud computing
2	To introduce the various levels of services that can be achieved by cloud
3	To describe the security aspects in cloud

COURSE OUTCOMES		**BTL**
Upon successful completion of the course, the student will be able to:		
CO1	Illustrate the key dimensions of the challenge of Cloud Computing	K2
CO2	Classify the Levels of Virtualization and mechanism of tools	K3
CO3	Analyze Cloud infrastructure including Google Cloud and Amazon Cloud	K4
CO4	Design Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud	K3
CO5	Analyze control storage systems and cloud security, the risks involved its impact and develop cloud application	K4

K1- Remembering, K2-Understanding, K3-Applying, K4-Analyzing, K5-Evaluating, K6-Creating

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	2	1	3	1	3	-	-	-	-	-	-	-	3	3	3
CO2	2	1	3	1	3	-	-	-	-	-	-	-	3	3	3
CO3	2	1	3	1	3	-	-	-	-	-	-	-	3	3	3
CO4	2	3	3	3	3	-	-	-	-	-	-	-	3	3	3
CO5	2	1	3	3	3	-	-	-	-	-	-	-	3	3	3

COURSE CONTENT	
UNIT I	**Systems Modeling, Clustering and Virtualization:** Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency
UNIT II	**Virtual Machines and Virtualization of Clusters and Data Centers:** Implementation Levels of Virtualization, Virtualization Structures/ Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation.
UNIT III	**Cloud Platform Architecture:** Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft

	Azure
UNIT IV	**Cloud Resource Management and Scheduling:** Policies and Mechanisms for Resource Management, Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds-Fair Queuing, Start Time Fair Queuing.
UNIT V	**Storage Systems:** Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

TEXT BOOKS	
1.	Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier,2014
REFERENCE BOOKS	
1.	Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier,First Edition,2013
2.	Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press,2014
3.	Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH,2009
4.	Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH
WEB RESOURCES	
1.	https://onlinecourses.nptel.ac.in/noc22_cs20/preview

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Switchgear and Protection
(Professional Elective – V)

Course Category	Professional Core Courses	**Course Code**	20EE7T26
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To provide the basic principles and operation of various types of circuit breakers.
2	To know the classification, operation and application of different types of electromagnetic protective relays.
3	To explain protective schemes for generator and transformers.
4	To gain the knowledge of various protective schemes used for feeders and bus bars.
5	To explain the principle and operation of different types of static relays.
	To understand different types of over voltages in a power system and principles of different neutral grounding methods.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate the principles of arc interruption for application to high voltage circuit breakers of air - oil - vacuum - SF_6 gas type	K3
CO2	Analyse the working principle and operation of different types of electromagnetic protective relays	K4
CO3	Acquire knowledge of protective schemes for generator and transformers for different fault conditions.	K3
CO4	Classify various types of protective schemes used for feeders and bus bar protection and Types of static relays.	K3
CO5	Analyse the operation of different types of over voltages protective schemes required for insulation co–ordination and types of neutral grounding.	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	1	1	-	-	-	-	-	-	-	-	2	1
CO2	1	2	1	1	-	-	-	-	-	-	-	-	2	1
CO3	3	1	1	1	-	-	-	-	-	-	-	-	2	1
CO4	2	2	2	-	-	-	-	-	-	-	-	-	2	1
CO5	3	2	3	-	-	-	-	-	-	-	-	-	2	1

COURSE CONTENT	
UNIT 1	**Circuit Breakers** Application oriented evolution of Switchgear - Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– Restriking Voltage and Recovery voltages– Restriking phenomenon - RRRV– Average and Max. RRRV– Current chopping and Resistance switching– Concept of oil circuit breakers– Description and operation of Air Blast– Vacuum and SF_6 circuit breakers– Circuit Breaker ratings and specifications– Concept of Auto

	reclosing – Application Spectrum Numerical examples
UNIT 2	**Electromagnetic Protection** Relay connection – Balanced beam type attracted armature relay - induction disc and induction cup relays–Torque equation - Relays classification–Instantaneous– DMT and IDMT types– Applications of relays**:** Over current and under voltage relays– Directional relays– Differential relays and percentage differential relays– Universal torque equation– Distance relays**:** Impedance– Reactance– Mho and offset mho relays– Characteristics of distance relays and comparison.
UNIT 3	**Generator Protection** Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples. **Transformer Protection** Percentage differential protection– Design of CT's ratio– Buchholz relay protection– Numerical examples.
UNIT 4	**Feeder and Bus bar Protection & Static Relays:** Over current Protection schemes – PSM - TMS – Numerical examples – Carrier current and three zone distance relay using impedance relays. Protection of bus bars by using Differential protection. Static relays**:** Introduction – Classification of Static Relays – Basic Components of Static Relays.
UNIT 5	**Protection against over voltage and grounding** Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc oxide lighting arresters. Grounded and ungrounded neutral systems – Effects of ungrounded neutral on system performance – Methods of neutral grounding**:** Solid–resistance–Reactance–Arcing grounds and grounding Practices.

TEXT BOOKS	
1	Power System Protection and Switchgear by Badri Ram and D.N Viswakarma - Tata McGraw Hill Publications - 2nd edition - 2011
2	Power system protection- Static Relays with microprocessor applications by T.S.Madhava Rao - Tata McGraw Hill - 2nd edition
REFERENCE BOOKS	
1	Fundamentals of Power System Protection by Paithankar and S.R.Bhide. - PHI - 2003.
2	Art & Science of Protective Relaying – by C R Mason - Wiley Eastern Ltd.
3	Protection and SwitchGear by BhaveshBhalja - R.P. Maheshwari - Nilesh G.Chothani - Oxford University Press - 2013.
WEB RESOURCES (Suggested)	
1	http://www.electrical4u.com/protection-system-in-power-system/
2	http://nptel.ac.in/downloads/108101039/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Switched Mode Power Conversion
(Professional Elective – V)

Course Category	Professional Core Courses	**Course Code**	20EE7T27
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To illustrate CCM and DCM modes of operation of non-isolated switched mode converters.
2	To illustrate the working of isolated switched mode converters.
3	To analyze ZVS and ZCS operation of buck, boost converters.
4	To learn about the control schemes & design aspects of transformers, inductors and capacitors.
5	To model the converters and design controller for closed loop operation of switched mode converters.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Design and analyze the operation of non-isolated switch mode converters.	K4
CO2	Analyze the operation of isolated switch mode converters.	K4
CO3	Illustrate the operation and control of resonant converters.	K2
CO4	Analyze the control schemes of converters and design transformer - inductor.	K4
CO5	Model the converters and design controller for closed loop operation.	K4
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	2	1
CO2	2	1	2	-	-	-	-	-	-	-	-	-	1	1
CO3	3	2	2		-	-	-	-	-	-	-	-	2	1
CO4	3	2	2	-	-	-	-	-	-	-	-	-	2	1
CO5	3	2	2	-	-	-	-	-	-	-	-	-	2	1

COURSE CONTENT	
UNIT 1	**Non-Isolated Switch Mode Converters** Control of DC-DC converters: Buck converters - Boost converters - Buck-Boost converter - CUK Converter - continuous and discontinuous operation - Converter realization with non-ideal components.
UNIT 2	**Isolated Switched Mode Converters** Forwarded converter – fly back converter - push-pull converter - half-bridge converter - full bridge converter.
UNIT 3	**Resonant Converters** Basic resonant circuit concepts - series resonant circuits - parallel resonant circuits - zero current switching quasi-resonant buck converter - zero current switching quasi-resonant boost converter - zero voltage switching quasi-resonant buck converter - zero voltage switching quasi-resonant boost converter.

