SRINIVASA EDUCATIONAL SOCIETY'S

**PACE INSTITUTE OF TECHNOLOGY & SCIENCES**

**(AUTONOMOUS)**

Approved by AICTE, UGC, New Delhi & Govt. of Andhra Pradesh | Permanently Affiliated to JNTUK, Kakinada, A.P.

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An ISO 9001 : 2008 Certified Institution |'A' Grade Engineering College by Government of A.P.

NH-16, Near Valluramma Temple, ONGOLE - 523 272, A.P., Contact No.: 08592 278315, 9581456310 | www.pace.ac.in

DEPARTMENT OF

# ELECTRICAL & ELECTRONICS ENGINEERING

## ACADEMIC REGULATIONS
## AND
## COURSE STRUCTURE & SYLLABI

**(For the students admitted to**

B.Tech Regular Four Years Programme from the Academic Year 2018-19

and

B.Tech Lateral Entry Scheme from the Academic Year 2019-20)

# ACADEMIC REGULATIONS R-18 FOR B.Tech (REGULAR)

## (CHOICE BASED CREDIT SYSTEM)

Applicable for the students of B.Tech (Regular) from the Academic Year 2018-19
&
B.Tech Lateral Entry Scheme from the Academic Year 2019-20

### 1. ELIGIBILITY CRITERIA FOR ADMISSION

The eligibility criteria for admission into B.Tech programme shall be as per the guidelines issued by the Andhra Pradesh State Council of Higher Education (APSCHE) and/or by any other competent authority.

### 2. PROGRAMMES OFFERED (UNDER GRADUATE)

A student shall be offered admission into any one AICTE-approved programme as given below:

| S.No | PROGRAMME |
|---|---|
| 01 | Civil Engineering (CE) |
| 02 | Electrical and Electronics Engineering (EEE) |
| 03 | Mechanical Engineering (ME) |
| 04 | Electronics and Communication Engineering (ECE) |
| 05 | Computer Science and Engineering (CSE) |
| 06 | Information Technology (IT) |
| 07 | Automobile Engineering (AME) |

### 3. AWARD OF DEGREE

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

**i. 4 Year B.Tech Programme:**

- The Student shall study a course for not less than four academic years and not more than eight academic years.
- The student shall register for 160 credits and secure all the 160 credits.

- The students, who fail to fulfill all the academic requirements for the award of degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech Programme.

- Students shall secure a satisfactory grade (SA) in all Mandatory Courses (Non Credit Courses/Activities).
- No disciplinary action pending against the student by the time of the completion of his/her course. If any disciplinary action is pending against any student, he/she should not be awarded with the degree.

**ii. 3 Year B.Tech Programme under Lateral Entry Scheme (LES):**

- The Student shall study a course for not less than three academic years and not more than six academic years.
- The student shall register for 120 credits and secure all the 120 credits.
- The students, who fail to fulfill all the academic requirements for the award of degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.
- Students shall secure a satisfactory grade (SA) in all non-credit courses/ activities. (Non Credit Courses/Activities).
- No disciplinary action pending against the student by the time of the completion of his/her course. If any disciplinary action is pending against the student, he/she should not be awarded with the degree.

## 4. MEDIUM OF INSTRUCTION

The medium of instruction shall be English in all academic activities.

## 5. MINIMUM INSTRUCTION DAYS

The minimum instruction days for each Semester shall be 90.

## 6. CATEGORIZATION OF COURSES

### 6.1 Choice Based Credit System (CBCS)

The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses). The CBCS provides a 'cafeteria' type approach in which students can take courses of their choice, learn at their own pace and adopt an interdisciplinary approach to learning.

**6.2** The curriculum of each programme shall contain various courses indicated in the following categories to train the students for employment, higher learning & research and entrepreneurship.

i. **Humanities and Social Sciences (HS):** These courses include Technical English, Environmental Science and Engineering, Industrial Management, Managerial Economics & Financial Accountancy, Communication skills etc.

ii. **Basic Sciences (BS):** These courses include Mathematics, Physics, Chemistry, Biology etc.

iii. **Engineering Sciences (ES):** These courses include Workshop, Drawing, and Basic Electrical/Mechanical/Computer etc.

iv. **Professional Core (PC):** These courses are the core courses that provide the requisite foundation in the chosen Branch of Engineering.

v. **Professional Elective (PE):** These courses are the elective courses opted by the students relevant to the chosen branch of engineering that provides the requisite foundation in a specific area of specialization.

vi. **Open Elective (OE):** These courses are inter-disciplinary in nature offered by other departments and/or any emerging subjects.

The department offers an elective course (PE/OE), if the number of students registered in such a course is a minimum of 20.

vii. **Add-on Courses:** Add-on courses are Skill enhancement courses for the students in the respective branch of engineering.

viii. **MOOCS/Self Study Courses:** An opportunity is given to the students to choose one online course offered by SWAYAM-NPTEL / Foreign institutions/ reputed universities to enhance the learning skills or a self-study course under the guidance of the faculty advisor to enhance the self-learning capabilities which are having Global acceptance.

ix. **Personality Development (PD):** These courses include Integrated Learning Practices (ILPs), Mandatory Courses (MCs) & Extra-curricular/Co-curricular activities and help the students into a well-trained professionals and good human beings with a high employability potential, good communication skills, soft skills, good engineering practices, personality transformation, professional presentation skills and networking skills.

x. **Mandatory Courses (MC):** The Professional Ethics & Human Values, Employability Enhancement Skills. Environmental Sciences, Indian Constitution, Essence of Indian Traditional Knowledge, Problem-assisted learning and Problem-based learning are non-credit courses relevant to the value education and also for enhancing employability skills.

- In addition to the above courses to enhance the overall personality & character of students and make them aware of social needs, the extra-curricular/co-curricular activities are included, which do not carry any credits. These activities include National Service Scheme (NSS), National Cadet Corps (NCC), Yoga & Meditation, Sports & Games and Professional Club Activities.
- The Students shall undergo Industrial /In-house training to expose them to the practical environment.
- A faculty advisor or counselor shall be assigned to a group of 20 students, and he/she will advise the students about the under graduate programme, its course structure and curriculum, choice/option for course based on their competence, progress, pre-requisites and interest.

**xi.** **Mini-Project:** A student is required to undergo a mini project of his/her choice by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis.

**xii.** **Summer School Practices:**

**Industry Internship:** Internship must involve practical work related to systems engineering, industry practices etc. The internship can be carried out at premier institutions/ research laboratories/industries.

## 7. CREDIT ASSIGNMENT

Each course is assigned a certain number of credits based on the following criteria.

| Contact hours per week | | | Credits |
|---|---|---|---|
| **L** | **T** | **P** | |
| 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 1 |
| 0 | 0 | 2 | 1 |

## 8. REGISTRATION OF COURSES

The entire programme of study is for four academic years (three academic years in case of LES), all the years are on semester pattern. As per the curriculum the student shall register for 160 credits from all the courses as specified for the programme of study under regular four years. As per the curriculum the student shall register for

120 credits from all the courses as specified for the programme of study under regular four years.

## 9. ASSESSMENT AND EVALUATION

The performance of a student in each course shall be evaluated based on Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) or only Continuous Internal Evaluation.

| S.No | Category of Course | Marks | |
|---|---|---|---|
| | | CIE | SEE |
| 1 | Theory Courses | 40 | 60 |
| 2 | Laboratory Courses | 40 | 60 |
| 3 | Mandatory Courses | 100 | - |
| 4 | Mini Project | 100 | - |
| 5 | Seminar | 100 | - |
| 6 | Internship | 100 | - |
| 7 | Project Work | 80 | 120 |

### 9.1 THEORY COURSES

#### 9.1.1 Continuous Internal Evaluation (CIE):

The CIE of a theory course consists of four components as indicated in the following table.

| S.No | Component | Marks |
|---|---|---|
| 1 | Mid-Term- Descriptive Examinations | 20 |
| 2 | Online Quiz Examinations | 10 |
| 3 | Assignments with Viva Voce | 05 |
| 4 | Class Room Test | 05 |
| | **Total** | **40** |

**a) Mid Term Descriptive Examinations (20 Marks):**

There shall be two mid-term descriptive examinations of 120 minutes each. The mid-term examinations shall be conducted with syllabi from units I,II & first half of

III for the first mid and second half of III, IV & V units for the second mid. In each theory course, the question paper for the mid-term descriptive examination consists of four questions. A student is required to answer all four questions for maximum 20 marks.

**b) Online Quiz Examinations (10 marks):**

Two online quiz examinations of 20 minutes each shall be conducted with syllabi from units I,II & first half of III for the first mid and second half of III, IV & V units for the second mid. The online quiz examination shall have 20 multiple choice questions for maximum 10 marks.

**c) Assignments with Viva Voce (5 Marks):**

A Student shall submit five Assignments with Viva Voce to the concerned faculty from all five units. The Assignment shall be evaluated by the concerned faculty. The average of best four assignment marks shall be considered for awarding 05 marks.

**d) Class Room Test (5 Marks):**

There shall be conducted 5 Class Room Tests from 5 units. The tests shall be conducted and evaluated by the concerned faculty. The average of best four class room tests considered for awarding 05 marks.

Assignment with Viva Voce and Class Room Tests marks will be evaluated at the end of the Semester.

**CIE is Computed as following**: Finalized internal marks can be calculated with 80% weightage for the better of the two mid-term examinations and 20% for the other shall be considered for marks of 30 and is added to Assignment with Viva Voce 05 marks, Class Room Tests 05 marks for awarding total 40 marks.

There shall be no Assignment with Viva Voce and Class Room Tests for Applied/Engineering Physics Course. Finalized internal marks for Applied/Engineering Physics Course can be calculated with 80% weightage for the better of the two mid-term examinations and 20% for the other shall be considered for marks of 30 and is added to Virtual Lab-Assignments 10 marks for awarding total 40 marks.

For the courses like Engineering Graphics, Machine Drawing and Design courses the CIE shall be 40 marks (20 marks for day-to-day work, 20 marks for two mid-term examinations) and 60 marks for SEE. A student is required to answer all 4 questions for maximum 20 marks. The final assessment of mid-term examinations is based on 80% weightage for the better and 20% for the other.

### 9.1.2Semester End Examinations (SEE)

The semester end examinations for theory courses (including Engineering Graphics and Engineering Drawing) will be conducted covering all the units for 60 Marks. The question paper consists of two parts. In Part-A There shall be compulsory first question containing 5 two marks questions and these are to be set from the entire syllabus. In Part-B There shall be one question from each unit with internal choice. Each question carries 10 marks. Each theory course shall consist of five units of syllabus. Part-A and Part-B put together are given for 60 Marks.

Special Subjects: The SEE question paper for Design courses like Building Planning & Drawing, Design & Drawing of Steel Structures, and Design & Drawing of Steel Structures Reinforced Concrete Structures consists of two parts. In Part-A there shall be one question out of 2 questions is to be answered for 24 marks and in Part-B 3 Questions out of 5 Questions are to be answered of which each carries 12 Marks in 3 hours time. Part-A and Part-B put together are given for 60 Marks.

## 9.2 LABORATORY COURSES

### 9.2.1 Continuous Internal Evaluation (CIE)

The continuous internal evaluation for laboratory courses is based on the following parameters:

| Parameter | Marks |
|---|---|
| Day-to-day work | 20 |
| Internal test | 10 |
| Record | 05 |
| Viva voce | 05 |
| Total | 40 |

### 9.2.2 Semester End Examinations (SEE)

The performance of the student in laboratory courses shall be evaluated jointly by internal and external examiners for 3 hours duration as per the parameters indicated below:

| Parameter | Marks |
|---|---|
| Procedure/Algorithm | 10 |
| Experimentation/Program Execution | 15 |
| Observations/Calculations/Testing | 15 |
| Result/Inference | 10 |
| Viva Voce | 10 |
| **Total** | **60** |

### 9.3 MANDATORY COURSES (NON CREDIT COURSES)

Mandatory courses are evaluated by the mode of a Presentation/ Comprehensive-Viva Voce/ Evaluation of Assignments. A student shall secure a minimum 40% of marks to get a satisfactory grade (SA). Otherwise unsatisfactory grade (US) will be indicated. However, a student who secures "US" grade /abstains shall reappear in the subsequent semester(s).

### 9.4 MINI-PROJECT

A student is required to undergo a mini project of his/her choice by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis. The performance of a student in the mini project shall be evaluated by a three-member committee constituted by the HOD as per the following parameters:

| Parameter | Marks |
|---|---|
| Mini project Report | 30 |
| Innovation | 25 |
| Presentation | 25 |
| Viva Voce | 20 |
| **Total** | **100** |

The performance of a student in mini project shall be evaluated based on two reviews, each carries 100 marks. The average marks of these two reviews will be awarded. However, a student who fails to secure minimum 40% marks or

abstains will be permitted to reappear in the subsequent semester(s). There shall be no semester end examination.

**9.5 SEMINAR**

A student shall deliver a seminar on any emerging topic of his/her choice from the core technical domain. The student shall submit a duly-certified seminar report. A three-member committee constituted by the HOD will finalize the CIE marks based on the following parameters:

| Parameter | Marks |
|---|---|
| Seminar report | 30 |
| Innovation | 20 |
| Presentation | 30 |
| Viva Voce | 20 |
| **Total** | **100** |

A student who fails to secure minimum 40% marks or abstains will be permitted to reappear in the subsequent semester(s). There shall be no semester end examination.

**9.6 INTERNSHIP**

Internship must involve practical work related to industry practices. The students shall undergo internship for a period of minimum 4 weeks continuously at the end of VI semester and shall be evaluated in VII semester. The internship can be carried out at premier institutions/ research laboratories/industries.

A student shall submit a report on the training undergone, along with a certificate from the organization. A three-member committee constituted by the HoD shall finalize the CIE marks based on the following parameters:

| Parameter | Marks |
|---|---|
| Internship Report | 50 |
| Presentation | 30 |
| Viva Voce | 20 |
| **Total** | **100** |

The Internal guide shall monitor the work progress and regularity of the students in periodic intervals. No financial support shall be provided by the Institute for Internship.

A student, who fails to secure minimum 40% marks or abstains, will be permitted to reappear in the subsequent semester(s). There shall be no semester end examination.

**9.7 Project Work**

A student is required to undertake a project work by using the knowledge acquired by him/her during the course of study. The student is expected to design and build a complete system or subsystem on an area of interest. The project work consists of two parts namely, project literature review and project implementation. A project work shall be carried out by a batch minimum of 4 Student members under a faculty supervisor.

**i. Continuous Internal Evaluation:**

The CIE for project work shall be based on project survey and project implementation and is evaluated by a three-member committee consisting of two senior faculties and a project supervisor constituted by the HoD.

- **Project Literature Review:**

The performance of a student in project survey shall be evaluated based on the following parameters:

| Parameter | Marks |
|---|---|
| Literature Review | 15 |
| Presentation | 15 |
| Viva Voce | 10 |
| Total | 40 |

- **Project Implementation:**

The performance of a student in project implementation shall be evaluated based on two reviews, each carries 40 marks. The average marks of these two reviews will be considered. The evaluation criterion of each review is based on the following parameters:

| Parameter | Marks |
|---|---|
| Contribution | 10 |
| Innovation | 10 |
| Presentation | 10 |
| Viva Voce | 10 |
| **Total** | **40** |

The marks secured by a student in project literature review and project implementation shall be awarded cumulatively as CIE of the project work in VIII semester.

**ii. Semester End Examination:**

A batch of students shall submit a duly-certified project report to the department in a specified time. They shall make a presentation on the project work before a three-member committee consisting of external examiner, internal examiner (HOD) and a project supervisor. The performance of each student is evaluated as per the following parameters:

| Parameter | Marks |
|---|---|
| Project report | 40 |
| Innovation | 30 |
| Presentation | 20 |
| Viva Voce | 15 |
| Research Publication (Seminar/Conference/Symposium/Journal) | 10 |
| Scope of Implementation | 05 |
| **Total** | **120** |

A student who fails to secure minimum 40% marks or abstains is permitted to re-appear in the advanced supplementary examinations or when offered next.

### 9.8 OTHER COURSES

**a. Online (MOOCS) / Self Study Course:**

Institute encourages the students to register and satisfy for MOOCs Certificate. A student is awarded certificates for 4 weeks programme – 1 credit, 8 weeks programme – 2 credits and 12 weeks programme – 4 credits.

**b. Add-On Courses:**

ADD-ON Courses are provided by the Institution with Industry Interaction to enhance skills in the domain of the study.

**c. Extra-Curricular / Co-Curricular Activities:**

The participation of a student is compulsory in any one of the extra-Curricular /co-curricular activities (non-credit) such as NSS, NCC, Yoga & Meditation, Sports & Games, Professional club activities during the semesters I to VII for award a Satisfactory grade (SA). The performance of a student in the extra-curricular/co-curricular activities is evaluated during VII semester by a three member committee constituted by HOD.

For physically disabled students, the satisfactory grade (SA) will be awarded, if he/she obtains certificate in co-curricular activities such as essay writing, debate competitions, technical & general quizzes, symposium etc.

However, a student who secures unsatisfactory grade (US) shall re- appear in the subsequent semester(s).

## 10. ATTENDANCE REQUIREMENTS

a. A student is eligible to write the Semester End Examinations if he acquires a minimum of 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%) in two times up to III Year II Semester and once in IV Year may be granted by the College Academic Committee on medical grounds.

c. A stipulated fee shall be payable towards condonation of shortage of attendance.

d. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

e. Shortage of Attendance below 65% in aggregate shall not be condoned.

f. A student who is shortage of attendance in semester may seek re-admission into that semester when offered within one week from the date of the commencement of class work.

g. Students whose shortage of attendance is not condoned in any semester are not eligible to write their Semester End Examination of that class.

## 11. MINIMUM ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.10.

a. A student shall be deemed to have satisfied the minimum academic requirements, if he/she gains the credits allotted to each course and secures not less than a minimum 35% of marks exclusively at the Semester End Examination. However, the student should secure minimum 40% of marks in both CIE and SEE put together to be eligible for passing the course.

b. A student shall be promoted from II Semester to III Semester if he/she fulfills the minimum attendance requirement.

c. A student will be promoted from IV Semester to V Semester if he/she fulfills the academic requirement of 50% of the credits up to either III Semester or IV Semester from all the examinations, whether the candidate appears or not for the examinations and secures prescribed minimum attendance in IV Semester.

The students admitted under Lateral Entry Scheme shall be promoted to the V semester, if he/she fulfills the minimum attendance requirement in IV Semester.

d. A student will be promoted from VI Semester to VII Semester if he/she fulfills the academic requirement of 50% of the credits up to either V Semester or VI Semester from all the examinations, whether the candidate appears or not for the examinations and secures prescribed minimum attendance in VI Semester.

The students admitted under Lateral Entry Scheme shall be promoted to the VII semester, if he/she fulfills the academic requirement of 50% of the credits up to either V Semester or VI Semester from all the examinations, whether the candidate appears or not for the examinations and secures prescribed minimum attendance in VI Semester.

e. The Students who fail to earn 160 credits as indicated in the course structure within 8 academic years from the year of admission shall forfeit their seat in B.Tech programme and admission stands cancelled.

f. The students admitted under Lateral Entry Scheme, who fail to earn 120 credits as indicated in the course structure within 6 academic years from the year of admission, shall forfeit their seat in B.Tech programme and admission stands cancelled.

## 12. PROCEDURES FOR SEMESTER END EXAMINATIONS

i. **Supplementary examinations:** There shall be supplementary examinations along with regular semester end examinations for a student to reappear in the course(s) he/she failed or not attempted.

ii. **Advanced supplementary examinations:** Students who fail in the courses in VIII semester (theory/project work) can reappear for advanced supplementary examinations within one month after the declaration of the revaluation results. However, the students who fail in advanced supplementary examinations shall reappear when offered next along with regular students.

iii. **Recounting:** A student, who wishes to verify the total marks obtained by him/her in any theory course in SEE can apply for recounting in response to the notification along with the prescribed fee. The outcome of the recounting gets reflected in the results sheet and grade card.

**iv.** **Revaluation:** A student who wishes to apply for revaluation of a theory course in SEE can submit an application along with the prescribed fee as per the notification issued.

a. If the variation in marks of the first valuation and revaluation is $\leq 15\%$ of the total marks, then the better of the two evaluations shall be considered as final marks.

b. If the variation of marks between the first valuation and revaluation is >15% of the total marks, there shall be a third evaluation by another examiner. The average marks of two nearer evaluations shall be taken into consideration. In case of any fractional value of marks, it can be rounded off to the next integer value.

c. If a student secures a higher grade in the revaluation, that grade will be declared as the final grade. Otherwise, the original grade will remain valid.

## 13. AWARD OF LETTER GRADES

A letter grade and grade points shall be awarded to a student in each course based on his/her performance as per the 10-point grading system given below.

| Marks (Max:100) | Letter Grade | Grade Point | Level |
|---|---|---|---|
| ≥ 90 | O | 10 | Outstanding |
| 80 to <90 | S | 9 | Excellent |
| 70 to <80 | A | 8 | Very Good |
| 60 to <70 | B | 7 | Good |
| 50 to <60 | C | 6 | Fair |
| 40 to <50 | P | 5 | Pass |
| <40 | F | 0 | Fail |
| -- | Ab | 0 | Absent |

| Marks (Max:100) | Letter Grade | Grade Point | Level |
|---|---|---|---|
| ≥ 40 | SA | - | Satisfactory |
| < 40 | US | - | Unsatisfactory |
| -- | Ab | - | Absent |

a. A student who secures from 'O' to 'D' grades in a course is declared to have successfully completed the course, and is deemed to have secured the credits assigned to that course.

**b.** A student who secures "F" grade in any course shall be considered "Failed" and is required to reappear as "Supplementary student" in SEE, as and when offered. In such cases, his/her CIE marks in those courses will remain same as obtained earlier.

c. A student, who is absent from any examination shall be treated as "Failed".

d. In general, a student shall not be permitted to repeat any course (s) for the sake of "Grade improvement" or "SGPA/CGPA improvement".

e. As per AICTE guide lines, If a student acquires additional 20 credits through online Certification (approved MOOCs), he/she will be awarded Graduate degree with Honours with subjected to JNTUK instructions.

If a Student from CE,EEE,ME,ECE & AME secures 20 credits from MOOCs courses (apart from Courses mentioned in Course Structure) in Computer Science & Engineering related courses is he/she will be awarded with additional Minor Engineering with Computer Science & Engineering with subjected to JNTUK instructions.

## 14. COMPUTATION OF SGPA & CGPA

### a. Semester Grade Point Average (SGPA)

The performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is the ratio of sum of the product of the number of credits and the grade points scored by a student in all the courses to the sum of the number of credits of all the courses.

**$SGPA\ (S_i) = \Sigma\ (C_i \times G_i) / \Sigma C_i$**

Where $C_i$ is the number of credits of the $i^{th}$ course and $G_i$ is the grade point scored by the student in the $i^{th}$ course.

### b. Cumulative Grade Point Average (CGPA)

The CGPA is a measure of the overall cumulative performance of a student. The CGPA is calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme.

**$CGPA = \Sigma\ (C_i \times S_i) / \Sigma C_i$**

Where $S_i$ is the SGPA of the $i^{th}$ semester and $C_i$ is the total number of credits in that semester.

c. The SGPA and CGPA are rounded off to 2 decimal points and reported in grade cards.

## 15. AWARD OF CLASS

A student, who satisfies the minimum requirements prescribed for the completion of a programme, is eligible for the award of B.Tech degree and he/she shall be placed in one of the following four classes on a 10 point scale.

| **Class Awarded** | **CGPA to be secured** | From the |
|---|---|---|
| First Class with Distinction | ≥ 7.75 with no subject failures | CGPA secured |
| First Class | ≥ 6.75 with subject failures | from 160 |
| Second Class | ≥ 5.75 to < 6.75 | Credits |
| Pass Class | ≥ 4.75 to < 5.75 | |

Equivalent percentage = (CGPA – 0.75) x 10

## 16. GAP YEAR

a. A student is permitted to make use of the gap year facility at the beginning of V / VII semester of the programme and undergo training programs at premier institutions / research laboratories/ industries for a maximum period of one year (two consecutive semesters of academic year), if he/she secures a CGPA of 7.75 and above with no backlog of courses.

b. A student is permitted to avail the gap year facility only once during the entire course of study.

**c.** The students are permitted to re-join the programme after availing gap year facility. However, their re-joining is subject to the regulations prevailing at that time.

d. The total period for completion of the programme reckoned from, the commencement of the first semester to which the student is admitted shall not exceed the maximum period in order that the student is eligible for the award of the degree.

e. If a student fails to report to the department after the expiry of 2 semesters, his/her readmission will be subject to the decision of competent authority.

f. A student seeking a gap year needs to apply in the prescribed format before the last working day of the running semester. The application submitted by the

student shall be evaluated by Department Academic Committee and forwarded to the head of the institution for approval.

g. The duration of the gap year shall be reflected in the consolidated grade card.

**17. DISCIPLINE**

a. A student is required to observe discipline and decorum both inside and outside the college and not to indulge in any activity that may tarnish the prestige of the college. The head of the institution shall constitute a disciplinary committee to enquire into acts of indiscipline and notify the college about the disciplinary action taken. In case of any serious disciplinary action, which leads to suspension or dismissal, a committee shall be constituted by head of the institution for taking final decision.

b. Those students who indulge in examination related malpractices shall be punished as per the scale of punishment notified in Annexure-I.

c. Those students involved in the illegal acts of ragging shall be punished as per the provisions of Act 26, 1997 of Govt. of Andhra Pradesh (Annexure-II).

**18. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI**

The college may revise, amend or change the regulations, curriculum, syllabus and scheme of examinations from time to time subject to decisions/recommendations of Board of Studies and the College Academic Council.

**19. WITHHOLDING OF RESULTS**

If a student fails to clear dues, if any, payable to the institution or any case of indiscipline is pending against him, the result of the student will be withheld, and also the award of his/her degree shall be withheld in such cases.

**20.TRANSITORY REGULATIONS**

a. A student, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those students who have already passed the courses in the earlier semester(s) he/she is originally admitted into and substitute courses/additional courses are offered in place of them as approved by the Board of Studies.

b. In general, after transition, there will be a fitment formula approved by the competent authority in order to balance course composition and the number of credits.

c. Students admitted by transfer from other institutions shall follow transitory regulations with suitable fitment formulae approved by the competent authority.

d. A student who is seeking readmission shall apply in the prescribed format within one week after the commencement of the class work. However, the readmission of a student shall be approved by the competent authority.

## 21.COURSE CODE

The Course Codes will be given by the departments concerned to the course. Each course code contains 8 characters. The 8 characters for each subject will be filled as per the following description.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| | | | | | | | |

1 Character: Institute Name as '**P**'

2, 3 Characters: Year of Commencement of Regulations as '**18**'

4, 5 Characters: Subject/Branch Category such as

**HS** for Humanities and Social Science Courses

**BS** for Basic Science Courses

**ES** for Engineering Science Courses

**CE** for Civil Engineering Courses

**EE** for Electrical & Electronics Engineering Courses

**ME** for Mechanical Engineering Courses

**EC** for Electronics & Communication Engineering Courses

**CS** for Computer Science & Engineering Courses

**IT** for Information Technology Courses

**AE** for Automobile Engineering Courses

**MC** for Mandatory Courses

**PD** for Personality Development

6 Characters: Mode of Subject Learning and Evaluation such as

**T** for Theory Courses

**L** for Laboratory Courses

**S** for Seminar

**P** for Project

**M** for Mini Project

**V** for Viva Voce

**E** for Professional Elective Courses

**O** for Open Elective Courses

**I** for Internship

7,8 Characters: Serial number of the course taught by the department in that Semester such 01, 02, 03,..... etc

## 22. GENERAL

- Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
- The academic regulations should be read as a whole for the purpose of any interpretation.
- In case of any doubt or ambiguity in the interpretation of the above rules, decision of the competent authority is final and binding.
- The college may change or amend academic regulations or syllabi at any time subject to approval of the competent authority and the changes or may be apply the amendments made to all students with effect from the dates notified.

## 23. STATUTORY DECLARATION

In case the regulations do not specify application of an appropriate rule in a unique case, the decision of the competent authority of the college shall be final.

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# ANNEXURE-I

# MALPRACTICE RULES

## DISCIPLINARY ACTION FOR MALPRACTICE/IMPROPER CONDUCT IN EXAMINATIONS

| S.No | Nature of Malpractices/Improper Conduct | Punishment |
|---|---|---|
| 1 (a) | If a student possesses or tries to access 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) | If a student 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. | If a student is found to have 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. The Hall Ticket of the candidate is to be cancelled. |
| 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 practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester End 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 to be registered against him. |
| 4. | If a student smuggles inside the exam hall an Answer book or additional sheet or takes out or Arranges to send out the question paper 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. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. |
| 5. | If a student 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 the subject. |
| 6. | If a student refuses to obey the orders of the Chief Superintendent/Controller of Examinations / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination. | Such a student(s) 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. The candidates also are to be debarred and forfeited their seats. In case of outsiders, they will be handed over to the police and a police case is to be registered against them. |

| | | |
|---|---|---|
| 7. | If a student 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. The candidate is also debarred for two consecutive semesters from class work and Semester End Examinations. The continuation of the course by the candidate is subjected to the academic regulations in connection with forfeiture of the seat . |
| 8. | If a student possesses 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. The candidate is also to be debarred and forfeited the seat. |
| 9. | If a 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 shall be expelled 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. The candidate is also to be debarred and forfeited the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them. |
| 10. | If a student 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. |
| 11. | If 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 examinations. |

**Malpractices identified by squad or special invigilators**

- Punishments to the candidates are as per the above guidelines.
- Punishment to institutions : (if the squad reports that the college is also involved in encouraging malpractices)
    i. A show cause 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.

# ANNEXURE-II


## Prohibition of ragging in educational institutions Act 26 of 1997

**Salient Features**

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

| | Imprisonment upto | | Fine Upto |
|---|---|---|---|
| Teasing, Embarrassing and Humiliation | 6 Months | + | Rs. 1,000/- |
| Assaulting or Using Criminal force or Criminal intimidation | 1 Year | + | Rs. 2,000/- |
| Wrongfully restraining or confining or causing hurt | 2 Years | + | Rs. 5,000/- |
| Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence | 5 Years | + | Rs. 10,000/- |
| Causing death or abetting suicide | 10 Years | + | Rs. 50,000/- |

**In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288**

## ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

# B.TECH COURSE STRUCTURE

# R-18 REGULATIONS

| I Year - I Semester | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Course Code | Course | L | T | P | Credits | Internal | External |
| 1 | P18MCT01 | Induction Program | 3 Weeks | | | - | - | - |
| 2 | P18HST01 | English-I | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | P18BST01 | Mathematics-I | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18BST05 | Applied Chemistry | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | P18EST03 | C - Programming for Problem Solving | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | P18EST02 | Engineering Graphics | 1 | 0 | 3 | 2.5 | 40 | 60 |
| 7 | P18HSL01 | English Language Communication Skills Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | P18BSL03 | Applied Chemistry Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | P18ESL02 | Engineering Workshop | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 10 | P18ESL03 | C - Programming For Problem Solving Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| Total | | | 13 | 0 | 15 | 20.5 | 360 | 540 |

| I Year - II Semester | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Course Code | Course | L | T | P | Credits | Internal | External |
| 1 | P18HST02 | English-II | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | P18BST02 | Mathematics-II | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | P18BST03 | Applied Physics | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18EST05 | Python Programming | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | P18EST01 | Basic Electrical and Electronics Engineering | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | P18MCT02 | Environmental Science | 2 | 0 | 0 | SA | - | - |
| 7 | P18ESL01 | Basic Electrical and Electronics Engineering Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | P18BSL01 | Applied Physics Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | P18ESL04 | Python Programming Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| Total | | | 17 | 0 | 9 | 19.5 | 320 | 480 |

| II Year - I Semester | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Course Code | Course | L | T | P | Credits | Internal | External |
| 1 | P18EET01 | Electrical Circuit Analysis | 3 | 1 | 0 | 4 | 40 | 60 |
| 2 | P18EET02 | Electromagnetic Fields | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | P18EET03 | Electrical Machines - I | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18ECT01 | Semiconductor Devices and Circuits | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | P18BST07 | Mathematics-III | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | P18MET09 | Thermal and Hydraulic Prime Movers | 3 | 0 | 0 | 3 | 40 | 60 |
| 7 | P18EEL01 | Electrical Circuits Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | P18EEL02 | Electrical Machines – I Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| Total | | | 18 | 1 | 6 | 22 | 320 | 480 |

| II Year - II Semester | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Course Code | Course | L | T | P | Credits | Internal | External |
| 1 | P18EET04 | Electrical Machines - II | 3 | 1 | 0 | 4 | 40 | 60 |
| 2 | P18EET05 | Control Systems | 3 | 1 | 0 | 4 | 40 | 60 |
| 3 | P18EET06 | Power Systems -I | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18CST02 | Data Structures | 3 | 1 | 0 | 4 | 40 | 60 |
| 5 | P18ECT03 | Switching Theory and Logic Design | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | P18BST08 | Mathematics - IV | 3 | 0 | 0 | 3 | 40 | 60 |
| 7 | P18ECL01 | Semi Conductor Devices and Circuits Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | P18EEL03 | Electrical Machines – II Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | P18CSL02 | Data Structures Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| Total | | | 18 | 3 | 9 | 25.5 | 360 | 540 |

| III Year - I Semester | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Course Code | Course | L | T | P | Credits | Internal | External |
| 1 | P18EET07 | Electrical Measurements & Instrumentation | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | P18EET08 | Power Systems –II | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | P18EET09 | Power Electronics | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18ECT07 | Pulse and Digital Circuits | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | | **Open Elective-I** | 2 | 0 | 0 | 2 | 40 | 60 |
| 6 | | **Professional Elective – I** | 3 | 0 | 0 | 3 | 40 | 60 |
| 7 | P18MCT08 | Design Thinking for Innovation | 2 | 0 | 0 | 2 | 100 | -- |
| 8 | P18EEL04 | Power Electronics Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | P18EEL05 | Control Systems Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 10 | P18EEI01 | Internship | 0 | 0 | | 2 | 100 | -- |
| Total | | | 19 | 0 | 6 | 24 | 520 | 480 |

| Professional Elective – I | | |
|---|---|---|
| S.No | Course Code | Course |
| 1 | P18EEE01 | Renewable Energy Sources |
| 2 | P18EEE02 | Electrical Machine Design |
| 3 | P18EEE03 | Digital Control Systems |
| 4 | P18EEE04 | Advanced Control Systems |

| III Year - II Semester | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Course Code | Course | L | T | P | Credits | Internal | External |
| 1 | P18EET10 | Power System Analysis | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | P18EET11 | Power Semiconductor Drives | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | P18ECT18 | Micro Processors & Micro Controllers | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | P18ECT09 | Linear and Digital IC Applications | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | | **Open Elective-II** | 2 | 0 | 0 | 2 | 40 | 60 |
| 6 | P18MCT09 | Biology | 2 | 0 | 0 | SA | - | - |
| 7 | P18EEL06 | Electrical Measurements & Instrumentation Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | P18ECL07 | Micro Processors & Micro Controllers Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | P18EEM01 | Mini Project | 0 | 0 | 4 | 2 | 100 | 0 |
| Total | | | 16 | 0 | 10 | 19 | 380 | 420 |

| IV Year - I Semester | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Course Code | Course | L | T | P | Credits | Internal | External |
| 1 | P18EET12 | Power System Operation and Control | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | P18EET13 | Utilization of Electrical Energy | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | P18HST03 | Management Science | 2 | 0 | 0 | 2 | 40 | 60 |
| 4 | P18EET14 | Switch Gear and Protection | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | | **Open Elective-III** | 2 | 0 | 0 | 2 | 40 | 60 |
| 6 | | **Professional Elective-II** | 2 | 0 | 0 | 2 | 40 | 60 |
| 7 | P18MCT10 | Employability Skills | 2 | 0 | 0 | 0 | - | - |
| 8 | P18EEL07 | Electrical Simulation Lab | 0 | 0 | 4 | 2 | 40 | 60 |
| 9 | P18EEL08 | Power Systems Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| Total | | | 17 | 0 | 6 | 18.5 | 320 | 480 |

| | | **Professional Elective-II** |
|---|---|---|
| S.No | Course Code | Course |
| 1 | P18EEE05 | High Voltage Engineering |
| 2 | P18EEE06 | Electrical Distribution Systems |
| 3 | P18EEE07 | Energy Audit, Conservation & Management |
| 4 | P18EEE08 | Special Electrical Machines |

| IV Year - II Semester | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| S.No | Course Code | Course | L | T | P | Credits | Internal | External |
| 1 | P18EET15 | HVDC Transmission | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | | **Professional Elective-III** | 2 | 0 | 0 | 2 | 40 | 60 |
| 3 | P18EEP01 | Project | 0 | 0 | 12 | 6 | 80 | 120 |
| Total | | | 5 | 0 | 12 | 11 | 160 | 240 |

| **Professional Elective – III** | | |
|---|---|---|
| S.No | Course Code | Course |
| 1 | P18EEE09 | Flexible AC Transmission Systems |
| 2 | P18EEE10 | Smart Grid Technologies |
| 3 | P18EEE11 | Power Quality |
| 4 | P18EEE12 | Electric and Hybrid Vehicles |

**B.Tech. I Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# English-I

**(**Common to all Branches)

**Internal Marks: 40**

**Course Code: P18HST01** **External Marks: 60**

**Course Prerequisite:** The students should have basic knowledge of English grammar and LSRW skills.

**Course Objectives:**

1. To enable the engineering students to develop their basic communication skills in English for academic and social purposes.
2. To equip the students with appropriate oral and written communication skills.
3. To inculcate the skills of listening, reading and critical thinking.
4. To integrate English Language learning with employability skills and training.
5. To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course.

**Course Outcomes:**

On completion of this course, the student is able to:

1. Use English Language effectively in spoken and written forms
2. Interpret the contextual meaning of words
3. Comprehend the given texts and respond appropriately
4. Recall and reproduce the theme in a given context
5. Communicate confidently in formal and informal contexts

**UNIT-I:** (9 Lectures)

The Happy Prince – Oscar Wilde

a. Vocabulary: Synonyms and Antonyms
(http://www.magickeys.com/books/riddles/words.html)

b. Grammar: Prepositions, Sentence structure & Types of sentences

c. Writing: Note Making and Note Taking

**UNIT-II:** (8 Lectures)

Technology with a Human Face – E.F. Schumacher

a. Vocabulary: One word substitutes & Idioms

b. Grammar: Subject–verb Agreement (Concord), Question tags and Modal Auxiliaries

c. Writing: Information Transfer

**UNIT-III:** (9 Lectures)

Presidential Address – APJ Abdul Kalam

a. Vocabulary: Word formation, Root Words

(www.englishhints.com,www.enchantedlearning.com,
www.learnenglish.de/grammar/prefixtext.html)
b. Grammar: Parts of Speech, Punctuation
c. Writing: Paragraph Writing

**UNIT- IV** (9 Lectures)

The Road Not Taken – Robert Frost
a. Vocabulary: Prefixes, Suffixes and Affixes
(http://www.magickeys.com/books/riddles/words.html)
b. Grammar: Articles
c. Writing: Letter Writing

**UNIT – V** (10 Lectures)

Good Manners – J.C Hill
a. Vocabulary: Homonyms, Homophones and Homographs
(http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)
b. Grammar: Tenses
c. Writing: E- mail Writing

**Text books:**

1. New Horizons – Pearson Publishers
2. Fluency in English", A Course Book for Engg. Students, Published by Orient Black Swan, Hyderabad, 2016 print.
3. "Technical Communication- Principles and Practice", Third Edition. New Delhi: Oxford University press.

**Reference Books:**


1. Meenakshi raman, Sangeetha, Sharma Fundamentals of technical communication, Pg: 119-153 Oxford University press, 2015
2. Rutherford, Andhrea. J, Communication skills for technology. Pearson, New Delhi.2001
3. Raymond Murphy, Murphy's English Grammar, Cambridge University Press 2004
4. Meenakshi raman, Sangeetha, Sharma,Technical communication: English Skills for Engineers, Oxford University press, 2009
5. Michael Swan, Practical English Usage, Oxford University press, 1996


**Web References:**

1. www.englishhints.com
2. www.enchantedlearning.com
3. www.learnenglish.de/grammar/prefixtext.html
4. http://www.magickeys.com/books/riddles/words.html
5. http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf
6. http://www.yourdictionary.com
7. http://www.learnenglish.com

8. http://www.cambridge.org
9. http://www.eslcafe.com
10. http://www.eslgames.com
11. http://www.penguin.co.uk
12. http://www.edufind.com/english/practice

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**B. Tech- I Year I Semester** **Course structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# MATHEMATICS-I
## (Differential equations and Laplace Transforms)

(Common to All Branches)

**Internal Marks: 40**

**Course code: P18BST01** **External marks: 60**

**Course Prerequisite:** The basic knowledge of Matrices, Trigonometry, Differentiation and Integration.

**Course Objectives:**

1. To learn the solving methods of the differential equations of first order with their applications.
2. To learn the solving methods of differential equations of second and higher order with their applications.
3. To learn to find the Laplace transform of different functions and obtained the solution of Design.
4. To understand the concepts Partial Differential.

**Course Outcomes:**

After learning the contents of this paper the student must be able to

1. Solve first order differential equations and their applications.
2. Usage of higher order differential equations that are applied to real world problems.
3. Find the Laplace transform of derivatives, integrals and periodic functions.
4. Use the method of Laplace transforms to solve systems of linear first-order differential equations.
5. Calculate total derivative, Jacobian, Maxima and minima of functions of two variables.

**UNIT-I:** (11 Lectures)

**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:** (9 Lectures)

**Linear differential equations of higher order:**

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type $e^{ax}$,sin ax, cos ax, polynomials in x, $e^{ax}$V(x), xV(x)- Method of Variation of parameters.

Applications: LCR circuit.

**UNIT-III:** (10 Lectures)

**Laplace Transforms:**

Laplace transforms of standard functions– First shifting Theorem, Change of scale property, Multiplication by $t^n$, division by t, Transforms of derivatives and integrals – Second shifting theorem– Laplace transform of Periodic functions.

**UNIT- IV:** (8 Lectures)

**Inverse Laplace Transforms:**

Inverse Laplace transforms – Convolution theorem.

Application of Laplace transforms to ordinary differential equations of first and second order.

**UNIT -V:** (10 Lectures)

**Partial Differentiation:**

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

**Text Books:**

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

**Reference Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearsonedn
3. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
4. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
5. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
6. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

**Web References:**

1. http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
2. http://mathworld.wolfram.com/topics
3. http://www.nptel.ac.in/course.php

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**B.Tech I Year - I Semester**

**Course structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# C - Programming for Problem Solving

(Common to all Branches)

**Course Code: P18EST03**

**Internal Marks: 40**

**External Marks: 60**

**Course Prerequisite:** NIL

**Course Objectives:**

1. Toimpartadequateknowledgeontheneedofprogramminglanguagesandproblem solving techniques.
2. To impart problem solving skills.
3. To enable student to write programs in C and to solve the problems.

**Course Outcomes:**

At the end of this course the student will be able to

1. Design algorithms and flowchart / Pseudo code for a given problem.
2. Design programs involving decision structures and loops.
3. Implement different operations on arrays and solve problems using functions.
4. Understand pointers and strings.
5. Implement structures, unions and file operations in C programming for a given application problem.

**UNIT-I:** (8 Lectures)

**Introduction to Programming**: Computer hardware, Bits and Bytes, programming languages, application and system software, the software development process.

**Idea of algorithm:** steps to solve logical and numerical problems. Representation of algorithm: flowchart/pseudo code with examples, from algorithms to programs.

**UNIT-II:** (9 Lectures)

**Introduction to C**: Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing Input and Output. Decision Making - Branching and Looping. Enumerated Data type, Renaming Data type with type definition, Type Casting.

**UNIT-III** (12 Lectures)

**Arrays:** Definition, Declaration, Initialization, Assignment, Processing array, Passing array to a function, Two and multi dimensional array.

**Functions:** Defining a function, accessing a function, Passing argument to functions, Function prototypes, Nested function call, Storage classes.

**UNIT-IV** (10 Lectures)

**Pointers:** Definition, initialization, operations on pointers, functions and pointers, arrays and pointers, pointers to pointers, dynamic memory allocation.

**Strings:** C Strings, String Input / Output functions, arrays of strings, string manipulation functions.

**UNIT-V** (9 Lectures)

**Structures:** Definition, declaration, initialization, accessing members, array of structures, arrays within structure, functions and structures, pointers to structures, nested structures, unions.

**File Handling:** Types, operations on files, modes, file I/O functions, Random Access Functions.

**Text Books:**

1. Byron S Gottfried, ―Programming with C, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B.Koffman.
3. Balagurusamy. 2011.C Programming. Tata McGraw Hills, New Delhi,India.

**ReferenceBooks:**

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. Yashavant P. Kanetkar. ―Let Us C, BPB Publications, 2011.

**Web References:**

1. https://www.studytonight.com/c/
2. https://www.cprogramming.com/tutorial/c-tutorial.html
3. https://www.javatpoint.com/c-programming-language-tutorial
   https://www.tutorialspoint.com/cprogramming

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**B.Tech I Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# APPLIED CHEMISTRY

**(For EEE Branch)**

**Internal Marks: 40**

**Course Code: P18BST05** **External Marks: 60**

**Course Prerequisite**: Basic Chemistry at Intermediate or equivalent level

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**Course Objectives**

1. In this course. Student will learn the concepts and applications of chemistry in engineering.
2. It aims at strengthening the students with the fundamental concepts of chemistry. Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace industries.
3. It enables the students to know analysis of Advanced materials and used in diverse fields.
4. It makes the students to effectively use of electro chemistry, battery technology, and corrosion science in engineering applications
5. It enables the students to Spectroscopic techniques and applications.

**Course Outcomes:**

After completion of course student will be able to

1. The advantages and limitations of plastic materials and their use in design would be understood.
2. Analyze the different types of electrodes and batteries for technological applications.
3. To understand the 3D structure of the organic molecules.
4. Analyze the structure of the chemical compounds.
5. The students would aware of materials like nano materials, liquid crystals, green chemistry.

**UNIT I:** (10 Lectures)

**High Polymers and Plastics**

Polymerization: Introduction, classification, types of polymerization, Stereo regular polymers, Methods of polymerization (emulsion and suspension), Physical and mechanical properties.

Plastics as engineering materials: Advantages and limitations, Thermoplastics and Thermosetting plastics, Compounding and fabrication (4/5 techniques), Preparation, properties and applications of polyethene, PVC, Bakelite and Teflon

Elastomers: Natural rubber, compounding and vulcanization, Synthetic rubbers : Buna S, Buna N, Thiokol- preparation ,properties and applications, applications of elastomers. Composite materials & Fiber reinforced plastics, conducting polymers.

**UNIT II:** (10 Lectures)

**Electrochemistry and Corrosion**

Introduction, Single electrode potential**,** EMF, Galvanic cell, Nernst equation and applications. Reference Electrodes-SHE, calomel electrode. Electro chemical series and uses of this series, Concentration cells

**Batteries**: Introduction, Types: Dry Cell, Ni-Cd Cells, Pb-acid storage cells, Li ion cells.

**Corrosion**: Causes Theories of Corrosion (chemical and Electro chemical), types- galvanic, differential aeration, stress corrosion, corrosion control methods– material selection and designing aspects, Cathode protection – sacrificial anodic protection and impressed current cathode. Galvanizing, Tinning, Electroplating of Copper and electro less plating of nickel.

**UNIT III:** (10 Lectures)

**Stereochemistry**

Representations of 3 dimensional structures, structural isomers and stereo isomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

**UNIT-IV:** (10 Lectures)

**Spectroscopic Techniques and Organic Synthesis Of Drug Molecule**

Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

**Synthesis of commonly used drug molecules**- Ibuprofen, Aspirin, Paracetamol.

**UNIT -V:** (8 Lectures)

**Chemistry of Advanced Materials**

**Nano materials:-** Introduction – Sol-gel method & chemical reduction method of preparation – Characterization by BET method and TEM methods - Carbon nanotubes and fullerenes: Types, preparation, properties and applications.