UNIT 4	**Control Schemes of Converters and Magnetic Design** Voltage control - Current mode control - Current control mode instability. **Magnetic Design:** Transformer design - inductor and capacitor design.
UNIT 5	**Modeling of Converters and Controller Design Based On Linearization:** Formulation of large signal models for buck and boost converters using state space analysis-derivation of averaged large signal model using circuit averaging method-small signal model derivation- average switch modeling technique to obtain small signal models of buck and boost converters- Transfer function of converters-Controller design based on linearization.

TEXT BOOKS	
1	Fundamentals of Power Electronics- Erickson - Robert W. - Maksimovic - Dragan - Springer - 2011.
2	Power switching converters- Simon Ang - Alejandro Oliva - CRC Press - 2010.
3	Power Electronics: Essentials & Applications- L. Umanand, S.P. Bhat, John Wiley & Sons Australia, 1992.
REFERENCE BOOKS	
1	Switching Power Supply Design- Abraham I. Pressman - McGraw-Hill Ryerson - Limited - 1991.
2	Power Electronics: converters Applications & Design – Mohan - Undeland - Robbins-Wiley publications.
3	Design of Magnetic Components for Switched Mode Power Converters- Z Umanand - S.P. Bhat - John Wiley & Sons Australia - 1992.
4	Elements of Power Electronics – Philip T. Krein - Oxford University press - 2014.
WEB RESOURCES (Suggested)	
1	www.peg.ee.iisc.ernet.in/people/faculty/vram/smpc/smpcbook.pdf
2	http://uni-site.ir/khuelec/wp-content/uploads/Mohan-Power-Electronics.pdf

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

AI Applications to Electrical Engineering
(Professional Elective – V)

Course Category	Professional Core Courses	**Course Code**	20EE7T28
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	**NIL**	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES	
1	To understand artificial neuron models & learning methods of ANN.
2	To utilize different algorithms of ANN.
3	To distinguish between classical and fuzzy sets.
4	To illustrated different modules of fuzzy controller.
5	To analyze applications of neural networks and fuzzy logic.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Analyze different models of artificial neuron & Use learning methods of ANN.	K4
CO2	Evaluate different paradigms of ANN.	K4
CO3	Classify between classical and fuzzy sets.	K3
CO4	Illustrate different modules of Fuzzy logic controller.	K4
CO5	Apply Neural Networks and fuzzy logic for real-time applications.	K3
K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create		

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)														
	PO 1	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	1	-	-	-	-	-	-	-	-	1	2	-
CO2	3	2	1	-	-	-	-	-	-	-	-	2	2	-
CO3	3	2	2	2	-	-	-	-	-	-	-	2	2	2
CO4	3	2	2	-	-	-	-	-	-	-	-	2	2	-
CO5	3	2	2	-	-	-	-	-	-	-	-	2	2	1

COURSE CONTENT	
UNIT 1	**Introduction** Artificial Neural Networks (ANN) – Humans and computers – Biological neural networks – ANN Terminology – Models of Artificial neuron – activation functions – typical architectures – biases and thresholds – learning strategy(supervised - unsupervised and reinforced) – Neural networks learning rules. Single layer feed forward neural networks: concept of pattern and its types - perceptron training and classification using Discrete and Continuous perceptron algorithms– linear separability- XOR function.
UNIT 2	**Multi-layer feed forward networks** Generalized delta rule– Back Propagation algorithm– Radial Basis Function (RBF) network - Kohonen's self-organizing feature maps (KSOFM) - Learning Vector Quantization (LVQ) – Bidirectional Associative Memory (BAM) – Hopfield Neural Network.
UNIT 3	**Classical Sets and Fuzzy Sets** Introduction to classical sets- properties - Operations and relations - Fuzzy sets - Operations - Properties - Fuzzy relations - Cardinalities - Membership functions.
UNIT 4	**Fuzzy Logic Modules**

	Fuzzification - Membership value assignment - development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods.
UNIT 5	**Applications** **Neural network applications:** Load flow studies - load forecasting - reactive power control. **Fuzzy logic applications:** Economic load dispatch - speed control of DC motors - single area and two area load frequency control.

TEXT BOOKS	
1	Introduction to Artificial Neural Systems - Jacek M. Zuarda - Jaico Publishing House - 1997.
2	Neural Networks - Fuzzy logic - Genetic algorithms: synthesis and applications by RajasekharanandPai – PHI Publication
REFERENCE BOOKS	
1	Artificial Neural Network – B.Yegnanarayana - PHI - 2012.
2	Fuzzy logic with Fuzzy Applications – T.J Ross – Mc Graw Hill Inc - 1997.
3	Introduction to Neural Networks using MATLAB 6.0 – S N Sivanandam - SSumathi - S N Deepa TMGH
4	Introduction to Fuzzy Logic using MATLAB – S N Sivanandam - SSumathi - S N Deepa Springer - 2007.
WEB RESOURCES (Suggested)	
1	https://online.egr.msu.edu/articles/ai-machine-learning-electrical-computer-engineering-applications/
2	https://www.igi-global.com/book/applications-artificial-intelligence-electrical --engineering/237832

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Data Science
(Professional Elective – V)

Course Category	Professional Core	**Course Code**	**20DS7T11**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Python Programming	**Internal**	**30**
		Assessment Semester	**70**
		End Examination	**100**
		Total Marks	

COURSE OBJECTIVES	
1	To provide a comprehensive knowledge of data science using Python
2	To learn the essential concepts of data analytics and data visualization
3	To understand the data loading from various file formats

COURSE OUTCOMES		**Cognitive level**
Upon successful completion of the course, the student will be able to:		
CO1	Apply principles of NumPy and Pandas to the analysis of data.	K2
CO2	Apply principles of Pandas to the analysis of data.	K2
CO3	Make use of various file formats in loading and storage of data	K3
CO4	Identify and apply the need and importance of pre-processing techniques	K2
CO5	Show the results and present them in a pictorial format	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1–Low, 2-Medium, 3– High)

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

COURSE CONTENTS	
UNIT I	**Data science:** definition, Datafication, Exploratory Data Analysis, The Data science process, A data scientist role in this process. **NumPy Basics:** The NumPy ndarray: A Multidimensional Array Object, Creating ndarrays, Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, Fancy Indexing, Data Processing Using Arrays, Expressing Conditional Logic as Array Operations, Methods for Boolean Arrays, Sorting, Unique.
UNIT II	**Getting Started with pandas:** Introduction to pandas, Library Architecture, Features, Applications, Data Structures, Series, Data Frame, Index Objects, Essential Functionality Reindexing, Dropping entries from an axis, Indexing, selection, and filtering, Sorting and ranking, Summarizing and Computing Descriptive Statistics, Unique Values, Value Counts, Handling Missing Data, filtering out missing data.