**Liquid crystals: -** Introduction, Types, Applications.

**Super conductors:** Introduction, Type-I & Type-II super conductors, properties and applications.

**Green Chemistry: -** Principles, 3or 4 methods of synthesis with examples and applications.

**Text Books:**

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication &Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press.
3. Physical chemistry by K.Bahl and Tuli
4. Elementary organic spectroscopy by Y.R. Sharma, S.Chand publications
5. Spectroscopic techniques by H.Kaur. Pragati Prakashan publications

**Reference Books:**

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others.
2. Engineering Chemistry by Prasanth Rath, Cengage Learning.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, SpringerPublishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others.

**Web References:**

1. http://jntuk-coeerd.in/
2. http://en.wikipedia.org/wiki/title
3. http://nptel.ac.in/coures/105106/.com
4. https://en.wikipedia.org/wiki/Electrochemistry
5. https://www.youtube.com/watch?v=WLyaZbT97EI&list=PLzW3l18TEXrpqo3jRarGr9ao-61tB2184
6. http://encyclopedia.che.engin.umich.edu/Pages/Polymers/PolymerProduction/PolymerProduction.html
7. http://encyclopedia.che.engin.umich.edu/Pages/ProcessParameters/Spectrometers/Spectrometers.html

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**B.Tech I Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 1 | 0 | 3 | 2.5 |

# ENGINEERING GRAPHICS

**(Common to EEE, ECE, CSE, IT Branches)**

**Internal Marks: 40**

**Course Code: P18EST02** **External Marks: 60**

**Course Prerequisite:** NIL

**Course objectives:**

1. To introduce the students to the "universal language of Engineers" for effective communication through drafting exercises.
2. To enable the students to acquire requisite knowledge, techniques and attitude required for advanced study of engineering drawing.
3. To enable the students to construct the layout development of basic solids for practical situations.
4. To enable the students to gain the ability to convert the Isometric views in to Orthographic views.
5. To enable the students to gain the ability to convert the Orthographic views in to Isometric views.

**Course Outcomes:**

After completion of the course the student will be able to

1. Gain the knowledge of various Geometrical Elements used in Engineering Practice.
2. Understand concepts of all 2 D elements like polygons, Conic Sections.
3. Understand concepts of 3 D Objects like various Prisms, Cylinders, Pyramids and Cones.
4. Draw and represent the Projections of various objects.
5. Convert the 3 D views in to 2 D views and vice versa.

**UNIT-I:** (12 Lectures)

**Introduction to Engineering Graphics**

Introduction to Drawing instruments and their uses, construction of regular polygons, Conic sections- ellipse, parabola, hyperbola using general method, Scales- Diagonal scale, Vernier scale.

**UNIT-II:** (12 Lectures)

**Projections of Points & Lines**

Principle of orthographic projection-Method of Projection – First and third angle projection methods- Projections of Points –Projection of straight lines- parallel to one plane and inclined to the other plane.

**UNIT-III:** (16 Lectures)

**Projections of Lines & Planes**

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

Projections of Planes: Projections of plane figures: triangle, square, rectangle, pentagon and hexagon, circle with surfaces inclined to both the reference planes.

**UNIT-IV:** (12 Lectures)

**Projections of Solids & Surface Development**

Projections of Solids: Projections of regular solids with the axis inclined to only one reference plane.

Development of surfaces for basic solids- prisms, pyramids, cylinder and cone.

**UNIT – V:** (12 Lectures)

**Projections of Pictorial Views**

Conversion of isometric views into orthographic views and conversion of orthographic views in to isometric views.

**Text Book:**


1. Engineering Drawing by N.D. Bhatt & V.M. Panchal, Charotar Publications, 2014.
2. Engineering Drawing by Basant Agrawal and C.M. Agrawal ,McGraw Hill Education Pvt. Limited, 2013.
3. Engineering Drawing by Prof.K.L.Narayana & Prof. R.K.Kannaiah, Scitech Publications, 2010.


**Reference Books:**


1.Engineering Graphics with AutoCAD 2002 by James D. Bethune, PHI, 2011.

2.Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd, 2010.

3.Engineering drawing – P.J. Shah .S.Chand Publishers, 2010.

4.Engineering Drawing- Johle/Tata Macgraw Hill Book Publishers, 2010.

5.Engineering Drawing – M.B. Shah and B.C. Rana, Pearson,2009.


**Web References:**

1.https://lecturenotes.in/subject/436/engineering-drawing-ed.

2.web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf.

3.https://www.smartzworld.com/notes/engineering-drawing-pdf-1st-year-notes-ppts

4.https://www.researchgate.net/305754529_A_Textbook_of_Engineering_Drawing

5.www.academia.edu/32510080/N_d_bhatt_engineering_drawing_pdf

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**B.Tech. I Year I Semester** **Course Structure**

| L | T | P | C |
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| 0 | 0 | 3 | 1.5 |

# English Language Communication Skills Lab

**(**Common to EEE, ME, ECE, CSE, IT, AME Branches)

**Internal Marks: 40**

**Course Code: P18HSL01** **External Marks: 60**

**Course Prerequisite:**

1. Basic knowledge of English grammar
2. Basic understanding of English vocabulary.
3. Ability to speak simple sentences.
4. Have interest to learn the language

**Course Objectives**

1. To facilitate computer assisted multimedia instructions enabling individualized and independent language learning.
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
3. To bring about a consistence accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
4. To improve the fluency of students in spoken English and neutralize their mother tongue influence.
5. To train students to use language appropriately for public speaking, group discussion and interviews.

**Course Outcomes**

1. Better understanding of nuances of English language through audio visual experience and group activities.
2. Neutralization of accent for intelligibility.
3. Speaking skills with clarity and confidence which in turn enhances their employability skills.
4. Better understanding of the production of sounds of language.
5. Suitable body language for employability.

**Scope:**

The curriculum of the **ELCS Lab** is designed to focus on the production and practice of sounds of language and to familiarize the students with the use of English in everyday situations and contexts.

**EXERCISE – I** **(3 Sessions)**

- **A.** Ice – Breaking Activity, Greeting, Introducing and taking leave
- **B.** Introduction to Phonetics
  Vowel sounds – Pure Vowels & Diphthongs
  Consonant sounds

**EXERCISE – II** **(2 Sessions)**

- **A.** JAM Session, Situational Dialogues, Giving Directions & Narration
- **B.** Structure of Syllables - Plural markers & Past tense Markers

**EXERCISE – III** **(2 Sessions)**

- **A.** Role play, Giving Information and Asking Information
- **B.** Word Stress & Listening Comprehension – Listening for General Details

**EXERCISE – IV** **(2 Sessions)**

- **A.**Describing objects, events, places etc. &Presentation Skills – Extempore, PublicSpeaking.
- **B.** Consonant Cluster, Rules of 'r' pronunciation and Neutralization of Mother

Tongue Influence

**EXERCISE – V** **(3 Sessions)**

- **A.** Interview Skills &Group Discussion
- **B.** Intonation & Listening Comprehension – Listening for Specific Details

**Text books:**

1. Strengthen your Communication Skills - Maruthi Publication, Hyderabad 2013
2. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan)

**Reference Books:**


1. INFOTECH English (Maruthi Publications).
2. Personality Development and Soft Skills (Oxford University Press, New Delhi)
3. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
4. Speaking English Effectively 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
5. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
6. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
7. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad
8. Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP
9. Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP
10. Nambiar, K.C. 2011. Speaking Accurately. A Course in International Communication. New Delhi : Foundation
11. Soundararaj, Francis. 2012. Basics of Communication in English. New Delhi: Macmillan
12. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
13. English Pronouncing Dictionary Daniel Jones Current Edition with CD.

**Web References:**

1. http://www.cambridge.org
2. http://www.edufind.com/english/practice
3. http://www.learnenglish.com
4. http://www.penguin.co.uk

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**B.Tech. I Year I Semester**

| L | T | P | C |
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| 0 | 0 | 3 | 1.5 |

## C - Programming for Problem Solving Lab

**(Common to all Branches)**

Course Code: **P18ESL03** **Internal Marks: 40**

**External Marks: 60**

**Course Prerequisite:** None

**Course Objectives:**

1. To understand the various steps in program development.
2. To understand the basic concepts in C Programming Language.
3. To understand different modules that includes conditional and looping expressions.
4. To understand how to write modular and readable C Programs.
5. To write programs in C to solve problems using arrays, structures and files.

## EXPERIMENT WISE PROGRAMS

**Experiment-1**

a) Write a simple C program to Print "Hello World"
b) Write a simple C Program to Calculate Area and Circumference of Circle
c) Write a simple C program to implement basic arithmetic operations - sum, difference, product, quotient and remainder of given numbers.

**Experiment-2**

Write C programs to demonstrate the following operators

a) Assignment Operator.
b) Relational and Logical Operator.
c) Increment and decrement operator.
d) Bitwise operators.
e) Ternary operator.

**Experiment-3**

a) Write a C programs - to find the largest and smallest of 2 numbers(if – else), to find the largest and smallest of 3 numbers(Nested if – else), roots of quadratic equation(else – if ladder).
b) The total distance travelled by vehicle in't' seconds is given by distance=ut+1/2at2 where 'u' and 'a' are the initial velocity and acceleration.
   Write a c program to find the distance travelled at regular intervals of time given the Values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
c) Write a c program, which takes two integer operands and one operator from the user, performs the operation and the prints the result. (Consider the operators +,-,*,/,% and use switch statement).

**Experiment-4**

a) Write a C program to find the sum of individual digits of a positive integer
b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1.Subsequent terms are found by adding the preceding two terms in the sequence .Write a c program to generate the first n terms of the sequence.
c) Write a c program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

**Experiment-5**

a) Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:
$1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$.
b) Write a C program to generate Pascal's triangle.
c) Write a C program to construct a pyramid of numbers

**Experiment-6**

a) Write a c program to find both the largest and smallest number in a list of integers.
b) Write a c program that uses functions to perform the following:
    i) Addition of Two Matrices.
    ii) Multiplication of Two Matrices.

**Experiment-7**

a) Write a programs that use both recursive and non-recursive functions
b) To find the factorial of a given integer.
c) To find the GCD of two given integers.

**Experiment-8**

a) Write a c program that uses functions to perform the following operations:
    i) To insert a sub-string in given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not.

**Experiment-9**

a) Write a C program that displays the position or index in the string S Where the string T begins, or - 1 if S doesn't contain T.
b) Write a C program to count the lines, words and characters in a given text .

**Experiment-10**

a) Write a program to print the details of a student like (Name, Rollno, marks) using nested structures.
b) Write a C Program to Calculate Difference Between Two Time Period.

**Experiment-11**

a) Write a C program that uses functions to perform the following operations:
   i) Reading a complex number
   ii) Writing a complex number
   iii) Addition of two complex numbers
   iv) Multiplication of two complex numbers
   (Note: represent complex number using a structure.)

**Experiment-12**

a) Write a C program which copies one file to another and display the contents of a file
b) Write a C program to reverse the first n characters in a file.
c) Write a C program to merge two files into a third file ( i.e., the contents of the first file followed by those of the second are put in the third file)

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**B.Tech I Year I Semester** **Course Structure**

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# APPLIED/ENGINEERING CHEMISTRY LAB

(Common to CE, EEE, ME, AME)

**Internal Marks: 40**

**Course Code: P18BSL03** **External Marks: 60**

**Course Prerequisite**: Basic Chemistry at Intermediate or equivalent level.

**Course Objectives:**

The purpose of this course to provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes:**

After completion of this course, the students should be able to

1. Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.
2. Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.

**LIST OF EXPERIMENTS:**

Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

**Volumetric Analysis:**

1. Estimation of $Na_2CO_3$ using standard HCl solution
2. Estimation of Mohr's salt using potassium dichromate ($K_2Cr_2O_7$) solution
3. Estimation of $CuSO_4$ using sodium thio sulphate ($Na_2S_2O_3$) solution.

**Water Analysis:**

4. Determination of hardness of water sample by EDTA method
5. Determination of alkalinity of water sample
6. Determination of free chlorine in bleaching powder

**Instrumental Titrations:**

7. Conduct metric Titrations between strong acid and strong base.
8. Conduct metric Titrations between strong acid and weak base.
9. Potentio metric Titration between Ferrous iron and potassium dichromate ($K_2Cr_2O_7$) solution

**Food Analysis & Separation Of Compounds:**

10. Estimation of Vitamin-c
11. Thin layer chromatography

**Preparation of Polymeric Resin:**

12. Preparation of phenol formaldehyde resin
13. Preparation of urea formaldehyde resin

**Lab Manual**: Engineering/Applied Chemistry Lab Manual, Dept. of Chemistry, Pace Institute of Technology and Science, Vallur, Prakasam Dist., Andhra Pradesh, India.

**Reference Books:**

1. Dr. Jyotsna Cherukuris (2012) Laboratory Manual of engineering chemistry-II,
2. VGS Techno Series 3. Chemistry Practical Manual, Lorven Publications

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**B. Tech- I Year I Semester** **Course structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

## ENGINEERING WORKSHOP

**(**Common to EEE, ECE, CSE, IT Branches**)**

**Internal Marks: 40**

**Course Code: P18ESL02** **External Marks: 60**

**Course Pre-requisite:** NIL

**Course Objectives:**

1. To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
2. To provide the students hands on experience to make different joints in carpentry with hand tools like jack plane, various chisels & hand saws.
3. To provide the students hands on experience to make different joints in Sheet metal work with hand tools like snips, stacks, nylon mallets etc.
4. To provide the students hands on experience to make different connections in house wiring with hand tools like cutting pliers ,tester ,lamps& lamp holders etc.
5. To develop a right attitude, team working, precision and safety at work place.

**Course Outcomes:**

At the end of the course the student will be able to

1. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
2. Familiarize with the basics of tools and equipment used in Carpentry.
3. Fabricate various basic components using Sheet metal.
4. Apply basic electrical engineering knowledge for house wiring practice.
5. Gain the hands on experience to form different models in Black smithy.

**LIST OF EXPERIMENTS**:

**Minimum two experiments should be conducted from each trade**

1. **Carpentry** **(6 Lectures)**
   a) Cross-Lap joint
   b) Dove tail joint
   c) T - Lap joint
   d) Mortise & Tenon joint
2. **Fitting** **(6 Lectures)**
   a) Square fit
   b) V - Fit
   c) Half round fit
   d) Dovetail fit

3. **Tin Smithy** **(6 Lectures)**
   a) Rectangular Tray
   b) Cylinder
   c) Square box without lid
   d) funnel
4. **Black Smithy** **(6 Lectures)**
   a) Round rod to Square
   b) S-Hook
   c) Round Rod to Flat Ring
   d) Round Rod to Square headed bolt
5. **House wiring** **(6 Lectures)**
   a) One lamp controlled by one switch
   b) Parallel and Series connections
   c) Fluorescent lamp fitting
   d) Stair case wiring

**Reference Books:**


1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers, 2015.
2. Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, Vikas publishers, 2009.
3. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House, 2003.


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**B.Tech. I Year II Semester** **Course Structure**

| L | T | P | C |
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| 3 | 0 | 0 | 3 |

# English-II

**(**Common to all Branches)

**Internal Marks: 40**

**Course Code: P18HST02** **External Marks: 60**

**Course Prerequisite: Nil**

The students should have basic knowledge of English grammar and LSRW skills.

**Course Objectives:**

1. To enable the engineering students to develop their basic communication skills in English for academic and social purposes.
2. To equip the students with appropriate oral and written communication skills.
3. To inculcate the skills of listening, reading and critical thinking.
4. To integrate English Language learning with employability skills and training.
5. To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course

**Course Outcomes:**

On completion of this course, the student is able to:

1. Use English Language effectively in spoken and written forms
2. Interpret the contextual meaning of words
3. Comprehend the given texts and respond appropriately
4. Recall and reproduce the theme in a given context
5. Communicate confidently in formal and informal contexts

**UNIT – I** (8 Lectures)

My Struggle for an Education – Booker T. Washington

a. Vocabulary: Collocations

b. Grammar: Finite verbs, Non- finite verbs, Gerund, Transitive and Intransitive Verbs

c. Writing: Precis Writing

**UNIT – II** (9 Lectures)

In London – M.K.Gandhi

a. Vocabulary: Commonly confused words

b. Grammar: Active voice and Passive voice

c.Writing: Technical Report Writing

**UNIT –III** (10 Lectures)

Principles of Good Writing – L A Hill

a. Vocabulary: Commonly Misspelt Words

b. Grammar: Direct & Indirect Speech

c.Writing: Essay Writing

**UNIT- IV** (9 Lectures)

The Secret of Work – Swami Vivekanada

a. Vocabulary: Technical vocabulary

b. Grammar: Degrees of Comparison

c.Writing: Curriculum vitae, Cover Letter and Resume Writing. (Functional, Chronological and standard Resumes)

**UNIT – V** (9 Lectures)

Oh Father Dear Father – Raj Kinger

a. Vocabulary: Phrasal verbs

b. Grammar: Simple, Compound and Complex Sentences

c.Writing:Hints Development

**Textbooks:**


1. Board of Editors, "Sure Outcomes"– Orient Blackswan, Hyderabad, 2013
2. "Panorama" – Oxford University Press, New Delhi, 2016
3. "Fluency in English", A Course Book for Engg. Students, Published by Orient Black Swan, Hyderabad, 2016 print.
4. "Technical Communication- Principles and Practice", Third Edition. New Delhi: Oxford University press.


**Reference Books:**


1. Murphy, "English Grammar with CD", Cambridge University Press, New Delhi, 2004.
2. Rizvi Asheaf M, "Effective Technical Communication", Tata McGraw Hill, New Delhi, 2008
3. Baradwaj Kumkum, Professional Communication", I.K. International-Principles and Practice". Third Edition. New Delhi: Oxford University Press.2015
4. Trailblazers – Board of Editors – Orient Blackswan New Delhi).


**Web References:**

1. (www.englishhints.com,www.enchantedlearning.com, www.learnenglish.de/grammar/prefixtext.html)
2. (http://www.magickeys.com/books/riddles/words.html)
3. (http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)
4. http://www.yourdictionary.com
5. http://www.learnenglish.com
6. http://www.cambridge.org
7. http://www.eslcafe.com
8. http://www.eslgames.com
9. http://www.penguin.co.uk
10. http://www.edufind.com/english/practice

**B. Tech- I Year II Semester** **Course structure**

| L | T | P | C |
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**MATHEMATICS-II**
(**Linear algebra and Vector calculus**)
(Common to All Branches)

Internal Marks: 40
Course code: P18BST02 External marks: 60

**Course Prerequisite**: Mathematics-I (P18BST01)
**Course Objectives**:

To learn

1. The subject gives the knowledge about matrices and applications to solve linear equations.
2. The course intends to provide an overview of Eigen values and Eigen vectors which occur in Physical and engineering problems.
3. To integration over the regions.
4. The concepts of vector differentiation.
5. Line integral, Surface and volume integrals, Vector integral theorems.

**Course Outcomes**:

After learning the contents of this paper the student must be ableto

1. Apply this knowledge to solve linear equations.
2. Eigen values and Eigen vectors of a given matrix and solve simultaneous linear equations.
3. Determine double integral over a region and triple integral over a volume.
4. Analyze the Vector differentiation in various domains.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

**UNIT I:** (10 Lectures)
**Linear systems of equations:**
Rank- Echelon form-Normal form – Solution of linear systems – Gauss elimination – Gauss Jordon- Gauss Jacobi and Gauss Seidal methods.
Applications: Finding the current in electrical circuits.

**UNIT II:** (10 Lectures)
**Eigen values - Eigen vectors and Quadratic forms:**
Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite – Index Signature.

**UNIT III: Multiple integrals:** (9 Lectures)

Double and triple integrals – Change of variables – Change of order of integration. Applications: Finding Areas, surface areas and Volumes.

**UNIT IV: Vector Differentiation:** (10 Lectures)

Gradient-Directional derivative, Divergence- Solenoidal vector, Curl –Irrotational Vector, Vector identities.

Applications: Equation of continuity, potential surfaces.

**UNIT V: Vector Integration:** (9Lectures)

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.

Applications: Work done, Force.

**Text Books:**


1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.


**Reference Books:**


1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
4. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
5. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
6. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.


**Web Reference:**

1. http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
2. http://mathworld.wolfram.com/topics
3. http://www.nptel.ac.in/course.php

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**B. Tech- I Year II Semester**

**Course structure**

| L | T | P | C |
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## PYTHON PROGRAMMING

**(Common to EEE, ME, ECE, CSE, IT, AME Branches)**

**Course Code: P18EST05** **Internal Marks: 40**
**External Marks: 60**

**Course Prerequisite:** NIL

**Course Objectives:**

1. To read and write simple Python programs.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and apply OOP concept.
4. To use Python data structures –- lists, tuples, dictionaries.
5. To develop GUI applications in Python.

**Course Outcomes:**

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

1. Understand the basics of python programming.
2. Understand control flow and implement various data structures provided by python.
3. Implement packages, methods and functions.
4. Develop real-world applications using oops and exception handling.
5. Build GUI Applications in Python.

**UNIT-I** (9 Lectures)

**Introduction:** History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

**UNIT-II** (10 Lectures)

**Types, Operators and Expressions**: Types - Integers, Strings, Booleans, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue, pass.

**Data Structures** Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions.

**UNIT III** (11 Lectures)

**Functions** - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

**Modules:** Creating modules, import statement, from. Import statement, name spacing,

**Python packages:** Introduction to PIP, Installing Packages via PIP, Using Python Packages

**UNIT IV** (9 Lectures)

**Object Oriented Programming OOP in Python:** Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.

**Error and Exceptions**: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

**UNIT V** (9 Lectures)

**Brief Tour of the Standard Library & Files** - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics, file operations.

**Text Books:**


1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/).
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.


**Reference Books:**


1. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
2. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.


**Web References:**

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/
2. https://www.codecademy.com/learn/learn-python
3. https://www.codementor.io/collections/learn-python-bwbc63ulz
4. http://www.diveintopython3.net/
5. https://www.python.org/3/
6. https://www.learnpython.org

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**B.Tech. I Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# APPLIED PHYSICS
**(Only for EEE)**

**Internal Marks: 40**

**Course code: P18BST03** **External Marks: 60**

**Course Prerequisites:** The basics of analytical and conceptual understanding of physics

**Course Objectives**

1. To study the wave nature of light through Interference and diffraction.
2. To learn the basic principles of Lasers and fiber optics.
3. To express the physics of electrostatics and electromagnetic wave concepts through Maxwell's equations.
4. To study the basic concepts of Quantum mechanics.
5. Aware of limits of classical free electron theory and apply band theory of solids.
6. Acquire the knowledge of semiconductor physics.

**Course Outcomes**

1. Understanding the basic concepts of optics and how to apply them for engineering applications.
2. Acquire the knowledge of fundamentals of Lasers and fiber optics enables the students to develop Laser devices to apply them in various systems like communications, Industries and medicine.
3. Set students to be exposed to Electrostatics, Maxwell's equations, electromagnetic waves and fundamental concepts of quantum mechanics.
4. Enable to learn the fundamental concepts of free electron theory and band theory of solids.
5. Develop knowledge of band theory of solids for fundamentals of Semiconductor physics enables the students to apply the knowledge to various systems like communications, solar cell, photo cells and so on.

**UNIT-I**

**Wave Optics** (10 lectures)

**Interference:** Introduction, Superposition of waves, Interference of light by wave front splitting and amplitude splitting, interference in thin films, Newton's rings.

**Diffraction:** Introduction, differences between interference and diffraction, difference between Fraunhoffer and Fresnel diffraction, Fraunhoffer diffraction at single slit, Diffraction grating (N-slits qualitative), diffraction at circular aperture, resolving power of microscope, and telescope.

**UNIT-II**

**Lasers And Fiber Optics** (9 lectures)

**Lasers:** Introduction, Characteristics of laser, Absorption, spontaneous emission, stimulated emission, Einstein's coefficients, Pumping, Types of Lasers: Ruby laser, He-Ne laser.

**Fiber optics:** Introduction, Total internal reflection-wave propagation in optical fiber, Acceptance angle, numerical aperture.

**UNIT-III**

**Electrostatics, Maxwell's Equations And Electromagnetic Wave** (9 lectures)

**Electrostatics: C**oulombs law, electric field, electric field intensity, electric flux Density, electrostatic potential, divergence of electric field, Laplace's and Poisson's equations for electrostatic potential, Gauss theorem in electrostatics.