UNIT III	**Data Loading, Storage, and File Formats :** Reading and Writing Data in Text Format, Reading Text Files in Pieces, Writing Data Out to Text Format, Manually Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping, Binary Data Formats, Using HDF5 Format, Reading Microsoft Excel Files, Interacting with Databases, Storing and Loading Data in Mongo DB.
UNIT IV	**Data Wrangling:** Combining and Merging Data Sets, Database style Data Frame Merges, Merging on Index, Concatenating Along an Axis, Combining Data with Overlap , Reshaping and Pivoting, Reshaping with Hierarchical Indexing, Data Transformation, Removing Duplicates, Replacing Values.
UNIT V	**Plotting and Visualization**: A Brief matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, Plotting Functions in pandas, Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots.

TEXTBOOKS	
1.	Wes Mc Kinney, "Python for Data Analysis", O'Reilly Media ,1st edition, October 2012.
2.	Rachel Schutt & O'neil, "Doing Data Science", O'Reilly Media, 1st edition, October 2013.
REFERENCEBOOKS	
1.	Joel Grus, "Data Science from Scratch : First Principles with Python", O'Reilly Media, 2015
2.	Matt Harrison, "Learning the Pandas Library : Python Tools for Data Munging, Analysis, and Visualization", O'Reilly Media,2016
WEBRESOURCES	
1.	https://www.analyticsvidhya.com/blog/2020/04/the-ultimate-numpy-tutorial-for-data-sciencebeginners
2.	https://www.analyticsvidhya.com/blog/2021/07/data-science-with-pandas-2-minutes-guide-tokey- concepts
3.	https://www.analyticsvidhya.com/blog/2020/04/how-to-read-common-file-formats-python

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Highway Engineering
(Open Elective – III)

Course Category	Professional course	**Course Code**	20CE7T11
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	------	**Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
1	To introduce the students with the principles and practice of transportation engineering which focuses on Highway Engineering.
2	Ability to mathematically develop and interpret design standards for horizontal and vertical geometry and super elevation
3	To provide basic knowledge on materials used in pavement construction.
4	To enable the students to have a strong analytical and practical knowledge of Planning, Designing of Pavements.
5	To provide basic knowledge in traffic engineering, and transportation planning.

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Plan highway network for a given area.
CO2	Design the Highway geometrics based on highway alignment.
CO3	Characterize the pavement materials like aggregates, Bituminous materials &construction.
CO4	Judge suitability of pavement materials and design flexible and rigid pavements.
CO5	Design Intersections and prepare traffic management plans.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	1	3	2	1	-	-	-	-	-	-	-	-	1	-	-
CO3	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	1	2	2	1	-	-	-	-	-	-	-	-	1	2	-
CO5	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-

COURSE CONTENT	
UNIT I	**Highway Planning and Alignment:** Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

UNIT II	**Highway Geometric Design:** Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements-Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves-Design of Vertical alignment- Gradients- Vertical curves.
UNIT III	**Highway Materials:** Sub-grade soil: classification –Group Index – Subgrade soil strength –California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties -Tests on Bitumen.
UNIT IV	**Design of Pavements:** Types of pavements; Functions and requirements of different components of pavements; Design Factors **Flexible Pavements:** Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements. **Rigid Pavements:** Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.
UNIT V	**Traffic Engineering:** Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents- Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC method.

TEXT BOOKS	
1.	Highway Engineering' by Paul H. Wright and Karen K Dixon, Wiley Student Edition, Wiley India (P)Ltd., New Delhi.
2.	Highway Engineering' by Khanna S.K., Justo C.E.G and Veeraragavan A, Nem Chand Bros, Roorkee.
REFERENCE BOOKS	
1.	Transportation Engineering and Planning' by Papacostas C.S. and PD Prevedouros, Prentice Hall ofIndia Pvt. Ltd; New Delhi.
2.	'Highway Engineering' by Srinivasa Kumar R, Universities Press, Hyderabad
WEB RESOURCES	
1.	https://nptel.ac.in/downloads/105101087/

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Additive Manufacturing
(Open Elective – III)

Course Category	Open Elective	**Course Code**	20ME7T28
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment**	30
		Semester End Examination	70
		Total Marks	100

COURSE OBJECTIVES	
Students will learn	
1	Fundamentals of rapid prototyping and concepts of liquid-based rapid prototyping systems
2	Concepts of solid-based rapid prototyping systems
3	Concepts of powder-based rapid prototyping systems
4	Different rapid tooling processes
5	Rapid prototyping data formats and applications of additive manufacturing in various industries

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Explain the rapid prototyping fundamentals & choose different liquid based rapid prototyping processes for manufacturing	K2
CO2	Choose different solid based rapid prototyping processes for manufacturing	K2
CO3	Choose different powder based rapid prototyping processes for manufacturing	K2
CO4	Choose different rapid tooling processes for prototyping manufacturing	K2
CO5	Elaborate the uses of additive manufacturing processes in various industries.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO2	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO3	1	2	2	1	-	-	-	-	-	-	-	1	2	-
CO4	1	2	2	1	-	-	-	-	-	-	-	-	1	-
CO5	1	-	-	-	1	-	-	-	-	-	-	-	1	-

COURSE CONTENT

UNIT I

INTRODUCTION: Prototyping fundamentals, historical development, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process.

LIQUID-BASED RAPID PROTOTYPING SYSTEMS: Stereo lithography Apparatus (SLA): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Photopolymers, photo polymerization, layering technology, laser and laser scanning. Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT II

SOLID-BASED RAPID PROTOTYPING SYSTEMS: Laminated object manufacturing (LOM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Fused deposition modelling (FDM) - models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT III

POWDER BASED RAPID PROTOTYPING SYSTEMS: Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Three-dimensional printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages, case studies

UNIT IV

RAPID TOOLING: Introduction to rapid tooling (RT), conventional tooling Vs RT, Need for RT. rapid tooling classification: indirect rapid tooling methods: spray metal deposition, RTV epoxy tools, Ceramic tools, investment casting, spin casting, die casting, sand casting, 3D Keltool process. Direct rapid tooling: direct AIM, LOM Tools, DTM Rapid Tool Process, EOS Direct Tool Process and Direct Metal Tooling using 3DP.