**Maxwell's equations and electromagnetic waves:** Gauss theorem in magneto statics, Faraday's law of electromagnetic induction, Ampere's law, displacement current, Maxwell's equations in vacuum, electromagnetic wave equation in dielectric medium, velocity of propagation of electromagnetic wave, poynting vector and poynting theorem.

**UNIT-IV**

**Quantum Mechanics, Free Electron Theory And Band Theory** (12 lectures)

**Quantum Mechanics:** Introduction to quantum physics, de-Broglie's hypothesis and properties of matter waves, Schrodinger's time independent wave equation, Particle in one dimensional box, physical significance of wave function.

**Free electron theory:** Free electron theory of metals assumptions and failures, Fermi Dirac distribution function- Fermi level, density of states.

**Band theory of solids:** Introduction, Bloch's theorem, Kronig penny model(qualitative), E-K diagram, Brillouin's zones, classification of solids into metals, semiconductors and insulators, effective mass of electron and concept of hole

**UNIT-V**

**Semiconductor Physics** (8 lectures)

**Semiconductor physics:** Introduction**,** Intrinsic and Extrinsic semiconductors. carrier concentration in intrinsic semiconductors, carrier concentration in N-type and P-type semiconductors, Dependence of Fermi energy on carrier-concentration and temperature, diffusion and drift, Hall effect and its applications, mechanism in LED, solar cell and photo conductor

**Text Books:**


1. A Textbook of Engineering Physics by Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand.
2. Optics by Ajoy Ghatak, Tata McGraw-Hill Publishing company limited
3. Lasers and nonlinear optics by BB Laud, New age International Publishers

4. Introduction to Electrodynamics by David Griffiths, Cambridge University Press
5. Introduction to Quantum physics by Eisberg and Resnick.
6. Solid state physics by AJ Dekker.

**Reference Books:**

1. Applied physics by Palanisamy (Scitech publications)
2. Optics by Eugene Hecht, Pearson Education.
3. Principle of Lasers by O.Svelto
4. Electricity, magnetism and light by W. Saslow
5. Introduction to Quantum mechanics by D.J.Griffiths. Cambridge University Press
6. Quantum mechanics by Richard Robinett.
7. Quantum Chemistry by Daniel McQuarrie
8. Semiconductor Optoelectronics by J. Singh, Physics and Technology, Mc Graw-Hill inc
9. Engineering Physics by B.K. Pandey, S. Chaturvedi - Cengage Learing.
10. Physics by Halliday and Resnick

**Web References:**

1. http://jntuk-coeerd.in/
2. http://www.youtube.com
3. http://en.wikipedia.org
4. http://nptel.ac.in/syllabus/122106027/

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**B.Tech. I Year II Semester** **Course Structure**

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|---|---|---|---|
| 3 | 0 | 0 | 3 |

# BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to ECE, CSE, IT, EEE)

**Internal Marks: 40**

**Course Code: P18EST01** **External Marks: 60**

**Course Prerequisite**: Physics.

**Course Objective:**

1. To study the concept of passive elements, and understand the applications of network theorems for analysis of electrical networks.
2. To Analyze the single-phase ac circuits consisting of R,L, C, RL, RC, RLC combinations.
3. To understand the faraday's laws and basic Principle of transformer.
4. To understand the working principle of various rotating machines.
5. To study the operation of PN junction diode, half wave, full wave rectifiers, Transistors and OP-AMPs.

**Course Outcomes:**

After completion of this course, the student is able to:

1. Solve various electrical networks in presence of active and passive elements and by using principles of network theorem.
2. Analyze the single-phase ac circuits consisting of R,L, C, RL, RC, RLC combinations.
3. Understand the faraday's laws and basic Principle of transformer.
4. Understand the working principle of various rotating machines.
5. Study the operation of PN junction diode, half wave, full wave rectifiers, Transistors and OP-AMPs

**UNIT – I** (10 Lectures)

**Electrical Circuits**

Basic definitions – Types of network elements- Types of sources - Ohm's Law - Kirchhoff's Laws –Inductive networks - Capacitive networks – Series - Parallel circuits- Star-delta and delta-star transformations - Source transformation - nodal analysis and mesh analysis -Super position theorem.

**UNIT – II** (9 Lectures)

**AC Circuit Analysis**

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

**UNIT –III** (9 Lectures)

**Magnetic Circuits and Transformers**

Basic definition of Magnetic quantities - Faraday's laws of electromagnetic induction- Analogy between electrical and magnetic circuits. Concept of self and mutual inductance. Principle of operation and construction of single phase transformer–EMF equation – Applications.

**UNIT- IV** (11 Lectures)

**Rotating Machines**

Construction and Principle of operation of DC Machines - EMF equation – Torque equation –Speed control of DC Shunt Motor- power losses and efficiency - Principle of operation and construction of 3-phase Induction motor - Principle of operation and construction of alternators.

**UNIT – V** (9 Lectures)

**Introduction to Semiconductor Devices**

PN junction diode - Diode applications -Half wave -Full wave rectifiers – Types of Transistors - PNP and NPN junction transistors, transistor as an amplifier- Frequency response of CE Amplifier-Characteristics of Operational Amplifiers.

**Textbooks:**


1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company,6th Edition
2. Electrical Technology by Surinder Pal Bali, Pearson Publications.
3. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th Edition, PEI/PHI 2006.
4. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill


**Reference Books:**


1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
2. Electrical Machines by D. P.Kothari, I .J .Nagarth, Mc Graw Hill Publications, 4th Edition
3. Electrical Machines by R.K.Rajput, Lakshmi publications, 5thEdition.
4. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
5. Electronic Devices and Circuits by David A. Bell, Oxford University Press
6. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, TATA MC Graw Hill, Second Edition


**Web References:**

1. https://embeddedengineers.files.wordpress.com/2015/09/electronic-devices-and-circuits-by-salivahanan.pdf
2. https://electricalanswers.files.wordpress.com/2014/09/a-textbook-of-electrical-technology-volume-i-basic-electrical-engineering-b-l-theraja.pdf

**B.Tech I Year II Semester** **Course Structure**

| L | T | P | C |
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| 2 | 0 | 0 | 0 |

# ENVIRONMENTAL SCIENCE
**(Common to CE, EEE, ME, AME Branches)**

**Course Code: P18MCT02** **Internal Marks: 100**

**Course Prerequisite:**

Basic knowledge about sciences up to intermediate or equivalent level.

**Course Objectives:**

1. Overall understanding of the natural resources
2. Basic understanding of the ecosystem and its diversity
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
4. An understanding of the environmental impact of developmental activities
5. Awareness on the social issues, environmental legislation and global treaties

**Course Outcomes:**

At the end of the course, the students will be able to acquire

1. The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
2. The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
3. Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
4. The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
5. Social issues both rural and urban environment and the possible means to combat the challenges and environmental assessment stages involved in EIA and the environmental audit.

**UNIT- I** (9 Lectures)

**Multidisciplinary Nature of Environmental Studies:** Definition, Scope and Importance– Need for Public Awareness. Renewable energy Resources, Solar energy-solar cells, solar batteries, wind energy, wind mills, ocean energy, tidal energy and nonrenewable energy resources: LPG, water gas, producer gas. World food problems, degradation and Soil erosion - overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity.

**UNIT- II** (8 Lectures)

**Ecosystems:** Concept of an ecosystem. – Structure, Components and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Ecological pyramids - Food chains, food webs and Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem. b. Grassland ecosystem c. Desert ecosystem d. Aquatic – River and Lake Ecosystems.

**UNIT -III** (8 Lectures)

**Biodiversity and Its Conservation:** Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India –Value of biodiversity: consumptive use, Productive use, social, ethical and aesthetic values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT- IV** (9 Lectures)

**Environmental Pollution:** Definition, Cause, Effects and Control measures of : a. Air Pollution, b. Water pollution, c. Soil pollution, d. Marine pollution, e. Noise pollution, f. Nuclear hazards.

**Solid Waste Management:** Causes, effects and control measures of urban and industrial wastes – **Disaster management:** floods, earthquake, cyclone and landslides.

**UNIT -V** (8 Lectures)

**Social Issues and the Environment**: From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management –Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Population growth – Impacts on society, variation among nations. Environmental Impact Assessment (EIA) and Environmental Protection Acts.

**Text Book:**


1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press, 2005.
2. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi, 2008.


**Reference Books:**


1. Environmental Science & Engineering by Dr. A. Ravi krishnan, Hitech Publishing Company Pvt. Ltd. 2013.
2. Perspectives in Environmental Studies, Second edition, Anubha Koushik and C.P. Koushik, New Age International (P) Limited, Publishers, 2004.


**Web References:**

1. Environmental Science - Oxford Research Encyclopedia
2. Environmental Science - Museum of Science and Industry
3. Collegesat.du.ac.in/UG/Envinromental%20Studies_ebook.pdf

**B. Tech I Year II Semester**

**Course Structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

## PYTHON PROGRAMMING LAB

**(Common to EEE, ME, ECE, CSE, IT, AME Branches)**

**Course Code: P18ESL04** **Internal Marks: 40**

**External Marks: 60**

**Course Outcomes:**

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
2. Express different Decision Making statements and Functions.
3. Interpret Object oriented programming in Python.
4. Understand File handling operations.
5. Design GUI Applications.

**Exercise1 - Basics**

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purpose fully raise Indentation Error and Correct it

**Exercise 2 - Operations**

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).
b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

**Exercise 3 – Control Flow**

a) Write a Program for checking whether the given number is a even number or not.
b) Using a for loop, write a program that prints out the decimal equivalents of 1/2,1/3,1/4,...,1/10.
c) Write a program using a for loop that loops over a sequence. What is sequence?
d) Write a program using a while loop that asks the user for a number, and prints a count down from that number to zero.

**Exercise 4 – Control Flow-Continued**

a) Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

   1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

**Exercise 5 - DS**

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure.
b) Write a program to use split and join methods in the string and trace a birth day with a dictionary data structure.

**Exercise 6- DS-Continued**

a) Write a program combine lists that combines these lists into a dictionary.

b) Write a program to count frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

**Exercise 7 - Files**

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

**Exercise 8 - Functions**

a) Write a function dups to find all duplicates in the list.

b) Write a function unique to find all the unique elements of a list.

**Exercise 9 - Functions –Problem Solving**

a) Write a function cumulative product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute GCD, LCM of two numbers. Each function shouldn't exceed one line.

**Exercise 10 – Multi - D Lists**

a) Write a program to perform addition of two square matrices.

b) Write a program to perform multiplication of two square matrices.

**Exercise 11 - OOP**

Class variables and instance variable and illustration of the self variable

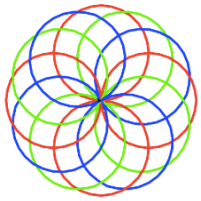
i) Robot.

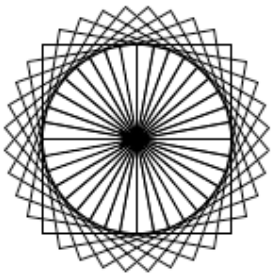
ii) ATM Machine.

**Exercise - 12 GUI, Graphics**

a) Write a GUI for an Expression Calculator using tk.

b) Write a program to implement the following figures using turtle





**B.Tech. I Year II Semester**

**Course Structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

# APPLIED PHYSICS LAB

**(Only for EEE)**

**Internal Marks: 40**

**Course code: P18BSL01** **External Marks: 60**

**Course Prerequisites:** The basics of analytical and conceptual understanding of physics.

**Course Objective:**

1. Deploy scientific method of experiments in the laboratory.
2. Develop the procedures and observational skills for appropriate use of simple and complex apparatus.
3. Enable analytical techniques, statistical analysis and graphical analysis.
4. Reinforce ideas and concepts covered in lecture host of experiments.
5. Train to find the radius of curvature of a Plan o-convex lens forming Newton's rings.

**Course Outcomes:**

1. Apply the phenomenon of interference and diffraction of light waves.
2. Implement the concept of resonance in LCR circuit and Sonometer.
3. Analyze the SHM to determine its dependent properties.
4. Evaluate the behavior of electronic components and its characteristics.

**List of Experiments**

(Any eight of the following to be done)

1. Determination of Radius of Curvature of Plano-Convex lens by forming Newton's Rings.
2. Determination of Wave length so f various spectral lines using diffraction grating with the normal incidence method.
3. Determination of wavelength of laser radiation.
4. Determination of Refractive index of a given prism.
5. Study of magnetic field along the axis of a current carrying coil and to verify Stewart-Gee's method.
6. Determination of energy gap of PN junction Diode.
7. Determination of hall coefficient and carrier concentration using Hall effect
8. Study of V-I characteristics of Zener diode.
9. Study of V-I characteristics of PN junction diode.
10. Determination of frequency of a vibrating bar or electrical tuning fork using Melde's apparatus.

11. Determination of acceleration due to gravity using compound pendulum
12. Verification of laws of transverse waves by Sonometer.
13. Determination of Velocity of sound by volume resonator.
14. Determination of rigidity modulus by Torsional Pendulum.

**Text Books:**


1. Madhu sudhanrao, "Engineering Physics lab manual" Istedition, Scietech Publication, 2015.
2. Ramarao Sri, Choudary Nityanand and Prasad Daruka, Lab Manual of Engineering physics 5th ed, Excell books, 2010.
3. Physics lab manual, department of physics, PACE Institute of Technology and Sciences.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**B.Tech. I Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

# BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

(Common to CE, ME & AME)

**Course Code: P18ESL01** **Internal Marks: 40**

**Course Prerequisite**: None **External Marks: 60**

**Course Objective:**

1. To verify and demonstrate on safety precautions and Kirchhoff laws.
2. To demonstrate construction of transformer, rotating machines and various protective devices.
3. To verify superposition theorem and control of dc shunt motor using speed control methods.
4. To analyze the characteristics of PN junction diode and transistor CE characteristics
5. To analyze the characteristics of CE amplifier and operation of half-wave and full-wave rectifier.

**Course Outcomes:**

After completion of this course, the student is able to:

1. Get an exposure on safety precautions and verify Kirchhoff laws.
2. Get an exposure on construction of transformer, rotating machines and various protective devices.
3. Verify superposition theorem and control the speed of DC shunt motor using speed control methods.
4. Analyze the characteristics of PN junction diode and transistor CE characteristics.
5. Analyze the characteristics of CE amplifier and operation of half-wave and full-wave rectifier.

**The following experiments are required to be conducted as compulsory experiments:**

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Kirchhoff's laws.
3. Demonstration of construction of Transformer and Rotating machines.
4. Demonstration on various protective devices.
5. Verification of superposition theorem
6. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
7. PN junction diode characteristics
   a. Forward bias b. Reverse bias (Cut in voltage and resistance calculations)

8. Transistor CE characteristics (Input and output)
9. CE Amplifier Characteristics
10. Half Wave rectifier and Full Wave Rectifier without filters

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**B.Tech. II Year I Semester** **Course Structure**

| L | T | P | C |
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# ELECTRICAL CIRCUIT ANALYSIS

**Internal Marks:** 40

**Course Code:** P18EET01 **External Marks:** 60

**Course Prerequisite:** Basic Electrical and Electronics Engineering

**Course Objectives:**

1. To understand the various network theorems for the analysis of electrical circuits.
2. To study the concepts of balanced and unbalanced three-phase circuits.
3. To study the Coupled Circuits and performance of a network based on input and output excitation/ response.
4. To calculate the various two port network parameters and to know interconnections.
5. To understand the applications of network topology to electrical circuits.

**Course Outcomes:**

At the end of this course, students will demonstrate the ability to

1. Apply network theorems for the analysis of electrical circuits.
2. Solve three- phase circuits under balanced and unbalanced condition.
3. Understand the Coupled Circuits find the transient response of electrical networks for different types of excitations.
4. Find the parameters for different types of network and their interrelations.
5. Solve Electrical networks with network topology concepts.

**UNIT-I NETWORK THEOREMS (15 Lectures)**

Extension of Node and Mesh Analysis to DC networks-Thevenin's theorem, Norton theorem, Maximum power transfer theorem, Reciprocity theorem and Compensation theorem - Analysis with dependent current and voltage sources.

**UNIT-II THREE PHASE CIRCUITS (12 Lectures)**Phase sequence- star and delta connection - relation between line and phase voltages and currents - analysis of balanced three phase circuits -Analysis of three phase unbalanced circuits: Loop method – Star-Delta transformation Technique. Importance of 3-phase circuits.

**UNIT-IIICOUPLED CIRCUITS&TRANSIENT ANALYSIS IN DC AND AC CIRCUITS (15 Lectures)**

Measurement of Self, Mutual Inductance, coefficient of coupling, coupled circuits – dot convention -Locus Diagram-Series, parallel Resonance – concept of band width and Q factor.

Transient response of R-L, R-C, R-L-C circuits for DC and AC excitations, Solution using differential equations and Laplace transforms.

**UNIT-IV TWO PORT NETWORKS (9 Lectures)**

Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, Cascaded networks.

**UNIT-VNETWORK TOPOLOGY (9 Lectures)**

Definitions of Graph and Tree, Basic cut set and tie set matrices for planar networks, Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources, Duality and Dual networks.

**Text Books**:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company, 6th edition, 2007.
2. Network Analysis by Van Valkenburg; Prentice-Hall of India Private Ltd, 2015.

**Reference Books**:

1. Fundamentals of Electrical Circuitsby Charles K.Alexander and Mathew N.O.Sadiku,McGraw Hill Education (India), 2013.
2. Linear Circuit Analysisby De Carlo, Lin, Oxford publications, 2008.
3. Electric Circuits– (Schaum's outlines)by MahmoodNahvi & Joseph Edminister, Adapted by Kuma Rao, McGraw Hill,5th Edition-2012.
4. Electric Circuits by David A. Bell, Oxford publications, 2009.
5. Introductory Circuit Analysisby Robert L Boylestad, Pearson Publications,2013.
6. Circuit Theory(Analysis and Synthesis) by A.Chakrabarthi,DhanpatRai&Co, 2009.

**Web Resources:**

1. www.allaboutcircuits.com
2. www.electronics-tutorials.ws

**B.Tech. II Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# ELECTROMAGNETIC FIELDS

**Internal Marks:** 40

**Course Code: P18EET02** **External Marks:** 60

**Course Prerequisites**: Applied Physics, Mathematics.

**Course Objective:**

1. To study the production of electric field and potentials due to different configurations of static charges.
2. To study the properties of conductors and dielectrics, calculate the capacitance of various configurations and understand the concept of conduction and convection current densities.
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 study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
   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's fourth equation for the induced e.m.f.

**Course Outcomes:**

After completion of this course, the students are:

1. Able to understand the production of electric field and potentials due to different configurations of static charges.
2. Able to understand the properties of conductors and dielectrics calculate the capacitance of various configurations and understand the concept of conduction and convection current densities.
3. Able to understand the magnetic fields produced by currents in different configurations, application of ampere's law and the Maxwell's second and third equations.
4. Able to understand the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops. To develop the concept of self and mutual inductances and the energy stored.
5. Able to understand the time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced E.M.F.

**UNIT-I ELECTROSTATICS – I** **(10 Lectures)**

**Coordinate systems:** Introduction to coordinate systems, rectangular, cylindrical and spherical coordinate systems.

**Electrostatics:** Coulomb's Law – Electric Field Intensity (EFI) – electric fields due to continuous charge distributions – volume charge, line charge, surface charge - EFI due to a

line and a surface charge – electric flux density – gauss law – applications of gauss law – Maxwell equations.

**UNIT-II ELECTROSTATICS – II (10 Lectures)**

**Electric Potential** - Properties of potential function – Potential gradient – electric potential due to charge distribution - Work done in moving a point charge in an electrostatic field – Current Density – equation of continuity - conduction and Convection current densities – Ohm's law in point form - Behavior of conductors in an electric field – dielectrics - polarization - Electric dipole – Dipole moment - potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field.

**Boundary conditions** : Conductors and Insulators - Boundary conditions between conduction to Dielectric and dielectric to dielectrics capacitance - capacitance of parallel plates, spherical and coaxial cables with composite dielectrics – Energy stored and energy density in a static electric field - Laplace's and Poison's equations - solution of Laplace's equation in one variable.

**UNIT-III MAGNETOSTATICS – I (10 Lectures)**

**Biot-Savart's law and its applications:** Static magnetic fields – Biot-Savart's law - Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI - Maxwell's second Equation, div(B)=0

**Amperes circuit law and its applications:**

MFI due to an infinite sheet of current and a long filament carrying conductor – Point form of Ampere's circuital law –Field due to a circular loop, rectangular and square loops, Maxwell's third equation, Curl (H)=J.

**UNIT-IV MAGNETOSTATICS – II (8 Lectures)**

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 – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field - Magnetic potential – scalar magnetic potential and its limitations – vector magnetic potential and its limitations – vector poisons equation

**Self and Mutual inductance** – determination of self-inductance of a solenoid and toroid – Neumanns formulae - 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 – V ELECTRO DYNAMIC FIELD (7 Lectures)**

Faraday's laws of electromagnetic induction – induced emf - Statically and dynamically induced EMFs - Simple problems -Modification of Maxwell's equations for time varying fields - Displacement current - Poynting Theorem and Poynting vector

**Textbooks:**

1. Engineering Electromagnetics by William H. Hayt& John. A. Buck Mc. Graw-Hill Companies, 7th Editon.2006.
2. Field theory by gangadhar K.A, khanna publishers, New delhi, 15th edition , 2004

**Reference Books:**

1. Principles of Electro Magnetics by Sadiku, Oxford Publications,4th edition,2010.
2. Introduction to Electro Dynamics by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd edition, 2012.
3. Electromagnetic Field Theory by YaduvirSingh,Pearson, 2018.
4. Fundamentals of Engineering Electromagnetics by Sunil Bhooshan,Oxford higher Education, 2012.

**Web References:**

3. www.niehs.nih.gov
4. www.emfields-solutions.com
5. www.electrical4u.com
6. www.indiabix.com
7. www.ece.uah.edu

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**B.Tech. II Year I Semester** **Course Structure**

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# ELECTRICAL MACHINES - I

**Internal Marks:** 40

**Course Code:** P18EET03 **External Marks:** 60

**Course Prerequisite:** Basic Electrical and Electronics Engineering

**Course Objective:**

1. To study the concepts of electromechanical energy conversion, understand the different types of DC machines and their characteristics.
2. To study the torque production mechanism, control the speed of DC motors & Testing of DC Machines.
3. To analyze the performance, losses and efficiency of single phase transformers.
4. To study the regulation of single phase transformers & parallel operation.
5. To study the analyzation, performance of three phase transformers, control voltages with tap changing methods and Three-phase to two-phase transformation

**Course Outcomes (COs):**

1. Able to assimilate the concepts of electromechanical energy conversion, understand the different types of DC machines and their characteristics.
2. Able to understand the torque production mechanism, control the speed of DC motors & Testing of DC Machines.
3. Able to analyze the performance, losses and efficiency of single phase transformers.
4. Able to predetermine the regulation of single phase transformers & parallel operation.
5. Able to analyze the performance of three phase transformers, control voltages with tap changing methods and Three-phase to two-phase transformation

**UNIT-I DC GENERATOR (10 Lectures)**

Principles of electromechanical energy conversion – singly excited and multi excited system – Classification of DC generators – Characteristics of DC generator.

**DC Motor**

Torque and back-EMF equations of dc motors, characteristics of separately-excited, shunt, series and compound motors - applications of dc motors

**UNIT-IISTARTING &SPEED CONTROL D.C. MOTOR (8 Lectures)**

Necessity of starter – Starting by 3 point and 4 point starters – Speed control of DC motor.

**Testing of DC Machines**

Losses and efficiency - brake test, Swinburne's method –Hopkinson's method – Load tests on dc Machine–Field's test.

**UNIT-IIISINGLE-PHASE TRANSFORMERS (10 Lectures)**

Introduction - operation on no-load and on-load – lagging, leading and unity power factor loads - phasor diagrams of transformers – equivalent circuit – regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – All day efficiency.

**UNIT-IVTESTING & PARALLEL OPERATION OF TRANSFORMER (7 Lectures)**

Tests on single phase transformer: open circuit and short circuit tests – Sumpner's test – parallel operation with equal and unequal voltage ratios – Autotransformer: equivalent circuit – comparison with two winding transformers.