UNIT V

ENHANCING ADDITIVE MANUFACTURING WITH REVERSE ENGINEERING: Reverse engineering, uses of reverse engineering, Steps for reverse engineering in additive manufacturing, 3D scanning techniques.

RP APPLICATIONS: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, GIS application, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis.

TEXT BOOKS

1. Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", Third Edition, World Scientific Publishers, 2010.
2. Gebhardt A., "Rapid prototyping", Hanser Gardener Publications, 2003

REFERENCE BOOKS

1. Liou L.W. and Liou F.W., "Rapid Prototyping and Engineering applications: A tool box for prototype development", CRC Press, 2007.
2. Kamrani A.K. and Nasr E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.
3. Hilton P.D. and Jacobs P.F., "Rapid Tooling: Technologies and Industrial Applications", CRC press, 2000.

WEB RESOURCES

1. nptel.ac.in/courses/112104204/47
2. nptel.ac.in/courses/112107078/37

3. https://www.youtube.com/watch?v=kNz-TM4zPkE&list=PLbTLRuAivTCR0YVCNxSTPI9lgccanmZLG
4. https://lecturenotes.in/m/46059-note-of-additive-manufacturing-by-madhura-diwakar?reading=true
5. https://www.slideshare.net/badebhau/additive-manufacturing-processes-pdf-by-badebhau4gmailcom

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Industrial Electronics
(Open Elective – III)

Course Category	Open Elective	**Course Code**	20EC7T40
Course Type	Theory	**L-T-P-C**	**3-0-0-3**
Prerequisites	Basic Electrical and Electronics Engineering	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
Student will learn	
1	The building block for differential amplifier and operational amplifier using DC amplifiers and applications of OP-AMP.
2	a Voltage Regulator ,Types of Voltage Regulators and their working and use of a different voltage regulators for real time applications
3	The characteristics and operation of SCR and Thyristor and techniques to turn Off a Thyristor
4	The operation and applications of important switching devices such as DIAC and TRIAC much used in power electronics
5	The different electronic devices such as Electronic timers and Electronic DC Motor and Control, Electric Welding methods, high frequency heating ,ultrasonic generation required for industrial applications

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Understand the concept of DC amplifiers.	K2
CO2	Analyze and design different voltage regulators for real time applications	K2
CO3	Describe the basis of SCR and Thyristor	K2
CO4	Determine the performance of DIAC and TRIAC	K2
CO5	Develop real time application using electronics	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2	2	**1**	-	-	-	-	-	-	-	1	-
CO2	2	2	2	-	-	-	-	-	-	-	1	1
CO3	2	2	2	-	-	-	-	-	-	-	1	1
CO4	2	2	2	-	-	-	-	-	-	-	1	1
CO5	2	2	2	-	-	-	-	-	-	-	1	1

COURSE CONTENT	
UNIT I	**DC Amplifiers:** Need for DC amplifiers, DC amplifiers - Drift, Causes, Darlington Emitter Follower, Cascode amplifier, Stabilization, Differential amplifiers - Chopper stabilization, Operational Amplifiers, Ideal specifications of Operational Amplifiers, Instrumentation Amplifiers.

UNIT II	**Regulated Power Supplies:** Block diagram, Principle of voltage regulation, Series and Shunttype Linear Voltage Regulators, Protection Techniques - Short Circuit, Over voltage and Thermal Protection. Switched Mode & IC Regulators: Switched Mode voltage regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators - Current boosting
UNIT III	**SCR and Thyristor:** Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors - Classes A, B, C, D, E and F, Ratings of SCR.
UNIT IV	**Applications of SCR in Power Control:** Static circuit breaker, Protection of SCR, Inverters - Classification, Single Phase inverters, Converters –single phase Half wave and Full wave. DIAC, TRIAC and Thyristor Applications: Chopper circuits – Principle, methods and Configurations, DIAC AND TRIAC, TRIACS – Triggering modes, Firing Circuits, Commutation
UNIT V	**Industrial Applications -I:** Industrial timers -Classification, types, Electronic Timers – Classification, RC and Digital Timers, Time base Generators. Electric Welding Classification, types and methods of Resistance and ARC wielding, Electronic DC Motor Control. **Industrial Applications –II**: High Frequency heating – principle, merits, applications, High frequency Source for Induction heating. Dielectric Heating – principle, material properties, Electrodes and their Coupling to RF generator, Thermal losses and Applications. Ultrasonics – Generation and Applications

TEXT BOOKS	
1.	Industrial and Power Electronics – G. K. Mithal and Maneesha Gupta, Khanna Publishers, 19th Ed., 2003.
2.	Integrated Electronics – J. Millman and C.C Halkias, McGraw Hill, 1972
REFERENCE BOOKS	
1.	Electronic Devices and circuits – Theodore. H. Bogart, Pearson Education, 6th Edition, 2003
2.	Thyristors and applications – M. Rammurthy, East-West Press, 1977.
WEB RESOURCES	
1.	https://nptel.ac.in/courses/108102145

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Big Data Analytics
(Open Elective – III)

Course Category	Professional Core	**Course Code**	**20DS6T02**
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Data Mining	**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSEOBJECTIVES	
1	To optimize business decisions and create competitive advantage with Big Data analytics
2	To learn to analyze the big data using intelligent techniques
3	To introduce programming tools PIG & HIVE in Hadoop echo system

COURSEOUTCOMES **Upon successful completion of the course, the student will be able to:**		**Cognitive level**
CO1	Illustrate big data challenges in different domains including social media, transportation, finance and medicine	K2
CO2	Enumerate and apply the features of Cassandra	K2
CO3	Design and develop Hadoop and Map Reduce programs	K3
CO4	Perform data analysis using Apache Spark	K2
CO5	Analyze the data analytics process with a case study	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1–Low,2-Medium,3– High)

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

COURSECONTENT	
UNIT I	**Types of Digital Data:** Classification of Digital Data. Introduction to Big Data: Characteristic of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, What is Big Data? **Big Data Analytics:** Where do we Begin?, What is Big Data Analytics?, What Big Data Analytics isn't?, Classification of Analytics, Terminologies Used in Big Data Environments. The Big Data Technology Landscape: NoSQL. **(Text Book 1)**
UNIT II	**Introduction to Cassandra:** Apache Cassandra – An Introduction, Features of Cassandra, CQL Data Types, CQLSH, Keyspaces, CRUD, Collections, Using a Counter, Time to Live, Alter Commands, Import and Export. **(Text Book 1)**