**UNIT-V3-PHASE TRANSFORMERS (10 Lectures)**

Types of Poly-phase connections – Uses of tertiary winding – Concept of Tap Changing - off load and on load tap changers - Scott connection of transformer for phase conversion.

**Text Books:**

1. Electrical Machines P.S. Bimbra, Khanna Publishers,7th edition, 2007.
2. Electrical Machines I.J Nagrath&D.PKothari, Tata Mc Graw-Hill, 3rd edition, 2009.
3. Electrical Machines by S.K. Bhattacharya, 2014.
4. Electrical Machines by J.B. Gupta, Kataria Publications, 2015.

**Reference Books:**

1. Performance and Design of D.C Machines by A.E. Clayton & Hancock, BPBPublishers,3rd edition, 2004.
2. Performance and Design of A.C Machines by M.G Say, BPB Publishers, 3rd edition,2002.
3. Electric Machinery by A.E.Fitzgerald , C Kingsley and S Umans, McGraw Hill 2013.
4. Performance and Design of DC Machines, by Clayton & Hancock, BPB Publishers, 2004.
5. Electro mechanics–I (D.C Machines), by S. Kamakshaiah, Hi-Tech Publishers, 2013.

**Web References:**

1. www.electrical4u.com
2. www.indiabix.com

**B. Tech II Year I Semester** **Course Structure**

| L | T | P | C |
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| 3 | 0 | 0 | 3 |

# SEMICONDUCTOR DEVICES AND CIRCUITS

**Internal Marks:** 40

**Course Code: P18ECT01** **External Marks:** 60

**Course Prerequisites:** Engineering Physics, Engineering Chemistry

**Course Objectives:**

1. The basic concepts of semiconductor physics are to be reviewed.
2. Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3. The application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
4. The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
5. The need of transistor biasing and its significance is explained. The quiescent point or operating point is explained.

**Course Outcomes:**

At the end of this course the student will able to:

1. Understand the basic concepts of semiconductor physics.
2. 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.
3. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
4. Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
5. Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.

**UNIT-I** **(10 Lectures)**

**Semi Conductor Physics :** Insulators, Semi conductors, and Metals classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semi conductors, extrinsic semi conductors, drift and diffusion, charge densities in

semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

**UNIT-II (10 Lectures)**

**Junction Diode Characteristics :** 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, energy band diagram of PN junction Diode.

**Special Semiconductor Devices**: Zener Diode, Breakdown mechanisms, LED, LCD, Photo Diode, Varactor diode, Tunnel Diode, Construction, operation and characteristics and application of all the diodes, comparison of various diodes in terms of doping levels.

**UNIT-III RECTIFIERS AND FILTERS (8 Lectures)**

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, Capacitor filter, comparison of various filter circuits in terms of ripple factors. Voltage regulators , zener diode regulator, IC regulator .

**UNIT-IV TRANSISTOR CHARACTERISTICS (10 Lectures)**

**BJT:** Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, and characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, typical transistor junction voltage values.

**FET:** FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

**UNIT-V TRANSISTOR BIASING AND THERMAL STABILIZATION**

**(7 Lectures)**

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.

**Text Books:**

1. Electronic Devices and Circuits by J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition,2011.

2. Integrated Electronics by Jacob Millman,C.Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2009.

**Reference Books:**

1. Electronic Devices and Circuits by K. Satya Prasad, VGS Book Links,2014.
2. Electronic Devices and Circuits by Bell, Oxford,2008.

**Web References:**

1. www.physics.info
2. www.allaboutcircuits.com
3. www.academia.edu

**B.Tech. II Year I Semester** **Course Structure**

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# MATHEMATICS-III

## (NUMERICAL METHODS AND FOURIER ANALYSIS)

(Common to All Branches)

**Internal Marks: 40**

**Course Code:** P18BST07 **External Marks: 60**

Course Prerequisite: Mathematics-I, Mathematics-II (P18BST01)

**Course Objectives**: To learn

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 Fourier series of a periodic function and its application to the solution of partial differential equations.
3. To calculate the Fourier transform or inverse transform of common functions including Delta, Unit-Step.
4. Learn to find Solution of One dimensional Wave, Heat equation

**Course Outcomes**:

1. After learning the contents of this paper the student must be able to Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.
2. Solve ordinary differential equations numerically using Euler's and RK method.
3. Analyze the spectral characteristics of signals using Fourier analysis. Classify systems based on their properties and determine the response
4. Find Fourier series and Fourier transforms for certain functions.
5. Identify/classify and solve the different types of partial differential equations.

### UNIT-I SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL QUATIONS AND INTERPOLATION (10 Lectures)

Introduction- Bisection method – Method of false position – Newton- Raphson method. Interpolation: Introduction- Forward differences- Backward differences. Newton's formula for interpolation- Lagrange's interpolation formula.

**UNIT-II NUMERICAL INTEGRATION AND SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS (9 Lectures)**

Trapezoidal rule- Simpson's 1/3rd and 3/8th rule Solution of ordinary differential equations by Taylor's series- Euler's method –Modified Euler's method, Runge- Kutta method of fourth order.

**UNIT-III FOURIER SERIES (9 Lectures)**

Introduction- Determination of Fourier coefficients – even and odd functions –change of interval– Half-range sine and cosine series.

**UNIT-IV FOURIER TRANSFORMS (8 Lectures)**

Fourier integral theorem (only statement) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier Transforms.

**UNIT-V FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS**

**(9 Lectures)**

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. Method of separation of Variables- Solution of One dimensional Wave, Heat equation.

**Text Books:**

1.Higher Engineering Mathematics byB.S.Grewal, Khanna Publishers, 43rd Edition.

2. Engineering Mathematics by N.P.Bali, Lakshmi Publications.

**Reference Books:**

1.Advanced Engineering Mathematics by Erwin Kreyszig,Wiley-India,$10^{th}$ edition.

2. Advanced Engineering Mathematics by Micheael Greenberg, Pearson edn,$9^{th}$edition.

3. Advanced engineering mathematics with MATLAB by Dean G. Duffy, CRC Press.

4. Advanced Engineering Mathematics by Peter O'neil, Cengage Learning.

5.Engineering Mathematics by Srimanta Pal, Subodh C.Bhunia, Oxford UniversityPress.

6. Higher Engineering Mathematics by Dass H.K., Rajnish Verma. Er, S. Chand Co.Pvt. Ltd, Delhi.

**Web Resources:**

1. www.tutorial.math.lamar.edu
2. www.mathworld.wolfram.com
3. www.nptel.ac.in

**B.Tech. II Year I Semester** **Course Structure**

| L | T | P | C |
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# THERMAL AND HYDRAULIC PRIME MOVERS

**Internal Marks:** 40

**Course Code:** P18MET09 **External Marks:** 60

**Course Prerequisite:** Basic knowledge of fluids

**Course objectives:**

1. To make the student learn about the basic air standard cycles and the constructional features, operational details of various types of internal combustion engines.
2. To train the student in the aspects of steam formation and its utilities through the standard steam data tables and charts.
3. To impart the knowledge of gas turbine fundamentals, the governing cycles and the methods to improve the efficiency of gas turbines
4. To make the student learn about the constructional features, operational details of various types of pumps and hydraulic turbines
5. 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:**

After completion of the course the student will be able to

1. Gain the knowledge of various types of internal combustion engines and calculate the performance of different types of internal combustion engines
2. Understand steam formation and the standard steam data tables and charts.
3. understand and the methods to improve the efficiency of gas turbines
4. Gain the knowledge of various types of fluid jets, pumps, hydraulic turbines and working and performance
5. Gain the knowledge of various types of hydro electric power plants, estimation and calculation of different loads by factors.

**UNIT-I** **(9 Lectures)**

**Air standard cycles** – Carnot, Otto, Diesel, Dual Combustion cycles -Description and representation on P–V and T-S diagram, Thermal Efficiency.

**I.C Engines:** Classification, working principles – valve and port timing diagrams, Engine systems - fuel injection, carburetion, ignition, cooling and Lubrication.

**UNIT-II (10 Lectures)**

Properties of Steam and use of Steam Tables- T-S and H-S Diagrams

**Vapor Power Cycles:** Carnot Cycle-Rankine Cycle- Analysis of simple Rankine Cycle and Re-heat cycle.

**Steam Turbines:** Schematic layout of steam power plant, Classification of Steam Turbines- Impulse Turbine and Reaction Turbine- Compounding in Turbines- Velocity Diagrams for simple Impulse and Reaction Turbines- Work done & efficiency.

**UNIT-III (9 Lectures)**

**Gas Turbines:** Simple gas turbine plant-ideal cycle, Classification of Gas Turbines - closed cycle -open cycle-. Efficiency, Work ratio and optimum pressure ratio for simple gas turbine cycle. Actual cycle, analysis of simple cycles & cycles with inter cooling, reheating and Regeneration.

**Impact Of Jets:** Impulse momentum equation, Impact of Jet on stationary and moving vanes (flat and curved).

**UNIT – IV (9 Lectures)**

**Pumps:** Types of pumps, Centrifugal and Reciprocating pumps - Main components, Working principle, classifications, Performance and characteristic curves.

**Hydraulic Turbines:** Classification of turbines; Working principle, Efficiency for Pelton Wheel, Francis and for Kaplan turbines; Governing of turbines; Performance and characteristic curves

**UNIT – V (8 Lectures)**

**Hydro Power:** Components of Hydro electric power plant: pumped storage systems, Estimation of water power potential; Estimation of load on turbines: load curve, load factor, capacity factor, utilization factor, diversity factor, load – duration curve, firm power, secondary power, prediction of load.

**Text Books:**

1. Thermal Engineering by Rajput, Lakshmi publications, 2015.
2. Thermal engineering by M.L.Mathur and F.S.Mehta, Jain Brothers, 2015.

3. Hydraulics & Fluid Mechanics by P.N. Modi and S.M. Seth, Text Books House,Delhi, 2017.
4. Fluid Mechanics & Hydraulic Machinery by A.K.Jain, , Khanna Publishers, Delhi, 1998.

**Reference Books:**

1. Fluid Mechanics by Victor.L.Streeter, McGraw Hill Higher Education; 8th Revised edition edition,1985.
2. Introduction to Fluid Mechanics by Edward .J. Shaughnessy Jr, Oxford University Press; 1 edition, 2004.
3. Fluid Mechanics & Its Applications by Vijay Gupta, Santhosh.k.Gupta, New Academic Science; 3rd Revised edition edition 2012.
4. Fluid Mechanics & Fluid power Engineering by Dr D.S.Kumar, Kataria, SK & Sons,2009.
5. Water Power Engineering by M.M Desumukh, Dhanpati Rai Publications,2010.

**Web References:**

1. www.en.wikipedia.org
2. www.wartsila.com
3. www.engineeringtoolbox.com
4. www.hydroworld.com
5. www.iitg.ac.in

**B.Tech. II Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

## ELECTRICAL CIRCUITS LAB

**Internal Marks:** 40

**Course Code:** P18EEL01 **External Marks:** 60

**Course Prerequisites:** Basic electrical Engineering & Electrical circuit Analysis

**Course Objectives:**

1. To verify the Thevenin's, Norton's and Maximum Power Transfer Theorems.
2. To verify the Compensation Theorem and Reciprocity Theorem.
3. To draw the Locus Diagrams of RL and RC Series Circuits and to find the Series and Parallel Resonance frequency.
4. To determine the Self, Mutual Inductances, Coefficient of coupling and Z and Y Parameters.
5. To determine the Transmission, hybrid parameters and Parameters of a choke coil.

**Course Outcomes:**

At the end of this course, students will able to

1. Verify the Thevenin's and Norton's and Maximum Power Transfer Theorems Practically.
2. Verify the Compensation Theorem and Reciprocity Theorem Practically.
3. Draw the Locus Diagrams of RL and RC Series Circuits and to find the Series and Parallel Resonance frequency.
4. Determine the Self, Mutual Inductances, Coefficient of coupling and Z and Y Parameters.
5. Determine the Transmission, hybrid parameters and Parameters of a choke coil.

**The following experiments are to be conducted:**

1. Verification of Thevenin's and Norton's Theorems.
2. Verification of Maximum Power Transfer Theorem.
3. Verification of Compensation Theorem.
4. Verification of Reciprocity Theorems.
5. Locus Diagrams of RL and RC Series Circuits.
6. Series and Parallel Resonance.
7. Determination of Self, Mutual Inductances and Coefficient of coupling.
8. Z and Y Parameters.
9. Transmission and hybrid parameters.
10. Parameters of a choke coil.

**B.Tech. II Year I Semester** **Course Structure**

| L | T | P | C |
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| 0 | 0 | 3 | 1.5 |

## ELECTRICAL MACHINES – I LAB

**Internal Marks:** 40

**Course Code:** P18EEL02 **External Marks:** 60

**Course Prerequisite:** Electrical Machines -I& Basic Electrical Lab

**Course Objectives:**

1. To plot the magnetizing characteristics of DC shunt generator.
2. To control the speed of the DC motors.
3. Determine and predetermine the performance of DC machines.
4. To predetermine the efficiency and regulation of transformer.

**Course Outcomes**

1. Able to understand the open circuit characteristics of DC shunt generator.
2. Able to understand the speed control methods for dc motors.
3. Able to understand the performance characteristics of various DC machines.
4. Able to find the efficiency, regulation and equivalent circuit parameters of transformers.

**Any 10 of the following experiments are to be conducted**

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Brake test on DC shunt motor. Determination of performance curves.
4. Load test on DC compound generator. Determination of characteristics.
5. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
6. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
7. Brake test on DC compound motor. Determination of performance curves.
8. Load test on DC series generator. Determination of characteristics.
9. O.C. & S.C. Tests on Single phase Transformer
10. Sumpner's test on single phase transformers
11. Scott connection of transformers
12. Parallel operation of Single phase Transformers

**B.Tech. II Year II Semester** **Course Structure**

| L | T | P | C |
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# ELECTRICAL MACHINES-II

**Internal Marks:** 40

**Course Code:** P18EET04 **External Marks:** 60

**Course Prerequisites:** Basic Electrical and Electronics Engineering, Electrical Machines-I

**Course Objectives:**

6. To assimilate the concepts of 3-Phase induction motor.
7. To understand the starting and testing methods of 3-Phase induction motor.
8. To analyze the performance, losses and efficiency of single phase induction motor.
9. To determine the regulation of synchronous generator.
10. To analyze the performance of synchronous motor.

**Course Outcomes (COs):**

1. Able to assimilate the concepts of 3-Phase induction motor.
2. Able to understand the starting and testing methods of 3-Phase induction motor.
3. Able to analyze the performance, losses and efficiency of single phase induction motor.
4. Able to determine the regulation of synchronous generator.
5. Able to analyze the performance of synchronous motor.

**UNIT-I 3-PHASE INDUCTION MOTORS (12 Lectures)**

Construction details of cage and wound rotor machines - production of rotating magnetic field - principle of operation - 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 – Harmonics.

**UNIT-II CHARACTERISTICS, STARTING AND TESTING METHODS OF INDUCTION MOTORS (12 Lectures)**

Torque equation - expressions for maximum, starting and running torque - torque slip characteristics - double cage and deep bar rotors - crawling and cogging – speed control of induction motor with V/f method – no load and blocked rotor tests - circle diagram– methods of starting.

**UNIT-III SINGLE PHASE INDUCTION MOTORS (12 Lectures)**

Single phase induction motors – Constructional features - Problem of starting–Double field revolving theory– Cross field revolving theory - Starting methods - equivalent circuit – Brake test on single phase induction motors.

**UNIT-IV SYNCHRONOUS GENERATORS (14 Lectures)**

Constructional features of non–salient and salient pole type– Armature windings – Distributed and concentrated windings – Distribution and Pitch factors –E.M.F equation– Improvement of waveform - armature reaction.

**Voltage Regulation of Synchronous generator**

Voltage regulation by synchronous impedance method– MMF method and Potier triangle method–Phasor diagrams–Synchronizing power – Load sharing – Slip Test –Methods of Phase Sequence -Numerical problems.

**UNIT-V SYNCHRONOUS MOTOR (10 Lectures)**

Synchronous Motor working principle and theory of operation– Phasor diagram – Starting torque–V & Inverted V curves –Synchronous Condenser – Hunting and it's suppression – Methods of starting – Applications- Numerical problems.

**Text Books:**

1. Electrical Machines by P.S. Bimbra, Khanna Publishers, 7th edition, 2007.
2. Electrical Machines by I.J Nagrath & D.P Kothari, Tata Mc Graw-Hill, 3rd edition, 2009.
3. Electrical Machines by S.K. Bhattacharya, 2014.
4. Electrical Machines by J.B. Gupta, Kataria Publications, 2015.

**Reference Books:**

1. Performance and Design of D.C Machines by A.E. Clayton & Hancock, BPB Publishers, 3rd edition, 2004.
2. Performance and Design of A.C Machines by M.G Say, BPB Publishers, 7th Edition,2002.
3. Electric Machinery by A.E.Fitzgerald, C Kingsley and S Umans, McGraw Hill, 2013.
4. Performance and Design of DC Machines by Clayton & Hancock, BPB Publishers, 2004.
5.Electro mechanics – I (D.C Machines) by S. Kamakshaiah, Hi-Tech Publishers, 2010.

**Web References:**

1. www.electrical4u.com
2. www.indiabix.com

**B. Tech II Year II Semester** **Course Structure**

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# CONTROL SYSTEMS

**Internal Marks: 40**

**Course Code: P18EET05** **External Marks: 60**

**Course Prerequisites:** Laplace Transformation & Differential Equations.

**Course Objectives:**

1. Tolearnthemathematicalmodellingofphysicalsystemsandtouseblockdiagram algebra and signal flow graph to determine overall transfer function
2. Toanalyzethetimeresponseoffirstandsecondordersystemsandimprovementof Performance by PI, PD & PID controllers
3. To investigate the stability of closed loop systems using Routh's stability criterion and the analysis by root locus method.
4. To present the Frequency Response approaches for the analysis of linear time invariant (LTI)systems using Bode plots, polar plots and Nyquist stabilitycriterion.Todiscussbasicaspectsofdesignandcompensationoflinearcontrolsyste msusing Bode plots.
5. Abilitytoformulatestatemodelsandanalyzethesystems.Topresenttheconceptsof Controllability and Observability.

**Course Outcomes:** After completion of the course the student will be

1. Ability to derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
2. Capabilitytodeterminetimeresponsespecificationsofsecondordersystemsandto determine error constants.
3. Acquirestheskilltoanalyzeabsoluteandrelativestabilityof LTIsystemsusing Routh's stability criterion and the root locus method.
4. Capable to analyze the stability of LTI systems using frequency response methods and able to design Lag, Lead, Lag-Lead compensators to improve system performance from Bode diagrams.
5. Abilitytorepresentphysicalsystemsasstatemodelsanddeterminetheresponse. Understanding the concepts of controllability and observability.

**UNIT-I MATHEMATICALMODELING OF CONTROL SYSTEMS**

**(15 Lectures)**

Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, Transfer function of linear system, Differential equations of electrical networks, mechanical systems.

Transfer Function of DC Servomotor & AC Servomotor- Synchro transmitter and receiver - Block diagram algebra–Representation by Signal flow graph-Mason's gain formula.

**UNIT-II TIMERESPONSEANALYSIS (10 Lectures)**

Standard test signals-Time response of first and second order systems-Time domain specifications-Steady state errors and error constants–Effects of PI, PD and PID control systems.

**UNIT-III STABILITY ANALYSIS IN S-DOMAIN (15 Lectures)**

The concept of stability–Routh's stability criterion–limitations of Routh's stability–Root locus concept -construction of root loci (Simple problems).

Introduction to Frequency domain specifications-Bodediagrams-transferfunctionfromthe BodeDiagram-PhasemarginandGainmargin-StabilityAnalysisfromBodePlots.

**UNIT-IV FREQUENCY RESPONSEANALYSIS & CLASSICAL CONTROL DESIGN TECHNIQUES (10 Lectures)**

Lag, Lead, Lag-Lead compensators, design of compensators – using Bode plots. Polar Plots, Nyquist plot – Stability criterion.

**UNIT-V STATESPACEANALYSIS OF LTISYSTEMS (10 Lectures)**

Concepts of state, state variables and state model- state space representation of transfer function, Transfer function from State Space Representation, Solving the time invariant state equations –State transition matrix and it's Properties – Concepts of Controllability and Observability.

**Text Books:**


1. Control Systems principles and design by M.Gopal, TataMcGraw Hill education PvtLtd., 4th Edition, 2014.
2. Automatic control systems by Benjamin C.Kuo, PrenticeHall of India,2nd Edition, 2012.

**Reference Books:**


1. Modern Control Engineering by Kotsuhiko Ogata, PrenticeHall of India, 2010.
2. Control Systems by Manik Dhanesh N, Cengagepublications, 2012.
3. ControlSystems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5$^{th}$Edition, 2015.
4. Control Systems Engineering by S.Palani, Tata McGraw Hill Publications, 2016.


**Web references:**

1. www.easyengineering.net

2.www.books.google.co.in

**B. Tech II Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# POWER SYSTEMS-I

**Internal Marks: 40**

**Course Code: P18EET06** **External Marks: 60**

**Course Prerequisite:** Electrical Circuit Analysis, Thermal & Hydraulic Prime Movers.

**Course Objectives:**

1. To study the electrical power generation in India and type of power plants.
2. To study the thermal power plant.
3. To study the working principle of nuclear power plant.
4. To study the constructional and operation of air and gas Insulated substations.
5. To study the different types of load curves and tariffs applicable to consumers.

**Course Outcomes:**

Students are

1. Able to understand the electrical power generation in India and type of power plants.
2. Able to understand the thermal power plant.
3. Able to understand the working principle of nuclear power plant.
4. Able to understand the constructional and operation of air and gas Insulated substations.
5. Able to understand the different types of load curves and tariffs applicable to consumers.

**UNIT-I CHOICE OF POWER STATIONS AND UNITS (9 Lectures)**

Growth of electrical power generation in India, Typical layout of power system, Types of power stations – choice of generation - size of generator units - effect of variable load on plant operation and design.

**UNIT-II (8 Lectures)**

**Thermal power stations**: Selection of site for thermal station – layout and salient features - boilers - economizers - condensers - coal handling - feed water treatment – electro static precipitator.

**UNIT-III** **(8 Lectures)**

**Nuclear Power Stations**: Principles of nuclear power station – basic factors in designing of reactors - pressurized water reactor – boiling water reactor - CANDU reactor - liquid metal cooled reactor – shielding and safety precautions

**UNIT-IV SUBSTATIONS** **(10 Lectures)**

**Air Insulated Substations**

Indoor & Outdoor substations, Substations layouts of 33/11KV 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, different types of gas insulated substations, single line diagram of gas insulated substations, constructional aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

**UNIT-V ECONOMICASPECTS OFPOWERGENERATION&TARIFF**
**(10 Lectures)**

**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, power 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. Elements of Electrical power station design by M.V. Deshpande , Wheeler Publishing Co,2010.
2. Generation of Electric Power by B.R. Gupta, S. Chand & Company Ltd, 2014.


**Reference Books:**


1. Solar power Engineering by B.S.Magal, TMH Publishing Company. Ltd., New Delhi, 2005.
2. Power plant Technology by M.M.el.Wakil, TMH Publishing Company. Ltd.,New Delhi, 2014.

3. Electrical power systems theory and practice –PHI", by M. N. Bandyopadhyay, 2006.
4. Generation distribution and utilization of electrical energy by C.L. Wadhwa, New Age International (P) Limited, 2005.
5. Renewable Energy Resources by John Twidell & Tony Weir, Taylor & Francis, 2nd Edition, 2007.

**Web Resources:**

1. www.nptel.iitm.ac.in
2. www.solarsystem.nasa.gov
3. www.microhydropower.net

**B. Tech II Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

# DATA STRUCTURES

**Internal Marks: 40**

**Course Code: P18CST02** **External Marks: 60**

**Course Prerequisite:** C-Programming

**Course Objectives:**

1. Comprehensive knowledge of data structures and ability to implement the same in software applications.
2. Exposure to algorithmic complexities, recursive algorithms, searching techniques.
3. Exposure to sorting technique, Applying stack techniques for logical operations.
4. Applying queue techniques for logical operations, Exposure to list representation models in various types of applications.
5. Implementation of tree in various forms, Advanced understanding of other variants of trees and their operations.
6. Orientation on graphs, representation of graphs, graph traversals, spanning trees Graphs.

**Course Outcomes:** At the end of this course the student will able to:

**UNIT-I** **(8 Lectures)**

**Data Structure, Recursion** &**Searching:** Preliminaries of algorithm, Algorithm analysis and complexity. **Data Structure:** Definition, types of data structures.

**Recursion:** Definition, Design Methodology and Implementation of recursive algorithms, Types of recursion (Linear, binary and Tail), recursive algorithms for factorial function, GCD Computation, Fibonacci sequence, Towers of Hanoi.

**Searching:** List Searches using Linear Search, Binary Search, Fibonacci Search

**UNIT-II** **(10 Lectures)**

**Sorting Techniques:** Basic Concepts, Sorting by: Insertion (Insertion Sort), Selection(heap sort), Exchange(Bubble sort, Quick Sort), distribution(Radix sort) and merging(Merge sort) Algorithms.

**Stacks:** Basic Stack operations, Representation of a stack using arrays, Stack Applications: Reversing list, Infix to postfix transformation.

**UNIT-III** **(8 Lectures)**

**Queues:** Introduction, Representation of a Queue using arrays, Queue Operations, Applications of queues- Round Robin Algorithm, Circular Queues, Priority Queues.

**Linked List:** Introduction, single linked list, representation of a linked list in memory, Operations on a single linked list, Reversing a single linked list, applications: single linked list to represent polynomial expressions, Circular linked list, Double linked list.

**UNIT-IV** **(9 Lectures)**

**Trees:** Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays, operations on a Binary tree, Binary Tree Traversals (recursive).

**Advanced Tree Concepts:** Binary search tree, Basic concepts, BST operations: Searching, insertion, deletion, Balanced search trees-AVL Trees-Definition and Examples only, B-Trees Definition and Examples only, Red-Black Trees-Definitions and Examples only (No operations )

**UNIT-V** **(10 Lectures)**

**Graphs:** Basic concepts, Graph Representations- Adjacency matrix, Adjacency lists, Graph algorithms: Graph Traversals (BFS & DFS), applications: Dijkstra's shortest path, Transitive closure, Minimum Spanning Tree using Prim's & Kruskal's Algorithm .

**Text Books:**


1. "Data Structures", by Richard F, Gilberg , Forouzan, Cengage, 2011.
2. "Data Structures and Algorithms", by G.A.V.Pai, TMH 2008.


**Reference Books:**


1. "Data Structure with C", by Seymour Lipschutz, TMH,2010.
2. "Classic Data Structures", by Debasis, Samanta, PHI 2009.
3. "Fundamentals of Data Structure in C", by Horowitz,Sahni, Anderson Freed, UniversityPress,2014.


**Web References:**

1. www.cs-fundamentals.com
2. www.geeksforgeeks.org
3. www.nptelvideos.in

**B. Tech II Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# SWITCHING THEORY AND LOGIC DESIGN

**Internal Marks: 40**

**Course Code: P18ECT03** **External Marks: 60**

**Course Prerequisite:** Set theory (Mathematics), Basic logic operations like bit wise operations, Shift operations, flow charts, ASCII codes, etc. (Computer Programming)

**Course Objectives:**

1. To learn basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems
2. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. To implement simple logical operations using combinational logic circuits
4. To design combinational logic circuits, sequential logic circuits
5. To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
6. To implement synchronous state machines using flip flops.

**Course Outcomes:** At the end of this course the student will able to:

1. Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.
2. Manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. Design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
4. Design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

**UNIT-I** **(8 Lectures)**

**Number Systems**: Base Conversion Methods, Complement of Numbers, Codes - Binary codes, Binary Coded Decimal code and its properties, Unit distance codes, Alpha Numeric codes, Error detecting and correcting codes.

**Boolean Algebra**: Basic theorems and properties

**Switching Functions:** Canonical and Standard forms, Algebraic simplification of digital logic gates, Properties of XOR gates , Universal gates, Multilevel NAND/NOR realizations.

**UNIT-II MINIMIZATION AND DESIGN OF COMBINATIONAL CIRCUITS (10 Lectures)**

Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six variable Maps, Prime and Essential Implications, Don't care Map entries, Using the maps for Simplifying, Tabular method, Partially specified Expressions, Multi-Output Minimization, Minimization and combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code Converters, Wired Logic, Tristate Bus system, Practical Aspects related to Combinational Logic Design, Hazards and Hazard Free Relations.

**UNIT-III SEQUENTIAL MACHINES FUNDAMENTALS (8 Lectures)**

Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, the Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D- Latch Flip-Flop, the Clocked T Flip-Flop, the clocked J-K Flip-Flop, Design of a clocked Flip-flop, conversion from one Type of Flip-Flop to another, Timing and Triggering considerations, Clock skew.

**UNIT-IV SEQUENTIAL CIRCUITS DESIGN AND ANALYSIS (9 Lectures)**

Introduction, State diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization using Flip-Flops.

**Counters:** Design Of Single Mode Counters; Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter using Shift Register.

**UNIT-V SEQUENTIAL CIRCUITS (10 Lectures)**

Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

**Algorithmic State Machines:** Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

**Text Books:**


1. "Switching & Finite Automata theory", by Zvi Kohavi and Neeraj K Jha,Cambridge ,3rd Edition,2010.
2. "Digital Design", by Morris Mano, PHI, 3rd Edition,2012.


**Reference Books:**


1. "Introduction to Switching Theory and Logic Design", by Fredriac J Hill, Gerald R Peterson, John Willey and Sons Inc, 3rd Edition,2014.
2. "Digital Fundamentals", by A Systems approach – Thomas L Floyd, Pearson, 2013.
3. "Digital Logic Design", by Ye Brian and Holds Worth, Elsevier,2012.
4. "Fundamentals of Logic Design", by Charles H. Roth, Thomson Publications ,5thEdition, 2014.
5. "Digital Logic Applications and Design", by John M. Yarbrough, Thomson Publications, 2006
6. "Digital logic and state machine design", by Comer, Oxford, 3rd edition,2013.


**Web references:**


1. www.geeksforgeeks.org
2. www.circuitglobe.com
3. www.ee.surrey.ac.uk
4. www.circuitstoday.com

**B. Tech- II Year II Semester** **Course structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# MATHEMATICS-IV

**Internal Marks: 40**

Course code: P18BST08 **External marks: 60**

Course Prerequisite: Mathematics-I, Mathematics-II

**Course objectives:**

1. To learn the properties of beta and gamma functions.
2. To learn the knowledge on functions of a complex variable.
3. To learn the concepts of complex integration and series expansions.
4. To learn the concept of complex integration using residues.
5. To learn the concept of conformal mapping.

**Course Outcomes**: Students will be able to

1. Evaluate the improper integrals using beta and gamma functions.
2. Have the knowledge on functions of complex variables.
3. Understand the concepts of exponential, trigonometry, hyperbolic functions and their properties.
4. Understand about conformal mapping

**UNIT-ISPECIAL FUNCTIONS (9 Lectures)**

Beta and Gamma functions- Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals.

**UNIT-II FUNCTIONS OF A COMPLEX VARIABLE (9 Lectures)**

Introduction–Continuity–Differentiability –Analyticity–Properties –Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thompson method.

**UNIT-III INTEGRATION AND SERIES EXPANSIONS (9 Lectures)**

Complex integration: Line integral – Cauchy's integral theorem, Cauchy's integral formula, Generalized integral formula (all without proofs)- Radius of convergence– Expansion in Taylor's series, Maclaurin's series and Laurent series.

**UNIT-IVINTEGRATION USING RESIDUES (9 Lectures)**

Types of Singularities: Isolated, pole of order m, essential - Residues – Residue theorem (without proof) - Evaluation of real integrals of type (a) $\int_0^{2\pi} f(\sin\theta, \cos\theta)d\theta$ (b) $\int_{-\infty}^{\infty} f(x)dx$ (c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$

**UNIT V: Conformal Mapping: (9 Lectures)**

Transformation by exp z, lnz, z^2, z^n(n positive integer), Sin z, cos z, z +a/z- Translation, rotation, inversion and bilinear transformation – fixed point – cross ratio – properties – invariance of circles.

**Text Books:**

1. Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers, 43rd Edition.
2. Engineering Mathematics by N.P.Bali, Lakshmi Publications.

**Reference Books:**

1. Advanced Engineering Mathematicsby Erwin Kreyszig, Wiley-India, 10th Edition.
2. Advanced Engineering Mathematics by Micheael Greenberg, Pearson edn, 9th edition.
3. Advanced engineering mathematics with MATLAB", by Dean G. Duffy, CRC Press
4. Advanced Engineering Mathematics by Peter O'neil, Cengage Learning.
5. Engineering Mathematics by Srimanta Pal, Subodh C.Bhunia, Oxford University Press.
6. Higher Engineering Mathematics by Dass H.K., Rajnish Verma. Er., S. Chand Co. Pvt. Ltd, Delhi.

**Web Resources:**

1. www.tutorial.math.lamar.edu
2. www.mathworld.wolfram.com
3. www.nptel.ac.in

**B. Tech II Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

## SEMICONDUCTOR DEVICES AND CIRCUITS LAB

**Internal Marks: 40**

**Course Code: P18ECL01** **External Marks: 60**

**Course Prerequisite:** Engineering Physics, Engineering Chemistry

**Course Objectives:**

1. To create interest in Hardware Technology
2. To identify active and passive components
3. To study multimeter, Function Generator, Regulated Power Supply and CRO
4. To analyze the V-I characteristics of diodes and transistor
5. To understand the fabrication of electronic circuits on PCB

**Course Outcomes:** At the end of this course the student will able to do:

**Electronic Workshop Practice:**

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

**List of Experiments: (Minimum of Ten Experiments has to be performed)**

1. P-N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias)
   Part B: Silicon Diode (Forward Bias only)
2. Zener Diode V-I Characteristics
3. Zener Diode as Voltage Regulator
4. Rectifiers (without filter)
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
5. Rectifiers ( with filter)
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier

6. BJT Characteristics (CE Configuration)
   Part A: Input Characteristics
   Part B: Output Characteristics
7. BJT Characteristics (CB Configuration)
   Part A: Input Characteristics
   Part B: Output Characteristics
8. FET Characteristics (CS Configuration)
   Part A: Drain Characteristics
   Part B: Transfer Characteristics
9. SCR Characteristics
10. UJT Characteristics
11. Transistor Biasing (self biasing)
12. CRO Operation and its Measurements

**Equipment Required:**

1. Regulated Power supplies
2. Analog /Digital Storage Oscilloscopes
3. Analog /Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

**B. Tech II Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

## ELECTRICAL MACHINES-II LAB

**Internal Marks: 40**

**Course Code: P18EEL03** **External Marks: 60**

**Course Prerequisites:** BEEE Lab, Electrical Machines-II.

**Course objectives:**

1. To control the speed of three phase induction motors.
2. To determine the performance characteristics of three phase and single phase induction motors.
3. To improve the power factor of single phase induction motor.
4. To predetermine the regulation of three–phase alternator by various methods.
5. To find $X_d$/ $X_q$ ratio of alternator and asses the performance of three–phase synchronous motor.

**Course Outcomes:**

1. Able to understand the speed control of three phase induction motor.
2. Able to assess the performance of single phase and three phase induction motors.
3. Able to understand the power factor of single phase induction motor with & without capacitor.
4. Able to understand the pre determination of regulation of three–phase alternator by various methods.
5. Able to find the $X_d$/ $X_q$ ratio of alternator and asses the performance of three–phase synchronous motor.

**List of Experiments: (minimum 10 experiments has to be performed)**

1. Brake test on three phase Induction Motor
2. No–load & Blocked rotor tests on three phase Induction motor
3. Regulation of a three –phase alternator by synchronous impedance method.
4. Regulation of a three –phase alternator by MMF method
5. Regulation of three–phase alternator by Potier triangle method
6. V and Inverted V curves of a three—phase synchronous motor.
7. Determination of $X_d$ and $X_q$ of a salient pole synchronous machine
8. Equivalent circuit of single phase induction motor

9. Speed control of induction motor by V/f method.
10. Determination of efficiency of three phase alternator by loading with three phase induction motor.
11. Power factor improvement of single phase induction motor by using with & without capacitors.
12. Brake test on 1-phase induction motor.

**B. Tech II Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

# DATA STRUCTURES LAB

**Internal Marks: 40**

**Course Code: P18CSL02** **External Marks: 60**

**Course Prerequisite:** Data Structures

**Exercise 1:** Write recursive program for the following

a) Write recursive C program for calculation of Factorial of an integer
b) Write recursive C program for calculation of GCD (n, m)
c) Write recursive program which computes the $n^{th}$ Fibonacci number
d) Write recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

**Exercise 2:**

a) Write recursive C program for functions to perform linear search for a Key value in a given list.
b) Write recursive C program for functions to perform Binary search for a Key value in a given list.
c) Write recursive C program for functions to perform Fibonacci search for a Key value in a given list.

**Exercise 3:**

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order
b) Write C program that implement Quick sort, to sort a given list of integers in ascending order
c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

**Exercise 4:**

a) Write C program that implement heap sort, to sort a given list of integers in ascending order
b) Write C program that implement radix sort, to sort a given list of integers in ascending order

c) Write C program that implement merge sort, to sort a given list of integers in ascending order

**Exercise 5:**

a) Write C program that implement stack (its operations) using arrays
b) Write C program that implement stack (its operations) using Linked list

**Exercise 6:**

a) Write a C program that uses Stack operations to Convert infix expression into postfix expression
b) Write C program that implement Queue (its operations) using arrays.
c) Write C program that implement Queue (its operations) using linked lists

**Exercise 7:**

a) Write a C program that uses functions to create a singly linked list
b) Write a C program that uses functions to perform insertion operation on a singly linked list
c) Write a C program that uses functions to perform deletion operation on a singly linked list

**Exercise 8:**

a) Write a C program to Create a Binary Tree of integers
b) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

**Exercise 9**: Write a C program for BST operations (insertion, deletion)

**Exercise 10:**

a) Write a C program for finding minimum spanning tree in a graph by using Prim's algorithm.
b) Write a C program for finding minimum spanning tree in a graphby using Kruskal's algorithm.

**B.Tech. III Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

## ELECTRICAL MEASUREMENTS & INSTRUMENTATION

**Internal Marks:** 40

**Course Code:** P18EET07 **External Marks:** 60

**Course Prerequisite:** Basic Electrical and Electronics Engineering, Electrical Circuit Analysis.

**Course Objectives:**

1. To give overview regarding different measurement techniques employed in industrial applications.
2. To discuss about various instruments used in electrical measurements.
3. To study the operation of C.T's and P.T's.
4. To gain the concept of measuring resistance, inductance, capacitance by using bridge circuits and also the operation of digital instruments.
5. To discuss the working principles and applications of transducers.

**Course Outcomes:**

1. Analyze types of instruments and principle of operation of various analog instruments used in laboratories and field practice.
2. Choose or design various measuring instruments for a variety of applications in electrical field.
3. Gain the knowledge on operation and maintenance of CTs and PTs.
4. Measure the resistance, inductance, and capacitance by selecting appropriate technique and analyze the operation of different digital instruments.
5. Analyze the working principle of transducers to measure the non electrical quantities.

**UNIT – I** (8 Hours)

**Instruments:** Classification – Deflecting, Controlling and Damping torques – PMMC, MI type instruments – Expression for torque.

Extension of ranges using Shunts and Multipliers, Single phase and three phase dynamometer wattmeter, LPF and UPF

**UNIT - II** (9 Hours)

**Measuring Instruments:** Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading, three phase energy meter.

Construction and operation of Power factor meters, Frequency meters, Synchro – scopes.

**UNIT – III** (8 Hours)

**Instrument Transformers:** Need of instrument transformers, construction and Principle of operation of C.T & P.T, Errors and testing.

**Magnetic Measurements:** Ballistic galvanometer, Calibration by Hibbert's magnetic standard, Flux meter, Determination of B-H curve.

**UNIT – IV** **(8 Hours)**

**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 – Measurement of inductance –Maxwell's bridge – Anderson's bridge–Schering Bridge– Wien's bridge.

**Digital Instruments:** Advantages of Digital Instruments**,** Digital voltmeters and Digital ammeters Principle of operation of Ramp, Integrating type DVMs – Digital frequency meter-digital phase angle meter.

**UNIT - V** **(6 Hours)**

**Transducers:** Definition of transducers – Classification of transducers – Advantages of Electrical transducers– Principle operation of resistor, inductor, LVDT and capacitor transducers – LVDT Applications.

Measurement of angular Velocity and Acceleration- Thermistors – Thermocouples — Piezo electric transducers.

**Text Books:**


1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney, Dhanpat Rai & Co 17th edition2000.
2. Electrical Measurements and measuring Instruments - by E.W. Golding and F.C. Widdis, 5th Edition, Wheeler Publishing, 1999.


**Reference Books:**


1. Electrical Measurements - by Buckingham and Price, Prentice - Hall, 1961
2. Electrical Measurements by Harris John Wiley.
3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.
4. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.


**Web Resources:**

1. http://nptel.ac.in/courses/108105053/pdf/L-42(GDR)(ET)%20((EE)NPTEL).pdf
2. http://www.facstaff.bucknell.edu/mastascu/elessonshtml/Measurements/MeasIntro.htm
3. http://www.electrical4u.com/electrical-measuring-instruments-types-accuracy-precision-resolution-speed/

**B.Tech. III Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

## POWER SYSTEMS-II

**Internal Marks: 40**

**Course Code: P18EET08** **External Marks: 60**

**Course Prerequisite**: Power systems-I

**Course Objective:**

1. To compute inductance/capacitance of transmission lines and to understand the concepts of GMD/GMR.
2. To study the short, medium and long length transmission lines, their models and performance.
3. To study the effect of travelling waves on transmission lines.
4. To study the factors affecting the performance of transmission lines
5. To discuss sag and tension computation of transmission lines as well as to study the performance of over head insulators.

**Course Outcomes:**

1. Able to understand parameters of various types of transmission lines during different operating conditions.
2. Able to understand the performance of short, medium and long transmission lines.
3. Student will be able to understand travelling waves on transmission lines.
4. Will be able to understand various factors related to charged transmission lines.
5. Will be able to understand sag/tension of transmission lines and performance of line insulators.

**UNIT –I** **(10 Hours)**

**Transmission Line Parameters**

Conductor materials - Types of conductors – Calculation of resistance for solid conductors – Calculation of inductance for single phase and three phase– Single circuit lines– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors-Numerical Problems–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 circuit lines – Numerical Problems.

**UNIT –II** **(10 Hours)**

**Performance of Short, Medium and Long Transmission Lines**

Classification of Transmission Lines – Short, medium, long line and their model representations –Nominal-T–Nominal-Pie Methods - A, B, C, D Constants for symmetrical and Asymmetrical Networks– Numerical Problems– Mathematical Solutions to estimate regulation and efficiency of all types of lines.

Long Transmission Line–Rigorous Solution – Interpretation of the Long Line Equations, – Incident, Reflected and Refracted Waves –Surge Impedance and SIL of Long Lines–Wave Length and Velocity of Propagation of Waves (Numerical Problems).

**UNIT –III** **(10 Hours)**

**Power System Transients**

Types of System Transients – Travelling or 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 – IV** **(10 Hours)**

**Factors governing the Performance of Transmission line**

Skin and Proximity effects – Description and effect on Resistance of Solid Conductors – Ferranti effect – Charging Current –Corona – Description of the phenomenon–Factors affecting corona–Critical voltages and power loss.

**UNIT–V** **(10 Hours)**

**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–Numerical Problems – Stringing chart and sag template and its applications–Types of Insulators – String efficiency and Methods for improvement– Numerical Problems – 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, Publishers,1998.
2. Modern Power System Analysis by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition.

**Reference Books:**

1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies,4th edition
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, DhanpatRai & Co Pvt. Ltd.
4. Electrical Power Systems by P.S.R. Murthy, B.S.Publications.

**Web Resources:**

1. www.nptel.iitm.ac.in
2. www.electrical4u.com
3. www.easyengineering.net

**B.Tech. III Year I Semester**

**Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# POWER ELECTRONICS

**Internal Marks: 40**

**Course Code: P18EET09** **External Marks: 60**

**Course Prerequisite**: Semi Conductor Devices, Mathematics, Control Systems

**Course Objectives:**

1. To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
2. To understand the operation of single phase and three phase converters.
3. To understand the operation of different types of DC-DC converters.
4. To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
5. To analyze the operation of AC-AC regulators.

**Course Outcomes:**

After completion of this course, the student is able to:

1. Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR's. Design firing circuits for SCR.
2. Explain the operation of single phase and three phase converters.
3. Analyze the operation of different types of DC-DC converters.
4. Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
5. Analyze the operation of AC-AC regulators.

**UNIT – I** (10 Lectures)

**Power Semi-Conductor Devices**

Thyristors–Silicon controlled rectifiers (SCR's) –Characteristics of power MOSFET and power IGBT– Basic operation of SCR–Static characteristics– Turn on and turn off methods– Dynamic characteristics of SCR– SCR- R and RC firing circuits. Snubber circuit design.

**UNIT – II** (12 Lectures)

**AC-DC Converters**

Single-phase half wave controlled rectifiers – R load and RL load with and without freewheeling diode, single-phase full wave controlled rectifiers – center tapped configuration and bridge configuration- R load and RL load with and without freewheeling diode, Effect of source inductance in single-phase fully controlled bridge rectifier with continuous conduction. Three -phase half wave controlled rectifier with R and RL load, three -phase fully controlled rectifier with R and RL load (operation).

**UNIT –III** (8 Lectures)

**DC–DC Converters**

Analysis of Buck, boost, buck-boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM output voltage ripple & inductor current, ripple for CCM only.

**UNIT- IV** (10 Lectures)

**DC–AC Converters**

Single - phase half bridge and full bridge inverters with R and RL loads, Three-phase square wave inverters – $120^0$ conduction and $180^0$ conduction modes of operation – PWM inverters –Sinusoidal pulse width modulation – Prevention of shoot through fault in Voltage Source Inverter (VSI) and Current Source Inverter (CSI).

**UNIT – V** (10 Lectures)

**AC Voltage Regulators**

Static V-I characteristics of TRIAC and modes of operation – single-phase AC-AC regulator phase angle control and integrated cycle control with R and RL load – For continuous and discontinuous conduction- 3-Phase AC-AC regulators with R load only – Transformer tap changing using anti parallel thyristors.

**Textbooks:**

1. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
2. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998

**Reference Books:**

1. Elements of Power Electronics–Philip T.Krein.oxford.
2. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M.
3. Power Electronics handbook by Muhammad H.Rashid, Elsevier.
4. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009.

**Web References:**

1. https://www.niehs.nih.gov/health/topics/agents/emf/index.cfm
2. *https://*www.electrical4u.com
3. https:indiabix.com
4. http://www.ece.uah.edu

**B. Tech III Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# PULSE AND DIGITAL CIRCUITS

**Internal Marks: 40**

**Course Code: P18ECT07** **External Marks: 60**

**Course Prerequisite:** Electronic Devices and Circuits, Network Analysis.

**Course Objectives:**

1. To understand the concept of linear wave shaping circuits.
2. To analyze transistor switch and different types of Multi vibrators and their design procedures.
3. To introduce voltage and current Time-base Generators in sweep signal generation.
4. To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.

**Course Outcomes:**

1. Design linear and non-linear wave shaping circuits.
2. Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
3. Understand the applications of diode as clippers, clamper circuits.
4. Design different Multi vibrators and Time base generators for various applications.
5. Realize logic gates using diodes and transistors and Difference between logic gates and sampling gates.

**UNIT-I** **(9Lectures)**

**Linear Wave Shaping:** High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator, Attenuators.

**UNIT-II** **(9Lectures)**

**Non-Linear Wave Shaping:** Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, applications of voltage comparators, Clamping operation, Clamping circuit theorem, effect of diode characteristics on clamping voltage.

**UNIT-III** **(9Lectures)**

**Multi vibrators**: Transistor as a switch, Transistor switching times, Analysis and Design of Bistable, Monostable, Astable Mult ivibrators and Schmitt trigger circuit using BJT.