UNIT III	**Hadoop** : Hadoop Overview, HDFS (Hadoop Distributed File System),Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN (Yet another Resource Negotiator). **MAPREDUCE:** Introduction to MAPREDUCE Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression. **(Text Book 1)**
UNIT IV	**Introduction to Data Analysis with Spark**: What is Apache Spark, A unified Spark, Who uses Spark and for what?, A Brief History of Spark, Spark version and releases, Storage layers for Spark. **Programming with RDDs:** RDD Basics, Creating RDDs, RDD Operations, Passing functions to Spark, Common Transformations and Actions, Persistence. **(Text Book 2)**
UNIT V	**JasperReport using Jaspersoft:** Introduction to JasperReports, Connecting to MongoDB NoSQL Database, Connecting to Cassandra NoSQL Database. **Few Interesting Differences:** Difference between Data Warehouse and Data Lake, Difference between RDBMS and HDFS, Difference between HDFS and HBase, Difference between Hadoop MapReduce and Spark, Difference between Pig and Hive **(Text Book 1)**

TEXTBOOKS

1.	Big Data and Analytics by Seema Acharya, Subhashini Chellappan, Second Edition, Wiley India Pvt. Ltd., 2019
2.	Learning Spark: Lightning-Fast Big Data Analysis by Andy Konwinski, Holden Karau, Matei Zaharia, Patrick Wendell, First Edition, O'Reilly, 2015

REFERENCEBOOKS

1.	Big Data Analytics, by Radha Shankarmani, M Vijayalakshmi, Second Edition, Wiley India Pvt. Ltd., 2016
2.	Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley& sons, 2012.
3.	Hadoop: The Definitive Guide by Tom White, O'Reilly Media, Inc., 2009
4.	Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

WEBRESOURCES

1.	http://hadoop.apache.org/
2.	https://nptel.ac.in/courses/106104189/
3.	https://www.edx.org/course/big-data-fundamentals
4.	https://www.coursera.org/specializations/big-data
5.	https://www.wileyindia.com/big-data-and-analytics-2ed.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Organizational behavior
(Open Elective – III)

Course Category	Humanities including Management	**Course Code**	20HM7T09
Course Type	Theory	**Lecture-Tutorial-Practice**	3 -0 -0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	Understand the meaning and importance of Organizational Behaviour to start and survive in corporate environment.	Understanding
CO 2	Demonstrate how the perception can integrate in human behaviour , attitudes and values.	Understanding
CO 3	Understand the importance of Groups and Teams in organizations for better Decision making.	Understanding
CO 4	Understand the need for change and its importance in organizations.	Understanding
CO 5	Understand the culture of organizations and to apply techniques in dealing with stress in organizations.	Applying

Contribution of Course Outcomes towards achievement of Program

Outcomes: 1 – Low, 2 - Medium, 3 – High

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	0	0	0	0	0	1	0	2	2	2	0	2
CO2	0	0	0	0	0	1	0	3	2	3	0	2
CO3	0	0	0	0	0	1	0	2	3	3	0	2
CO4	0	0	0	0	0	1	0	3	3	2	0	2
CO5	0	0	0	0	0	3	0	1	2	2	0	2

Course Content :

Unit-I Introduction to Organizational Behaviour
Concept-Nature and scope-Importance of Organizational Behaviour-Key elements of Organizational Behaviour-Role of managers in Organizational Behaviour-Approaches to Organizational Behaviour-Perspectives of Human Behaviour-Challenges and Opportunities for Organizational Behaviour.

Unit-II Perceptual Management
Nature-Process of Perception- Organization and Interpretation-Influencing factors- Importance of Perception in OB - Perceptual Errors- Attitudes and Values –Changes and Behaviour Modification Techniques-Impression Management.

Unit-III Introduction to Groups and Teams
Meaning –Importance of Groups - Foundations of Group Behaviour –Reasons for Group formation-Group and Team-Types of Groups-Stages of Group development –Meaning and Importance of Teams- Factors affecting Group and Team performance-Types of teams-Creating an effective Team.

Unit-IV Organization Change and Development
Definition and Meaning - Need for change-Forces for changes in Organization-Types of change-Organizational Resistance-Strategies overcome Resistance-Process of change-Meaning and Definition of Organization Development-OD interventions.

Unit-V Organizational Culture and Organizational Stress
Organizational culture: Meaning and Nature of Organizational Culture-Functions-Types-Creating and maintain Organizational Culture-Managing Cultural Diversity. Organizational Stress: Definition and Meaning-Sources of stress-Impact of stress on organizations-Stress Management Techniques.

Text Books:

1. K.Aswathappa: “Organizational Behaviour-Text, Cases and Games”, Himalaya Publishing House, New Delhi, 2017,
2. Stephen P. Robbins, Timothy, A. Judge: “Essentials of Organizational Behaviour” Pearson,2017
3. Pareek Udai, Sushma Khanna: “Understanding Organizational Behaviour”, Oxford University Press, New Delhi, 2016.

References:

1. Luthans, Fred: Organizational Behaviour 10/e, McGraw-Hill, 2015
2. Steven L McShane, Mary Ann Von Glinow, Radha R Sharma: “Organizational Behavior”, Tata McGraw Hill Education, New Delhi, 2017.
3. Jerald Greenberg and Robert A Baron: “Behavior in Organizations”, PHI Learning Private Limited, New Delhi, 2013.
4. Jai B.P.Sinha: “Culture and Organizational Behavior”, Sage Publication India Private Limited, New Delhi, 2009.
5. New strom W. John& Davis Keith, Organisational Behaviour--Human Behaviour at Work, 12/e, TMH, New Delhi, 2009.

Web Resources
1.https://www.diversityresources.com/cultural-diversity-workplace/
2.https://www.chanty.com/blog/problem-solving-techniques/
3.https://www.simplypsychology.org/perspective.html#:~:text=The%20five%20major%20perspectives%20in,%2C%20behavioral%2C%20cognitive%20and%20humanistic
4.https://theintactone.com/2019/06/18/mpob-u3-topic-6-perception-process-and-errors

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Water resource engineering
(Open Elective – IV)

Course Category	Professional Core	**Course Code**	20CE7T18
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Hydraulics and Hydraulic Machinery	**Internal AssessmentSemester End Examination Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To introduce hydrologic cycle and its relevance to Civil engineering.
2	Make the students understand physical processes in hydrology and, components of the hydrologic cycle.
3	Appreciate concepts and theory of physical processes and interactions.
4	Learn measurement and estimation of the components hydrologic cycle.
5	Provide an overview and understanding of Unit Hydrograph theory and its analysis.
6	Understand flood frequency analysis, design flood, flood routing.
7	Appreciate the concepts of groundwater movement and well hydraulics
8	Learn overview of flood routing and its effects.
9	Has to be understood and identify the flood occurring areas nearby.