**UNIT-IV** **(9Lectures)**

**Time Base Generators:** General features of a time base signal, Methods of generating time base waveform, Sweep generation by UJT, Transistor Miller time base generator, Transistor Bootstrap time base generator, Transistor current time base generators.

**UNIT-V** **(9Lectures)**

**Logic Families**: Realization of digital logic gates with Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, Comparison of Digital Logic Families.

**Sampling Gates**: Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four- Diode gates, Six-Diode Gates.

**Text Books:**


1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, 2nd Edition,2007.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edition,2002.


**Reference Books:**


1. Jacob Miman, Christos C. Halkias, "Integrated electronics" Tata McGraw Hill Publication, 2nd Edition,2017.
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2nd Edition,2005.
3. Ronald J. Tocci, Fundamentals of Pulse and Digital Circuits", PHI, 3rd Edition, 2008.


**Web References:**

1. www.npteliitm.ac.in
2. www.modernelectronics.org
3. www.electronicsforyou.com

# PROFESSIONAL ELECTIVE-I

**B.Tech III Year I Semester** **L T P C**

**3 0 0 3**

## RENEWABLE ENERGY SOURCES

**Internal Marks: 40**

**Course Code: P18EEE01** **External Marks: 60**

**Course Prerequisites: Power Systems-I**

**Course Objectives:**

1. To study the solar radiation data, extraterrestrial radiation, radiation on earth's surface.
2. To study solar thermal collections.
3. To study solar photo voltaic systems.
4. To study maximum power point techniques in solar pv and wind energy.
5. To study wind energy conversion systems, Betz coefficient, tip speed ratio, basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

**Course Outcomes:**

1. Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface.
2. Explain solar thermal collectors, solar thermal plants.
3. Design solar photo voltaic systems.
4. Develop maximum power point techniques in solar PV and wind energy systems.
5. Explain wind energy conversion systems, wind generators, basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

**UNIT–I** **(10 Hours)**

**Fundamentals of Energy Systems and Solar energy**

Energy conservation principle – Energy scenario (world and India) – various forms of renewable energy - Solar radiation: Outside earth's atmosphere – Earth surface - Radiation on tilted surfaces.

**UNIT–II** **(10 Hours)**

**Solar Thermal Systems**

Liquid flat plate collectors: Performance analysis –Transmissivity– Absorptivity product collector efficiency factor – Collector heat removal factor. Introduction to solar air heaters – Concentrating collectors, solar pond and solar still – solar thermal plants.

**UNIT–III** **(10 Hours)**

**Solar Photovoltaic Systems**

Solar photovoltaic cell, module, array – construction – Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Equivalent circuit of solar cell – Series resistance – Shunt resistance – Applications.

**System design**: storage sizing – PV system sizing – Maximum power point techniques: Perturb and observe (P&O) technique – Hill climbing technique.

**UNIT–IV** **(10 Hours)**

**Wind Energy**

Sources of wind energy - Wind patterns –Horizontal axis and vertical axis machines - Kinetic energy of wind – Betz coefficient – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking – wind farms – Power generation for utility grids.

**UNIT–V** **(10 Hours)**

**Tidal, Biomass, fuel cells and geothermal power systems**

**Tidal power**: Basics – Kinetic energy equation. **Wave power**: Basics – Kinetic energy equation.

**Biomass Energy**: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing. **Fuel cell**: Classification of fuel for fuel cells – Fuel cell voltage– Efficiency – V-I characteristics. **Geothermal**: Classification – Dry rock and hot acquifer – Energy analysis – Geothermal based electric power generation.

**Text Books:**


1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis - second edition, 2013.


**Reference Books:**


1. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford University Press.
2. Renewable Energy- Edited by Godfrey Boyle-oxford university.press,3rd edition,2013.
3. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
5. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.
6. Non conventional energy source –B.H.khan- TMH-2nd edition.


**Web References:**

1. www.npteliitm.ac.in

**B.Tech III Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# ELECTRICAL MACHINE DESIGN

**Internal Marks: 40**

**Course Code: P18EEE02** **External Marks: 60**

**Course Prerequisites:** Electrical machines-I & Electrical Machines-II

**Course Objectives:**

1. To give overview of switched reluctance motors and its applications.
2. To discuss about various steppers motors used in industrial applications.
3. To study variable reluctance stepper motors.
4. To gain the knowledge on permanent magnet brushless DC motors and its applications.
5. To discuss the other special machines used in industrial applications.

**Course Outcomes:**

1. Ability to acquire the knowledge on construction and operation of switched reluctance motors.
2. Ability to acquire the knowledge on stepper motors and their applications.
3. Gain the knowledge on variable reluctance motors.
4. Ability to acquire the knowledge on principle of operation of permanent magnet brushless dc motors.
5. Ability to acquire the knowledge on some other special machines used in industrial applications.

**UNIT – I** **(8 Hours)**

Stepper Motors: Introduction-synchronous inductor (or hybrid stepper motor), Hybrid stepping motor, construction, principles of operation, Energisation with two phase at a time essential conditions for the satisfactory operation of a 2-phase hybrid step motor.

**UNIT – II** **(8 Hours)**

Variable Reluctance Stepping Motors: Variable reluctance (VR) Stepper motors, single stack VR step motors, Multiple stack VR motors-Open-loop control of 3-phase VR step motor-closed-Loop control of step motor.

**UNIT-III**

**Switched Reluctance Motors (SRM)** **(8 Hours)**

Constructional features -Principle of operation- Torque production-Characteristics, Steady state performance, Power converters – Control of SRM drive- Sensor less operation of SRM -Applications.

**UNIT-IV** **(8 Hours)**

**Permanent Magnet Brushless D.C. Motors:**

Fundamentals of Permanent Magnets- Types- Principle of operation of BLDC Motor- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers -Characteristics and control- Applications. Comparison between BLDC and PMSM.

**UNIT-V**

Other special Machines: **(8Hours)**

Hysteresis motor : Constructional features – Principle of operation and Characteristics. Synchronous Reluctance Motor-Linear Induction motor-Repulsion motor- Applications.

**Text Books:**

1. K.Venkata Ratnam, Special Electrical Machines, Universities Press (India),Private Limited 2008
2. E.G.Janardanan, Special Electrical Machines, PHI Learning Private Limited Delhi 2014.

**Reference Books:**

1. R.Krishnan-Switched reluctance motor drives-design and applications-New York, 2001
2. R.Srinivasan-Special electrical machines-Lakshmi Publications,2013
3. T.J.E.Miller,Brushless Permanent Magnet and Reluctance Motor drives.

**Web Resources:**

1. http://www.facstaff.bucknell.edu/mastascu/elessonshtml/Special machines /MeasIntro.htm
2. http://www.electrical4u.com/special electrical machines--types-construction – operation -applications/

**B.Tech III Year – I Semester**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# DIGITAL CONTROL SYSTEMS

**Internal Marks: 40**

**Course Code: P18EEE03** **External Marks: 60**

**Prerequisites**: Control systems

**Course objectives:**

1. The concepts of digital control systems and assemble various components associated with it. Advantages compared to the analog type.
2. The theory of z–transformations and application for the mathematical analysis of digital control systems.
3. To represent the discrete–time systems in state–space model and evaluation of state transition matrix.
4. To the conventional method of analyzing digital control systems in the w–plane.
5. To the design of state feedback control by "the pole placement method."

**Course outcomes:**

1. The students learn the advantages of discrete time control systems and the "know how" of various associated accessories.
2. The learner known z–transformations and their role in the mathematical analysis of different systems (like Laplace transforms in analog systems).
3. The stability criterion for digital systems and methods adopted for testing the same are explained.
4. The conventional and state–space methods of design are introduced.
5. Able to the design of state feedback control by "the pole placement method."

**UNIT – I** **(8 Hours)**

**Introduction and signal processing**

Introduction to analog and digital control systems – Discrete Time Control Systems and Continuous Time Control Systems, Analog to digital conversion, Digital to analog conversion Advantages of digital systems – Typical examples – Signals and processing – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

**UNIT–II** **(8 Hours)**

**Z–transformations**

Z–Transforms – Theorems – Finding inverse z–transforms – Formulation ofdifference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses Application in electrical systems.

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**UNIT–III** **(8 Hours)**

**State space analysis and the concepts of Controllability and Observability**

State Space Representation of discrete time systems – State transition matrix and Electrical and Electronics Engineering methods of evaluation – Discretization of continuous – Time state equations –Concepts of controllability and observability – Tests (without proof).

**UNIT – IV** **(8 Hours)**

**Design of discrete–time control systems and stability analysis**

Transient and steady state specifications – Design using frequency response in the w–plane for lag and led compensators – Root locus technique in the z– plane Mapping between the s–Plane and the z–Plane and Jury's stability test

**UNIT – V** **(8 Hours)**

**State feedback controllers and analysis:**

Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula. Modified routh's stability criterion and jury's stability test

**Text Book:**

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI,2nd Edition

**Reference Books:**

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition,2003.
2. Digital Control and State Variable Methods by M.Gopal, TMH

**B.Tech III Year – I Semester** **L T P C**
**3 0 0 3**

# ADVANCED CONTROL SYSTEMS

**Internal Marks: 40**
**Course Code: P18EEE04** **External Marks: 60**

**Prerequisites**: Control systems

**Course Objectives:**

1. Review of the state space representation of a control system Formulation of different models from the signal flow graph diagonalization.
2. To introduce the concept of controllability and observability. Design by pole placement technique.
3. The Lypanov's method of stability analysis of a system.
4. Formulation of Euler Lagrange equation for the optimization of typical functional and solutions.
5. Formulation of linear quadratic optimal regulator (LQR) problem by parameter adjustment and solving riccatti equation.

**Course Outcomes:**

1. State space representation of control system and formulation of different state models are reviewed.
2. Able to design of control system using the pole placement technique is given after introducing the concept of controllability and observability.
3. Able to analysis the stability analysis using lypnov method.
4. Minimization of functional using calculus of variation studied.
5. Able to formulate and solve the LQR problem and riccatti equation.

**UNIT – I**

**State space analysis** **(8 Hours)**

Discrete Time Control Systems and Continuous Time Control Systems, Sampling Process. State Space Representation – Solution of state equation – State transition matrix, –Canonical forms – Controllable canonical form – Observable canonical form, Jordan Canonical Form.

**UNIT-II** **(8 Hours)**

**Controllability and observability**

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 – applications.

**UNIT – III** **(8 Hours)**

**Stability and function analysis**

Stability in the sense of Lyapunov – Lyapunov's stability and Lypanov'sinstability theorems – Direct method of Lypanov for the linear and nonlinearcontinuous time autonomous systems. Introduction to phase–plane analysis.

**UNIT–IV**

**Calculus of variations** **(8 Hours)**

Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints – Euler lagrangine equation.

**UNIT –V**

**Optimal control** **(8 Hours)**

Linear quadratic optimal regulator (LQR) problem formulation – Optimal regulator design by parameter adjustment (Lyapunov method) – Optimal regulator design by continuous time algebraic riccatti equation (CARE) - Optimal controller design using LQG framework.

**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

**B. Tech III Year I Semester**

**Course Structure**

| L | T | P | C |
|---|---|---|---|
| 2 | 0 | 0 | 2 |

# DESIGN THINKING FOR INNOVATION

**Internal Marks: 100**

**Course Code: P18MCT08**

**Course objectives:**

1. To bring awareness on design thinking
2. To build creative confidence and equip them for innovation
3. To understand and empathize human need
4. To generate the ideas for the human need
5. To evaluate business viability, human desirability and technological feasibility by making prototype

**Course outcomes:**

1. Explain and define the design thinking definition, basic concepts and process
2. Understand abilities that need for innovation
3. Analyze the barriers of the innovation
4. Analyze the human need and the problems of mankind
5. Demonstrate the idea generation process
6. Generate and Evaluate deferent ideas
7. Select best ideas and make prototypes

**Outcome indicates:**

1. Assignments
2. Prototype report
3. Prototype
4. Charts by students
5. Store boards

| Week | | Total hours | Topics |
|---|---|---|---|
| **1.** | 1 | 1 | What Is Design, What Is Design Thinking, Design Thinking– Importance, and Impact |
| | 2 | 2 | Historical Perspective of Design Thinking, |
| | 3 | 3 | Evolution of Design Thinking Definitions and Perspectives |
| | 4 | 4 | Thinking Definitions and Perspectives & Three Space of Innovation In Design Thinking, |
| **2.** | 1 | 5 | Divergent and Convergent Thinking & Design Thinking Process |
| | 2 | 6 | Design thinking vs Traditional thinking (problem solving) |
| | 3 | 7 | Myths of Innovation |

| | | | |
|---|---|---|---|
| | 4 | 8 | Myths of Creativity |
| **3.** | 1 | 9 | Creative Confidence |
| | 2 | 10 | Innovators DNA |
| | 3 | 11 | Concept of flow and purpose |
| | 4 | 12 | Building Design Team |
| **4.** | 1 | 13 | Initial Problem Description - 5why, beginner's mindset |
| | 2 | 14 | Research –persona development |
| | 3 | 15 | Empathy mapping |
| | 4 | 16 | interview with empathy and stories collection |
| **5.** | 1 | 17 | Question the critical assumptions |
| | 2 | 18 | Reframe Problem Definition – (PoV) point of view &power of ten, |
| | 3 | 19 | how might we |
| | 4 | 20 | Nine window tool and daisy map |
| **6.** | 1 | 21 | Ideation and Visualization- Brainstorming |
| | 2 | 22 | SCAMPER |
| | 3 | 23 | Mind mapping |
| | 4 | 24 | sketch –structure idea |
| **7.** | 1 | 25 | Storyboard |
| | 2 | 26 | Customer Co-Creation |
| | 3 | 27 | Provocation |
| | 4 | 28 | Role-play |
| **8.** | 1 | 29 | step-by-step prototyping & low fidelity prototyping |
| | 2 | 30 | Testing Prototyping -feedback capturing grid, conduct A/B testing |
| | 3 | 31 | Experiment grid, user retrospective board |
| | 4 | 32 | Create a Pitch of the prototype |

**Text Books:**


1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, "ExploringEngineering: An Introduction to Engineering and Design", 4th edition, Elsevier, 2016.
2. David Ralzman, "History of Modern Design", 2nd edition, Laurence King PublishingLtd., 2010
3. An AVA Book, "Design Thinking", AVA Publishing, 2010.


**Reference Books:**


1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, "Engineering Design: A Systematic Approach", 3rd edition, Springer, 2007.
2. Tom Kelley, Jonathan Littman, "Ten Faces in Innovation", Currency Books, 2006.
3. Liedtka, Jeanne and Ogilvie, Timothy, Ten Tools for Design Thinking.
4. The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems By : Michael Lewrick
5. The Myths of Innovation by Scott Berkun ,Publisher(s): O'Reilly Media, Inc.ISBN:781449389628
6. The Myths of Creativity: The Truth About How Innovative Companies and People Generate Great Ideas, D. Burkus. Jossey-Bass, San Francisco, CA (2014), 214 pp., ISBN: 978-1-118-61114-2

7. Creative Confidence: Unleashing the Creative Potential Within Us All by Tom Kelley(Author), David Kelley(Author)
8. The innovator's DNA: mastering the five skills of disruptive innovatorsAuthor: **Dyer, JeffGregersen, Hal B., 1958-Christensen, Clayton M.**Published:Boston, Mass. : Harvard Business Press, [2011].
9. Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.
10. The Power of Purpose: Find Meaning, Live Longer, by **Richard J. Leider**
11. Collective Genius: The Art and Practice of Leading Innovation,**Authors**: **Linda A. Hill, Greg Brandeau, Emily Truelove, Kent Lineback**
12. Change by Design, by Tim Brown

**Online resource:**
https://www.interaction-design.org/courses/design-thinking-the-beginner-s-guide

**ASSESSMENT**

| Assessment | Internal -100 marks |
|---|---|
| Assignments | 1*5= 25 |
| Report of the prototype | 1*5=25 |
| Prototype and presentation | 50*1=50 |

**Prototype Making and Evaluation Methods**:

1. Prototypes can be made by individuals or teams.
2. 4 is Maximum member for the team
3. HOD of the department and 3 exports evaluating the prototype
4. HOD act as chairperson for the evaluation team

**Prototype Report:**
It can be printed or handwritten

Topics in the report

1. Title of the problem
2. Research work
3. How you redefining the problem
4. Methods used for generation idea
5. Ideas ( here multiple ideas can be written)
6. Prototyping process

**Assignments:**
5 assignments will be given and each assignment carries 5 marks

**Assignment topics (tentatively): faculty has the right to change the topics**

1. Collect 50 different design that you think it is wonderful
2. Introspection (confidence, creativity)
3. User interview (video file submission) or story collection
4. Book review
5. HBR articles reading and writing opinion

**B.Tech. III Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

# POWER ELECTRONICS LAB

**Internal Marks: 40**

**Course Code: P18EEL04** **External Marks: 60**

**Course Prerequisite**: Power Electronics

**Course Objectives:**

1. To study 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, Boost converter.
5. To understand the working of series, parallel and PWM inverter.

**Course Outcomes:**

1. Able to study the characteristics of various power electronic devices and analyze gate drive circuits of IGBT.
2. Able to analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.
3. Able to understand the operation of single phase AC voltage regulator with resistive and inductive loads.
4. Able to understand the working of Buck converter, Boost converter, single–phase square wave inverter and PWM inverter.
5. Able to understand the working of series, parallel and PWM inverter.

**Any 10 of the following experiments are to be conducted**

1. Study of Characteristics of Thyristor, MOSFET &IGBT.
2. Design and development of a firing circuit for Thyristor.
3. Design and development of gate drive circuits for IGBT.
4. Single -Phase Half controlled converter with R and RL load
5. Single -Phase fully controlled bridge converter with R and RL loads
6. Single -Phase AC Voltage Regulator with R and RL Loads
7. Single -Phase square wave bridge inverter with R and RL Loads
8. Three- Phase fully controlled converter with RL–load.
9. Design and verification of voltages gain of Boost converter.
10. Design and verification of voltages ripple in buck converter.
11. 3-phase AC-AC voltage regulator with R-load.
12. Single -Phase series inverter with R and RL Loads.

**B.Tech. III Year I Semester**

**Course Structure**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 3 | 1.5 |

# CONTROL SYSTEMS LAB

**Internal Marks: 40**

**Course Code: P18EEL05** **External Marks: 60**

**Course Prerequisite**: Control Systems

**Course Objectives:**

1. To impart hands on experience to understand the performance of Magnetic Amplifier.
2. To learn the design of P,PI,PID controllers
3. To analyze the controlling of temperature by using PID controllers
4. To derive the transfer function of DC motor and Generator.
5. To understand time and frequency responses of control system AC and DC servomotors.

**Course Outcomes:**

1. Analyze the performance and working Magnetic amplifier.
2. Design P,PI,PD, PID controllers and lag, lead, lag – lead compensators.
3. Evaluate the stability analysis by using MATLAB/Simulink.
4. Determine the transfer function of D.C. Motor and DC Generator
5. Control the performance of AC and DC servo motors.

**Any 10 of the following experiments are to be conducted**

1. Time response of Second order system
2. Characteristics of Synchros
3. Potentiometer as an error detector
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. DC position control system
8. Transfer function of DC motor
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Transfer function of DC Generator

**B.Tech III Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# POWER SYSTEM ANALYSIS

**Internal Marks: 40**

**Course Code: P18EET10** **External marks: 60**

**Course Prerequisite**: Power systems - I & II

**Course Objectives:**

1. To development the impedance diagram (p.u) and formation of $Y_{bus}$
2. To study the different load flow methods.
3. To study the concept of the $Z_{bus}$ building algorithm.
4. To study short circuit calculation for symmetrical faults& effect of unsymmetrical faults and their effects.
5. To study the rotor angle stability of power systems.

**Course Outcomes:**

1. Able to draw impedance diagram for a power system network and to understand per unit quantities.
2. Able to form a $Y_{bus}$ and $Z_{bus}$ for a power system networks.
3. Able to understand the load flow solution of a power system using different methods.
4. Able to find the fault currents for all types faults to provide data for the design of protective devices.& sequence components of currents for unbalanced power system network.
5. Able to analyze the steady state, transient and dynamic stability concepts of a power system

**UNIT –I** **(10 Hours)**

**Per Unit Representation & Topology**

Per Unit Quantities–Single line diagram– Impedance diagram of a power system – 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.

**UNIT –II** **(10 Hours)**

**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) – Problems on 3–bus system only.

**UNIT –III** **(10 Hours)**

**Z–Bus formulation**

Formation of Z–Bus**:** Partial network– Algorithm for the Modification of $Z_{bus}$ Matrix for addition element for the following cases**:** Addition of element from a new bus to reference– Addition of element from a new bus to an old bus– Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems) – Modification of Z–Bus for the changes in network (Problems).

**UNIT – IV** **(10 Hours)**

**Symmetrical Fault Analysis**

3–Phase short circuit currents and reactances of synchronous machine–Short circuit MVA calculations.

**Symmetrical Components & Fault analysis**

Synthesis of unsymmetrical phasor from their symmetrical components– Symmetrical components of unsymmetrical phasor –Phase - shift of symmetrical components in Y–Δ– Power in terms of symmetrical components – Sequence networks – Positive, negative and zero sequence networks– Various types of faults LG– LL– LLG and LLL on unloaded alternator– unsymmetrical faults on power system.

**UNIT – V** **(10 Hours)**

**Power System Stability Analysis**

Elementary concepts of Steady state– Dynamic and Transient Stabilities– Description of Steady State Stability Power Limit–Transfer Reactance– Synchronizing Power Coefficient – Power Angle Curve and Determination of Steady State Stability –Derivation of Swing Equation–Determination of Transient Stability by Equal Area Criterion–Application of Equal Area Criterion–Methods to improve steady state and transient stability.

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**Text Books:**

1. Modern Power system Analysis – by I.J.Nagrath & D.P.Kothari: Tata Mc Graw–Hill Publishing Company, 2nd edition.
2. Electrical Power Systems by P.S.R.Murthy, B.S.Publications

**Reference Books:**

1. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
2. Power System Analysis by HadiSaadat – TMH Edition
3. Power System Analysis by B.R.Gupta, Wheeler Publications.
4. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
5. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J. Overbye – CengageLearning publications.

**Web Resources:**

1. www.nptel.iitm.ac.in
2. www.electrical4u.com
3. www.easyengineering.net

**B.Tech. III Year II Semester** **Course Structure**

| L | T | P | C |
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| 3 | 0 | 0 | 3 |

# POWER SEMICONDCUTOR DRIVES

**Internal Marks: 40**

**Course Code: P18EET11** **External Marks: 60**

**Course Prerequisite**: Power Electronics, Electrical Machines, Control Systems.

**Course Objectives:**

6. To learn the fundamentals of electric drive and different electric braking methods.
7. To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
8. To discuss the converter control of dc motors in various quadrants.
9. To understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters, principles of static rotor resistance control and various slip power recovery schemes.
10. To understand the speed control mechanism of synchronous motors

**Course Outcomes:**

After completion of this course, the student is able to:

6. Explain the fundamentals of electric drive and different electric braking methods.
7. Analyze the operation of three phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
8. Describe the converter control of dc motors in various quadrants of operation
9. Known the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters, differentiate the stator side control and rotor side control of three phase induction motor.
10. Explain the speed control mechanism of synchronous motors.

**UNIT – I** (10 Lectures)

**Fundamentals of Electric Drive**

Electric drive – 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 – II** (9 Lectures)

**Controlled Converter Fed DC Motor Drives**

Single half and fully controlled converter fed separately and self-excited DC motor drive – Continuous current operation– Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics — Principle of operation of dual converters and dual converter fed DC motor drives -Numerical problems.

**UNIT –III** (9 Lectures)

**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 – Speed–torque characteristics –Four quadrant operation – Closed loop operation (qualitative treatment only).

**UNIT- IV** (11 Lectures)

**Control of 3-Φ Induction Motor Drive**

**Stator 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 voltage source and current source inverter – Comparison of VSI and CSI – Closed loop v/f control of induction motor drives (qualitative treatment only).

**Rotor side control of 3-phase Induction motor Drive**

Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages – Applications

**UNIT – V** (9 Lectures)

**Control of Synchronous Motor Drives**

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives (qualitative treatment only).–Variable frequency control–Pulse width modulation.