COURSE OUTCOMES	
Upon successful completion of the course, the student will be able to:	
CO1	Explain the theories and principles governing the hydrologic processes and list out the forms of precipitation in real conditions.
CO2	Apply key concepts to several practical areas of engineering hydrology and related design aspects.
CO3	Design major hydrologic components for a need-based structures.
CO4	Estimate flood magnitude and carry out flood routing.
CO5	Demonstrate the recuperation test process in open wells.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	3	2	2	2	2	2	--	--	--	--	1	--	1	--	2
CO2	3	2	2	2	2	2	--	--	--	--	1	--	1	--	2
CO3	3	2	2	2	2	2	--	--	--	--	1	--	1	--	2
CO4	3	2	2	2	2	2	--	--	--	--	1	--	1	--	2
CO5	3	2	2	2	1	2	--	--	--	--	1	--	1	--	2

COURSE CONTENT	
UNIT I	INTRODUCTION: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. Precipitation: Types and forms, measurement, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, Frequency of point rainfall, Rain fall data in India. Intensity-Duration-Frequency (IDF) curves, Depth-Area Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm, problems on average rainfall on towns
UNIT II	ABSTRACTIONS FROM PRECIPITATION: Introduction, Initial abstractions. EVAPORATION: Factors affecting, measurement, reduction, Analytical methods of Evaporation estimation. EVAPOTRANSPIRATION: Factors affecting, measurement, control, INFILTRATION: Factors affecting, Infiltration capacity curve, measurement, Infiltration Indices. Problems on ϕ-Index and W-Index.
UNIT III	RUNOFF: Catchment characteristics, Factors affecting runoff, components, computation- empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve. HYDROGRAPH ANALYSIS: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S- hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph. Problems on unit hydrograph.
UNIT IV	FLOODS: Causes and effects, frequency analysis - Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management, Design flood, Design storm. FLOOD ROUTING: Hydrologic storage routing, channel and reservoir routing-Muskingum and Puls methods of routing, flood control in India. ADVANCED TOPICS IN HYDROLOGY: Rainfall-Runoff Modelling, Instantaneous Unit Hydrograph (IUH) - Conceptual models - Clark and Nash models, general hydrological models- Chow - Kulandaiswamy model.
UNIT V	GROUNDWATER: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, specific capacity, permeability, transitivity and storage coefficient, types of wells, well loss, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test.

TEXT BOOKS	
1.	„Engineering Hydrology" by Subramanya, K, Tata McGraw-Hill Education Pvt. Ltd, (2013), NewDelhi.
2.	„Engineering Hydrology" by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi.
3.	"Irrigation and Water Power Engineering" by Punmia B C, P.B.B Lal, A.K. Jainand A.K. Jain

	(2009), Laxmi Publications Pvt. Ltd., New Delhi.
REFERENCE BOOKS	
1.	'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
2.	'Hydrology' by Raghunath. H.M., New Age International Publishers,(2010).
3.	'Engineering Hydrology –Principles and Practice' by Ponce V.M., Prentice International,(1994).
4.	'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications,(2011).
5.	'Applied hydrology' by Chow V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt.Ltd., Transportation Engineering-Id., (2011), NewDelhi.
6.	'Engineering Hydrology' by Ojha C.S.P, R. Berndtsson and P. Bhunya, Oxford University Press,(2010).
WEB REFERENCES	
1.	https://www.digimat.in/nptel/courses/video/105104103/L01.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Sustainable Energy Technologies
(Open Elective – IV)

Course Category	Open Elective	**Course Code**	20ME7T38
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	NIL	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES	
1	To demonstrate the importance and solar radiation, solar energy collection and storage
2	To understand the energy sources and potential from wind energy, bio-mass, geothermal energy and ocean energy
3	To interpret energy efficient electrical and mechanical systems
4	To develop energy efficient processes
5	To understand features and benefits of green buildings

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Illustrate the importance and solar radiation, solar energy collection and storage.	K2
CO2	Understand the energy sources and potential from wind energy, bio-mass, geothermal energy and ocean energy.	K2
CO3	Analyze energy efficient electrical and mechanical systems.	K2
CO4	Understand features and benefits of green buildings.	K2
CO5	Understand the different types of unconventional machining methods and principles of finishing processes.	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	2	2	-	3	-	-	-	3	-	3	-	-	2
CO2	3	2	2	-	3	-	-	-	3	-	3	-	-	2
CO3	3	2	2	-	3	-	-	-	3	-	3	-	-	2
CO4	3	2	3	-	3	-	-	-	3	-	3	-	-	2
CO5	3	2	3	-	3	-	-	-	3	-	3	-	-	2

COURSE CONTENT

UNIT I

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems. Photo voltaic energy conversion – types of PV cells.

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of

concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT II

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

GEOTHERMAL ENERGY: Resources, types of wells, methods of harnessing the energy.

OCEAN ENERGY: OTEC, Principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques.

UNIT III

ENERGY EFFICIENT SYSTEMS:

ELECTRICAL SYSTEMS: Energy efficient motors, energy efficient lighting and control, selection of luminaire, variable voltage variable frequency drives (adjustable speed drives), controls for HVAC (heating, ventilation and air conditioning), demand site management.

MECHANICAL SYSTEMS: Fuel cells- principle, thermodynamic aspects, selection of fuels & working of various types of fuel cells, environmentally friendly and Energy efficient compressors and pumps**.**

UNIT IV

ENERGY EFFICIENT PROCESSES: Environmental impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, design and implementation of efficient and sustainable green production systems with examples like environmentally friendly machining, vegetable based cutting fluids, alternate casting and joining techniques, zero waste manufacturing.

UNIT V

GREEN BUILDINGS: Definition, features and benefits. Sustainable site selection and planning of buildings for maximum comfort. Environmentally friendly building materials like bamboo, timber, rammed earth, hollow blocks, lime & lime pozzolana cement, agro materials and industrial waste, Ferro cement and Ferro-concrete, alternate roofing systems, paints to reduce heat gain of the buildings. Energy management.

TEXT BOOKS

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH
2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006
3. Green Manufacturing Processes and Systems - J. Paulo Davim/Springer 2013

REFERENCE BOOKS

1. Alternative Building Materials and Technologies - K.S Jagadeesh, B.V Venkata Rama Reddy and K.S Nanjunda Rao/New age international
2. Principles of Solar Engineering - D.YogiGoswami, Frank Krieth & John F Kreider/Taylor & Francis
3. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd
4. Renewable Energy Technologies -Ramesh & Kumar /Narosa
5. Non conventional Energy Source- G.D Roy/Standard Publishers
6. Renewable Energy Resources-2nd Edition/ J.Twidell and T. Weir/ BSP Books Pvt. Ltd

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Biomedical Instrumentation
(Open Elective – IV)

Course Category	OE	**Course Code**	20EC7T41
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites	Basics of Analog circuits	**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

COURSE OBJECTIVES: In this course the student will	
1	Study the physiological relation of human body – environment and Identify various errors that occur while measuring living system
2	Study various types of Electrodes and Transducers used in biomedical measurements
3	Learn Anatomy of Heart, Respiratory system and the measuring instruments.
4	Learn various fundamental blocks in patient care and monitoring
5	Study various diagnostic and therapeutic techniques

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Acquainted with the function of human body and measure active and resting potentials of cell bodies.	K2
CO2	Measure the Bioelectric potential using appropriate electrodes and Transducers.	K2
CO3	Know the mechanism and measurement of ECG for the Cardiac cycle and respiratory system	K2
CO4	Monitor the Patient care monitoring system and applications of therapeutic equipment	K2
CO5	Know the working principles of diagnostic equipment	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	1										1	
CO2	2	2	1										1	
CO3	1	1	2											1
CO4		1	2	2										1
CO5		1	1	1	2								1	

COURSE CONTENT	
UNIT I	**INTRODUCTION TO BIOMEDICAL INSTRUMENTATION:** Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Problems Encountered in Measuring a Living System, Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Bio amplifiers

UNIT II	**ELECTRODES AND TRANSDUCERS:** Introduction to Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer principles, Biochemical Transducers, The Transducer and Transduction principles, Active Transducers, Passive Transducers.
UNIT III	**CARDIOVASCULAR SYSTEM AND MEASUREMENTS:** The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart sound, Plethysmography, Angiogram and Angioplasty **RESPIRATORY SYSTEM AND MEASUREMENTS:** The Physiology of the Respiratory System, Tests and Instrumentation for the Mechanics of Breathing, Respiratory Therapy Equipment.
UNIT IV	**PATIENT CARE AND MONITORING:** Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring equipmentOther Instrumentation for Monitoring Patients, Pacemakers, Defibrillators, Ventilators, Radio Frequency applications of Therapeutic use, ECG & EEG Recorders.
UNIT V	**DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY:** Principles of Ultrasonic Measurement, Ultrasonic imaging, Ultrasonic Applications of Therapeutic uses, Ultrasonic diagnosis, X-Ray and Radio-Isotope instrumentations, CAT Scan, Emission Computerized Tomography, MRI, and Telemedicine Technology.

TEXT BOOKS	
1.	Fundamentals of biomedical instrumentation –Dr.O.N.Pandey, S.K.Kataria & sons,4 th edition,2012
2.	Bio-Medical Instrumentation – Leslie Cromwell, Fred J.Weibell, Erich A. Pfeiffer, 2nd edition, PHI, 2011.
REFERENCE BOOKS	
1.	Hand Book of Bio-Medical Instrumentation – R.S.Khandapur, McGrawHill, 2nd edition, 2003.
2.	Biomedical Instrumentation – Dr. M. Arumugam, Anuradha Publications, 2006
WEB RESOURCES	
1.	http://www.digimat.in/nptel/courses/video/108105101/L28.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Cryptography and network security
(Open Elective – IV)

Course Category	Professional Core	**Course Code**	20IT7T10
Course Type	Theory	**L-T-P-C**	3-0-0-3
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	**30** **70** **100**

COURSE OBJECTIVES

The objective of the course is to

1	The main objectives of this course are to explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms, design issues and working principles of various authentication protocols and various secure communication standards including Kerberos, IPsec, and SSL/TLS.

COURSE OUTCOMES **Upon successful completion of the course, the student will be able to:**		**Cognitive level**
CO1	Explain different security threats and countermeasures and foundation course of cryptography mathematics.	K1
CO2	Classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography	K2
CO3	Revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more	K2
CO4	Design applications of hash algorithms, digital signatures and key management techniques	K3
CO5	Determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL, TSL, and IPsec	K2

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Contribution of Course Outcomes towards achievement of Program Outcomes
(1 – Low, 2 - Medium, 3 – High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	1	2	-	-	-	-	-	-	-	-	2	2
CO2	3	2	3	1	2	-	-	-	-	-	-	-	2	2	2
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	2	2
CO4	3	2	3	3	3	-	-	-	-	-	-	-	1	1	2
CO5	3	2	3	3	3	-	-	-	-	-	-	-	1	1	2

COURSE CONTENT	
UNIT I	**Basic Principles:** Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.
UNIT II	**Symmetric Encryption:** Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption

	Standard.
UNIT III	**Asymmetric Encryption:** Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptography
UNIT IV	**Data Integrity, Digital Signature Schemes & Key Management:** Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management.
UNIT V	**Network Security - I:** Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, **Network Security - II :** Security at the Network Layer: IPSec, System Security

TEXT BOOKS	
1.	Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill, 2015
2.	Cryptography and Network Security, 4th Edition, William Stallings, (6e) Pearson,2006
3.	Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016
REFERENCE BOOKS	
1.	Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning, 2018.

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(Autonomous)
ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Marketing Management
(Open Elective – IV)

Course Category	Humanities including Management	**Course Code**	20HM7T04
Course Type	Theory	**Lecture-Tutorial-Practice**	3 -0 -0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	Understand the concepts of Marketing and Marketing Environment.	Understanding
CO 2	Analyze the consumer behavior and market segmentation in order to maintain better consumer relations and product positioning respectively.	Analyzing
CO 3	Make use of strategies and make decisions based on product life cycle and product mix concepts.	Application
CO 4	Understand the pricing effects and select a better distribution channel to reach the consumer.	Understanding
CO 5	Understand the promotional methods and importance.	Understanding

Contribution of Course Outcomes towards achievement of Program

Outcomes: 1 – Low, 2 - Medium, 3 – High

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	0	0	2	0	0	1	1	1	0	1	1	0
CO2	0	0	1	0	0	1	0	2	1	0	1	0
CO3	0	0	1	2	1	2	1	1	0	0	1	1
CO4	0	0	1	0	0	1	0	1	0	0	1	0
CO5	0	0	0	0	0	1	1	1	1	1	1	1

Course Content :

Unit -I

Introduction to Marketing: Market and Marketing, Functions, importance and problems of marketing – Marketing Environment, Approaches to the study of marketing – Institutional Approach, Commodity approach, Management approach, systems approach to marketing. Marketing Mix(7 p's of Marketing.)

Unit -II

Consumer Behavior and CRM

Meaning and features and Factors influencing Consumer Behavior – Theories of Buying Behavior

(Economic theories – Marshallion model, psychological theories, psycho-analytic theories, socio-cultural theories) – buying decision process - Customer Relationship Management.

Market Segmentation

Market Segmentation – Bases of Segmenting Consumer Market and Industrial Market – Target Marketing – Product differentiation – Product Positioning.

Unit -III

Product decision: New product development – Product mix – management of product life cycle – product strategies – product additions and deletions.

Branding, packaging and labeling – product differentiation – planned obsolescence.

Unit –IV Pricing and Channels of distribution:

Pricing: Pricing objectives – Pricing methods – Pricing strategies.

Channels of Distribution: Nature and types of marketing channels – wholesale distribution- retail distribution – direct marketing – selection of channels, Logistics, Third Party Service providers.

Unit –V Promotion : Nature and Importance of promotion – promotional methods of personal selling : objectives and function, Advertising objectives – Message content – media selection – Advertising agency – Advertising Budgets – Measuring Advertising effectiveness; Sales promotion Techniques – Social Media Promotion

Textbooks:

1. Phil T.Kotler – Marketing Management - Pearson Education limited – 2019
2. S.A.Sherlekar – Marketing Management - Himalaya Publishing House - 2019
3. Dr. K.Karunakaran – Marketing Management Himalaya Publishing House – 2010.

Reference Books :

1. Priyanka Goel - Marketing Management – Atlantic publications - 2019.
2. Philip Kotler and Lane Keller - Marketing Management – Pearson Educaion ltd - 2017
3. L.Natarajan – Marketing Management – Margham Publications - 2012

Web Resources:

1. https://www.tutorialspoint.com/marketing_management/marketing_management_functions
2. https://keydifferences.com/difference-between-branding-and-packaging.html
3. https://smallbusiness.chron.com/product-mix-639.html

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Universal Human Values-2: Understanding Harmony

CourseCategory	Humanities including Management	**Credits**	3
CourseType	Theory	**Lecture-Tutorial-Practice**	3 -0 -0
Prerequisites		**Internal Assessment** **Semester End Examination** **Total Marks**	30 70 100

Course Outcomes		**Blooms Taxonomy Level**
On successful completion of the course, the student will be able to		
CO 1	Understand the significance of value inputs in a classroom and start applying them in their life and profession	K2
CO 2	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual, etc.	K1
CO 3	Understand the role of a human being in ensuring harmony in society and nature.	K2
CO 4	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.	K1
CO 5	Understand the current scenario in Technology with respect to the Professional Ethics	K2

Contribution of Course Outcomes towards achievement of Program

Outcomes: 1 – Low, 2 - Medium, 3 – High

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	0	0	0	0	0	3	0	3	0	0	0	3
CO2	0	0	0	0	0	3	0	3	3	0	0	0
CO3	0	0	0	0	0	3	2	3	3	0	0	0
CO4	0	0	0	0	0	3	0	3	3	0	0	0
CO5	0	0	0	0	0	3	0	3	3	0	0	0

Course Content :

Unit – I

Introduction to Value Education:

Value Education, Definition, Concept and Need for Value Education, Content and Process of Value Education, Basic Guidelines for Value Education, Self exploration as a means of Value Education, Happiness and Prosperity as parts of Value Education.

Unit – II

Harmony in the Human Being:

Human Being is more than just the Body, Harmony of the Self ('I') with the Body, Understanding Myself as Co-existence of the Self and the Body, Understanding Needs of the Self and the needs of the Body, Understanding the activities in the Self and the activities in the Body.

Unit – III

Harmony in the Family and Society and Harmony in the Nature:

Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love. Comprehensive Human Goal: The Five Dimensions of Human Endeavour, Harmony in Nature: The Four Orders in Nature, The Holistic Perception of Harmony in Existence.

Unit – IV

Social Ethics:

The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct, Human Rights violation and Social Disparities.

Unit – V

Professional Ethics:

Value based Life and Profession, Professional Ethics and Right Understanding, Competence in Professional Ethics, Issues in Professional Ethics – The Current Scenario, Vision for Holistic Technologies, Production System and Management Models.

Textbooks:

1. A.N Tripathy, New Age International Publishers, 2003.
2.Bajpai. B. L , , New Royal Book Co, Lucknow, Reprinted, 2004
3.Bertrand Russell Human Society in Ethics & Politics

Reference Books :

1.Corliss Lamont, Philosophy of Humanism
2.Gaur. R.R. , Sangal. R, Bagaria. G.P, A Foundation Course in Value Education, Excel Books, 2009.
3.Gaur. R.R. , Sangal. R , Bagaria. G.P, Teachers Manual Excel Books, 2009.
4.I.C. Sharma . Ethical Philosophy of India Nagin & co Julundhar
5.Mortimer. J. Adler, – Whatman has made of man
6.William Lilly Introduction to Ethic Allied Publisher

Web Resources:

1. https://www.tandfonline.com/doi/abs/10.2753/RSP1061-1967330482?journalCode=mrsp20
2. https://www.thefbcg.com/resource/building-family-harmony-starts-with-living-our-values/#:~:text=What%20does%20family%20harmony%20mean,family%20as%20a%20larger%20unit

PRAGATI ENGINEERING COLLEGE: SURAMPALEM
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ELECTRICAL AND ELECTRONICS ENGINEERING

IV Year I semester

Machine Learning with Python-II
(Skill Oriented Course)

Course Category	SOC	**Course Code**	20AM7SO4
Course Type	Laboratory	**L-T-P-C**	1-0-2-2
Prerequisites	Python Programming	**Internal Assessment** **Semester End Examination** **Total Marks**	00 50 50

COURSE OBJECTIVES	
The student will:	
1	This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

COURSE OUTCOMES		
Upon successful completion of the course, the student will be able to:		**Cognitive Level**
CO1	Implement procedures for the machine learning algorithms.	K1
CO2	Design and Develop Python programs for various Learning algorithms	K2
CO3	Apply appropriate data sets to the Machine Learning algorithms	K3

K1: Remember, K2: Understand, K3: Apply, K4: Analyze, K5: Evaluate, K6: Create.

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

List of Experiments	
1	Build an Artificial Neural Network by implementing the Back propagation algorithm and test thesame using appropriate data sets.
2	Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print bothcorrect and wrong predictions.
3	Implement the non-parametric Locally Weighted Regression algorithm in order to fitdata points. Select appropriate data set for your experiment and draw graphs.
4	Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model toperform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.
5	Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
6	Exploratory Data Analysis for Classification using Pandas or Matplotlib.
7	Write a Python program to construct a Bayesian network considering medical data. Use this model todemonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
8	Write a program to Implement Support Vector Machines.
9	Write a program to Implement Principle Component Analysis
10	Write a program to Implement Principle Component Analysis.