**Textbooks:**


3. Fundamentals of Electric Drives – by G K Dubey, Alpha Science International Limited, 2001.
4. Power Semiconductor Drives, by S.B.Dewan, G.R.Slemon, A.Straughen, WileyIndia Edition.


**Reference Books:**


1. Electric Motors and Drives Fundamentals, Types and Apllications, by Austin Hughes and Bill Drury, Newnes.
2. Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI
3. Power Electronics handbook by Muhammad H.Rashid, Elsevier.


**Web References:**

1. https://www.niehs.nih.gov/health/topics/agents/emf/index.cfm
2. *https://*www.electrical4u.com
3. https:indiabix.com
4. http://www.ece.uah.edu

**B.Tech III Year II Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

# MICROCPROCESSORS &MICROCONTROLLERS

**Internal Marks: 40**

**Course Code:** P18ECT18 **External Marks: 60**

**Course Prerequisite:** Switching Theory and Logic Design

**Course Objectives:**

1. Understand the theory and basic architectures of 8086microprocessors
2. Learn the assembly language programming.
3. Understand Interfacing of 8086, With memory and other peripherals
4. Study the features 8051 microcontroller and programming.
5. Learn the features of PIC micro controller families.

**Course Outcomes:**

1. Describe the microprocessor capability in general and explore the evaluation of micro processors.
2. Write the assembly language programming
3. Describe 8086 interfacing with different peripherals and implement programs.
4. Describe hardware concepts, development of programs for 8051 Micro controller and interfacing.
5. Describe hardware features of PIC microcontroller families.

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**UNIT-I** **(9 Lectures)**

**8086 ARCHITECTURE**: Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, interrupts and interrupt responses, 8086 system timing, minimum mode and maximum mode configuration, Advanced microprocessors.

**UNIT-II** **(8 Lectures)**

**8086 PROGRAMMING**: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

**UNIT-III** **(10 Lectures)**

**8086 INTERFACING** : Semiconductor memories interfacing (RAM,ROM), 8254 software programmable timer/counter, Intel 8259 programmable interrupt controller, software and hardware interrupt applications, Intel 8237a DMA controller, Intel 8255 programmable peripheral interface, keyboard interfacing, alphanumeric displays (LED,7-segment display, multiplexed 7-segment display, LCD), Intel 8279 programmable keyboard/display controller, stepper motor, A/D and D/A converters.

**UNIT-IV** **(8 Lectures)**

**Intel 8051 MICROCONTROLLER:** Architecture, Memory organization, counters/timers, serial data input/output, interrupts. Assembly language programming: Instructions, addressing modes, simple programs. Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters.

**UNIT-V** **(10 Lectures)**

**PIC MICROCONTROLLER:** Introduction, characteristics of PIC microcontroller, PIC microcontroller families, memory organization, parallel and serial input and output, timers, Interrupts, PIC 16F877 architecture, instruction set of the PIC16F877.

**Text Books:**


1. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition.
2. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J.Ayala, Dhananjay V.Gadre,Cengage Learninbg , IndiaEdition.


**References Books:**


1. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B.Brey, Pearson, EighthEdition-2012.
2. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition,2014.
3. Microprocessors and Microcontrollers by N.Senthil Kumar, M.Saravanan and S.Jeevananthan, Oxford University Press, Seventh Impression2013


**Web References:**

1. https://nptel.ac.in/courses/106108100/
2. https://www.sanfoundry.com/best-reference-books-microprocessors-microcontrollers/

**B.Tech III Year II Semester** **Course Structure**

| L | T | P | C |
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| 3 | 0 | 0 | 3 |

# LINEAR AND DIGITAL IC APPLICATIONS

**Internal Marks:** 40

**Course Code:** P18ECT09 **External Marks:**60

**Course Prerequisite:** Semiconductor Devices and Circuits, Switching Theory and Logic Design Electronic Circuit Analysis, Pulse and Digital Circuits.

**Course Objectives:**

1. Understand the basic features of Operational Amplifier and its applications.
2. Understand the design of Op-Amp based Active Filters, Waveform generators, functionality of 555 Timer and 565 ICs and their applications.
3. Understand the design of various types of ADCs and DACs.
4. Introduction of digital logic families and interfacing concepts for digital design is considered and VHDL fundamentals were discussed to modeling the digital system design blocks.
5. VHDL compilers, simulators and synthesis tools are described, which are used to verify digital systems in a technology-independent fashion.

**Course Outcomes:**

1. Explain the concepts of Operational Amplifier and its features and apply the concepts of Op- Amps in the design of Summing Amplifier, Subtractors, Comparators, differentiators, Integrators and Voltage Regulators.
2. Analyze and design Op-Amp based circuits namely Active Filters, Wave form generators; Design and apply Astable and Mono-stable multi vibrator modes using 555 Timer IC; Conceptualize Phase Locked Loop using 565 IC and explain its applications.
3. Analyze and design DACs and ADCs using various methods of implementation.
4. Explain the structure of commercially available digital integrated circuit families and the IEEE Standard 1076 Hardware Description Language (VHDL).
5. Design complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis and rapid system prototyping.

**UNITI** **(9 Lectures)**

**Operational Amplifier:** Introduction to Emitter Coupled Differential Amplifier using BJTs, Operational Amplifier Block Diagram, Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Design of Voltage Regulator using IC723.

**UNITII** **(9 Lectures)**

**Applications of OPAMP IC741, IC-555 & IC 565:** Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis and Design of 1st order and 2nd order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth,

Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

**UNITIII (7 Lectures)**

**Analog to Digital and Digital to Analog Converters:** Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

**UNITIV (11 Lectures)**

**Introduction to logic families**: CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Introduction to VHDL: Design flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers. Packages, Libraries and Bindings, Subprograms. VHDL Programming using structural and data flow modeling.

**Behavioral Modeling:** Process statement, variable assignment statement, signal assignment statement, wait statement , if statement, case statement ,null statement, loop statement, exit statement, next statement ,assertion statement, more on signal assignment statement, Inertial Delay Model, Transport Delay Model ,Creating Signal Waveforms, Signal Drivers , Other Sequential Statements , Multiple Processes. Logic Synthesis, inside a logic Synthesizer.

**UNITV (9 Lectures)**

**Combinational Logic Design: Binary** Adder-Subtractor, Ripple Adder, Look Ahead Carry Generator, ALU, Decoders, encoders, multiplexers and de multiplexers, parity circuits, comparators. Design considerations of the above combinational logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.

**Sequential Logic Design:** SSI Latches and flip flops, Ring Counter, Johnson Counter, Design of Modulus N Synchronous Counters, Shift Registers, Design considerations of the above sequential logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.

**Text Books:**


1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003
2. Op-Amps & Linear Integrated Circuits – Ramakanth A. Gayakwad, PHI,2003.
3. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed.,2005.
4. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rdEdition.


**Reference Books:**


1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma;SK Kataria&Sons;2ndEdition,2010
2. Linear Integrated Circuits and Applications – Salivahana,TMH.
3. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, ZvonkoVranesic, McGrawHill, 3rdEdition.


**Web References:**

1. https://swayam.gov.in/nd1_noc20_ee55/preview
2. https://www.tutorialspoint.com/linear_integrated_circuits_applications/index.htm

**B.Tech III Year II Semester** **Course Structure**

| L | T | P | C |
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| 2 | 0 | 0 | 0 |

# BIOLOGY

**Course Code:** P18MCT09 **Internal Marks: 100**

## COURSE OBJECTIVIES

- To understand relation between science and engineering.
- To provide a foundation in basic biological principles.
- To develop an understanding of the scientific methods and its implications.
- To familiarize the students with the basic organization of organisms and subsequent building to a living being.
- To understand about the machinery of the cell functions that is ultimately responsible for various daily activities.
- To provide knowledge about biological problems that requires engineering expertise to solve them.
- To understand the various industrial applications of single celled organisms.
- To understand history of the origin of universe.

## COURSE OUTCOMES

After studying the course, the student will be able to:

- It presents an introduction to biology and its applications. It also provides an overview of biological observations of 18th Century that lead to major discoveries.
- It describes cell and types of cell. It discusses various stages of cell cycle like growth,division and its differentiation, ultrastructure of Eukaryotic cell and also discusses Glycolysis and Krebs cycle.
- It describes molecular analysis of various biomolecules are the building blocks of all life forms. Identify DNA as a genetic material in the molecular basis of information transfer.At well explains the concept of enzymes.
- It discusses Mendel's laws;Highlight the concepts of recessiveness and dominance during the passage of geneticmaterial from parent to offspring.Chromosomal disorders.It introduces the concept of origin of life with detailed description of Darwinian evolution and Lamarckism.
- Understanding of the human health and awareness diseases symptoms and prevention.Gain the knowledge of rDNA technology stem cells and monoclonal antibodies.Identify and classify microorganisms.
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## UNIT-I HISTORY OF BIOLOGY (5 Lectures)

Science and Engineering; Definition of Biology, Characters of living organisms, Diversity in the living world, Applications of biology; Biological classification of organisms: Nomenclature, History of biological classification, Systematic Hierarchy, Classification of the five kingdoms: Monera, Protista, Fungi, Plantae and animalia.

Major contributions of prominent scientists:Aristotle,Antonie van Leeuwenhoek, Linnaeus, William Harvey, Louis Pasteur,Watson & Crick,Charles Darwin, SalimMoizuddin Abdul Ali and YellapragadaSubbarao.

**UNIT-II STRUCTURALORGANIZATION &CELL BIOLOGY** (10 Lectures)

Animal organization: Cellular grade of organization, Tissue grade of organization (Diploblastic organization), Organ-system grade of organization(triploblastic organization). Animal tissues: epithelial tissue, connective tissue, cells of connective tissue, fluid tissue-blood, Muscle tissue, nervous tissue-structure of neuron.

Ultra structure of animal cell: Plasma membrane, Golgi complex, Endoplasmic reticulum, Mitochondria, Glycolysis, Kreb's cycle, Lysosomes, Ribosomes, chromosomes, and Nucleus. Cell divisions: Cell cycle stages, Mitotic phase, meiosis.

**UNIT-III BIOMOLECULES** (10 Lectures)

Introduction, properties of biomolecules,Carbohydrates:-structure, classifications andfunctions of carbohydrates. Proteins:-structure, classification and functions of proteins. Lipids-characteristic features of lipids, important functions in biological systems, classification of lipids and vitamins.

Nucleic acids- structure and properties of DNA & RNA.Enzymes- Mode of action of enzymes, properties of enzymes, classification and nomenclature of enzymes, importance of enzymes.

**UNIT- IVGENETICS AND EVOLUTION** (10 Lectures)

Introduction, reasons for Mendel's success, characters selected by Mendel, Mandel's laws- 1. Law of dominance, 2.Law of segregation or Law of purity of gametes, 3.Law of independent assortment. Monohybrid cross, Dihybrid cross, Test cross, Back cross. Multiple alleles and Blood grouping, Sex determination in human. Chromosomal disorders in human- Klinefelter's syndrome, Turner's syndrome and Down's syndrome. Protein synthesis: Transcription and Translation.

Evolution:-Evolutionary concepts: Theory of special creation, Cosmozoic theory, Theory of spontaneous generation or abiogenesis, Biogenesis theory, Theory of catastrophism, Theory of organic evolution. Origin of life: Primitive atmosphere and molecules, Biological evolution, Experimental chemical origin of life. Theories of evolution: Lamarckism and Darwinism.

**UNIT-V HUMAN HEALTH & DISEASES AND APPLIED BIOLOGY**(10 Lectures)

Common diseases in humans: Health, Disease, Pathogens, Transmission, Bacterial diseases-Typhoid, Pneumonia, Diphtheria, Tetanus, Plague, Cholera, Tuberculosis, Syphilis, Gonorrhoea, Leprosy, Peptic ulcers; Viral diseases- Common cold, Measles, Rubella, Rabies, Chickenpox, Flu, Smallpox, Chikungunya, Poliomyelitis, AIDS; Fungal diseases- Ringworm; Protozoan diseases- Malaria, Amoebic dysentery and Helminth diseases- Filariasis, Ascariasis. Immunity: Innate immunity, Acquired immunity, Antibodies-structure, Immune disorder-AIDS and Hepatitis.

Applied Biology-rDNA technology; Industrial use of microorganisms- alcohols, acids and vitamins; enzymes, pollution control, vaccines, hormones. Monoclonal antibodies and stem cells.

**References:**


1) Biology: A global approach: Campbell, N.A.; Reece, J.B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P.V.; Jackson, R. B. Pearson Education Ltd
2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons

3) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company
4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher
5) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

**Web references:**

6) Human health and diseases https://www.emedicalprep.com/study-material/biology/ biology-in-human- lefare/human-health-and-disease/
**7)** Aristotle's biologyhttps://en.wikipedia.org/wiki/Aristotle%27s_biology**.**
8) Sir Ronald Ross; https://en.wikipedia.org/wiki/Ronald_Ross.
9) Recombinant DNA Technology- Steps, Applications and Limitations; https://microbenotes.com/recombinant-dna-technology-steps-applications-and-limitations/
10) Nucleic acids https://www.khanacademy.org/science/ap-biology/gene-expression-and-regulation/dna-and-rna-structure/a/nucleic-acids.

**B.Tech. III Year II Semester**

**Course Structure**

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# ELECTRICAL MEASUREMENTS & INSTRUMENTATION LAB

**Internal Marks: 40**

**Course Code: P18EEL06** **External Marks: 60**

**Course Prerequisite**: Electrical Measurements & Instrumentation

**Course Objective:**

1. To understand the calibration of single phase energy Meter, dynamometer wattmeter, voltmeter and ammeter.
2. To measure the resistance, Inductance and capacitance by using the bridge circuit.
3. To measure the 3-phase reactive power using single phase wattmeter and to calibrate the LPF wattmeter.
4. To Measure the 3-phase power with single watt meter and to test the C.T&P.T using appropriate Method.
5. To understand the LVDT operation and characteristics.

**Course Outcomes:**

1. Calibrate the single phase energy Meter, dynamometer wattmeter, voltmeter and ammeter.
2. Measure the resistance, Inductance and capacitance by using the bridge circuit.
3. Measure the 3-phase reactive power using single phase wattmeter and to calibrate the LPF wattmeter.
4. Measure the 3-phase power with single watt meter and to test the C.T&P.T using appropriate Method.
5. Measure the linear displacement using LVDT and draw the characteristics.

**Any 10 of the following experiments to be conducted**

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer wattmeter using phantom loading
3. Calibration of PMMC ammeter and voltmeter using Crompton D.C. Potentiometer
4. Measurement of resistance and Determination of Tolerance using Kelvin's double Bridge.
5. Capacitance Measurement using Schering Bridge.
6. Inductance Measurement using Anderson Bridge.
7. Measurement of 3- Phase reactive power with single phase wattmeter for balanced loading.
8. Calibration of LPF wattmeter by direct loading.
9. Measurement of 3-Phase power with single watt meter and using two C.Ts.
10. Testing of C.T. using mutual inductance method.
11. Testing of P.T. using absolute null method.
12. LVDT characteristics, calibration and displacement measurement.

**B.Tech III Year II Semester** **Course Structure**

| L | T | P | C |
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| 0 | 0 | 3 | 1.5 |

## MICROPROCESSOR AND MICROCONTROLLERS LAB

**Internal Marks:** 40

**Course Code:** P18ECL07 **External Marks:** 60

**Prerequisite**: Microprocessors and Microcontrollers

**Course Objectives**:

1. Learn the assembly language programming of 8086 microprocessor
2. Learn the design aspects of interfacing the peripheral devices with the 8086 microprocessor
3. To study programming based on 8051 microcontroller.
4. Learn the design aspects of interfacing the peripheral devices with the 8051 microcontroller

**Course Outcomes**:

1. Design and implement programs on 8086 microprocessor.
2. Design and implement interfacing programs with 8086 microprocessor.
3. Design and implement programs on 8051 microcontroller based systems
4. Design and implement interfacing programs with 8051 microcontroller.

### List of the Experiments / Programs

**PART – A: 8086 ASSEMBLY LANGUAGE PROGRAMMING**

1. Introduction to MASM/TASM, KEIL
2. Multi byte addition/subtraction
3. Multi byte Multiplication/division operations
4. Find sum of squares/cubes of a given-numbers
5. Find factorial of given n-numbers
6. Sorting of given string in Ascending and Descending order

**PART – B: 8086 INTERFACING**

7. Interrupt Controller-Generate an interrupt using 8259timer
8. Generation of counting clock pulse using Intel8253/8254

**PART – C: 8051 ASSEMBLY LANGUAGE PROGRAMS**

9. Finding number of 1's and number of0's
10. Arrange numbers in ascending/descending order
11. Find average of n-numbers

**PART – D: 8051 INTERFACING**

12. Switches and LEDs
13. 7-Segment display(multiplexed)

**ADDITIONAL EXPERIMENTS**

1. Arithmetic and Logical operations by using 8086 trainer kit
2. Arithmetic and Logical operations by using 8051 trainer kit

**B.Tech. IV Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

## POWER SYSTEM OPERATION AND CONTROL

**Internal Marks:** 40

**Course Code:** P18EET12 **External Marks:** 60

**Course Prerequisite:** Power system – I, II and Control system.

**Course Objectives:**

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

**Course Outcomes:**

After going through this course, the student will be able to

1. Compute optimal scheduling of Generators.
2. Understand hydrothermal scheduling.
3. Understand importance of the frequency and PID controllers in single area and two area systems.
4. Understand the unit commitment problem.
5. Understand reactive power control and compensation for transmission line.

**UNIT–I** **(10 Hours)**

**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–II** **(8 Hours)**

**Hydrothermal Scheduling**

Optimal scheduling of Hydrothermal System**:** Hydroelectric power plant models – Scheduling problems – Short term hydrothermal scheduling problem.

**UNIT–III**

**Single Area Load Frequency Control** **(12 Hours)**

Speed governing system–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.

**Two Area Load Frequency Control**

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–IV** **(7 Hours)**

**Unit Commitment**

Optimal unit commitment problem – Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

**UNIT–V** **(8 Hours)**

**Reactive Power Control**

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 – Uncompensated and compensated transmission lines**:** Shunt and series compensation – Need for FACTS controllers.

**Text Books:**

1. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata McGraw Hill Publishing Company Ltd, 2nd edition.
2. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–hill Publishing Company Ltd., Second edition.

**Reference Books:**

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., Thompson, 3rd Edition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by HadiSaadat – TMH Edition.
4. Power System stability & control, PrabhaKundur,TMH.

**Web Resources:**

1. www.npteliitm.ac.in

**B.Tech. IV Year I Semester** **Course Structure**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

## UTILIZATION OF ELECTRICAL ENERGY

**Internal Marks: 40**

**Course Code: P18EET13** **External Marks: 60**

**Course Prerequisite**: Electrical Machines, Power Electronics and Drives, Power Systems –II

**Course Objectives:**

1. To understand the operating principles and characteristics of traction motors with respect to speed, temperature, loading conditions.
2. To study with the different types of heating and welding techniques.
3. To study the basic principles of illumination and its measurement and its design.
4. To understand the basic principle of electric traction including speed–time curves of different traction services.
5. To understand the method of calculation of various traction system for braking, acceleration and other related parameters, including demand side management of energy.

**Course Outcomes:**

After going through this course, the student will be able to

1. Identify a suitable motor for electric drives and industrial applications
2. Identify most appropriate heating and welding techniques for suitable applications.
3. Understand various level of luminosity produced by different illuminating Sources.
4. Determine the speed/time characteristics of different types of traction motors.
5. Estimate energy consumption levels at various modes of operation.

**UNIT – I** **(9 Hours)**

**Electric Drives**

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.

**UNIT – II** **(9 Hours)**

**Electric Heating & Welding**

Advantages and methods of electric heating–Resistance heating, induction heating and dielectric heating – Arc furnaces -Direct and indirect arc furnaces - Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding.

**UNIT – III** **(9 Hours)**

**ILLUMINATION**

Introduction, terms used in illumination, laws of illumination, polar curves sources of light. 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 and LED Lightning.

**UNIT – IV** **(9 Hours)**

**Electric Traction – I**

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-High speed transportation trains.

**UNIT – V** **(9 Hours)**

**Electric Traction – II**

Specific energy consumption for given run–Effect of varying acceleration and braking retardation–coefficient of adhesion–Principles of energy efficient motors-Modern traction motors.

**Text Books:**

1. Utilization of Electric Energy – by E. Open shaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, DhanpatRai&Sons.
3. Utilization of Electrical Power including Electric drives and Electric traction – by N.V. Suryanarayana, New Age International (P) Limited, Publishers, 1996.

**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.

**B.Tech. IV Year I Semester** **Course Structure**

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# MANAGEMENT SCIENCE

**Internal Marks: 40**

**Course Code: P18HST03** **External Marks: 60**

**Course Prerequisite**:--

**COURSE OBJECTIVES:**

1. To understand the application of management science in decision making process& its importance, evaluation of management thought, how organization structure is designed and its principle and types.
2. To understand the types of management about work study, how quality is controlled, control charts and inventory control and their types.
3. To learn the main functional areas of organization i.e., Financial Management, Production Management, Marketing Management, Human resource Management, Product life cycles and Channels of Distribution.
4. The learning objective of this unit is to understand the Development of Network and Identifying Critical Path.
5. The learning objective of this unit is to understand the concept of strategic management, and the basic concepts of MIS, MRP, JIT, TQM, Six sigma, CMM, Supply chain management, ERP, Business Process Outsourcing, bench marking and business process re-engineering.

**COURSE OUTCOMES:**

After going through this course, the student will be able to

1. Apply the concepts & principles of management in real life. The student will be able to design & develop organization structure for an enterprise.
2. Apply PPC techniques, Quality Control, Work-study principles in industry.
3. Identify and apply Marketing, HRM, and Production Strategies and implement them effectively.
4. Develop PERT/CPM Charts for projects of an enterprise and estimate time & cost of project.
5. Develop Mission, Objectives, Goals & strategies for an enterprise in dynamic environment and apply modern management techniques MIS, ERP, TQM, SCM, BPR, and Bench Marking wherever possible.

**UNIT-I** **(9 Hours)**

**Introduction to management:** Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure.

**UNIT – II** **(9 Hours)**

**Operations Management**: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

**UNIT – III** **(9 Hours)**

**Functional Management**: Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans (Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationalising change through performance management.

**UNIT-IV** **(9 Hours)**

**Project Management**: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

**UNIT –V** **(9 Hours)**

**Strategic Management**: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process –SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives - Global strategies.

**Contemporary Management Practices:** basic concepts of MIS, Total Quality Management (TQM), Six Sigma, Supply chain management, Enterprise Resource Planning (ERP), Business process Re- engineering and Bench Marketing,

**Text Books**


1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, '*Management Science'* Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, *Management Science'* TMH 2011.


**References**


1. Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
2. Biswajit Patnaik: Human Resource Management, PHI, 2011
3. Hitt and Vijaya Kumar: Starategic Management, Cengage learning
4. Seth & Rastogi: Global Management Systems, Cengage learning , Delhi, 2011


**Web References:**

1. https://mrcet.com/downloads/digital_notes/ECE/II%20Year/Management%20Science.pdf
2. https://books.askvenkat.org/management-science-textbook-aryasri-pdf/
3. https://nptel.ac.in/courses/122/102/122102007/
4. https://nptel.ac.in/courses/122/108/122108038/
5. http://www.universityofcalicut.info/SDE/Management_science_corrected_on13April2016.pdf

**B. Tech IV Year I Semester** **Course Structure**

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# SWITCH GEAR AND PROTECTION

**Internal Marks: 40**
**Course Code: P18EET14** **External Marks: 60**
**Course Prerequisite**: Power Systems-II

**Course Objective:**

1. To provide the basic principles and operation of various types of circuit breakers.
2. To study the classification, operation and application of different types of electromagnetic protective relays.
3. To explain protective schemes, for generator and transformers.
4. To impart knowledge of various protective schemes used for feeders and bus bars.
5. To explain the principle and operation of different types of static relays and different types of lightning arresters

**Course Outcomes:**

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

1. Understand basic principles and operation of various types of circuit breakers.
2. Study the classification, operation and application of different types of electromagnetic protective relays.
3. Explain protective schemes, for generator and transformers.
4. Impart knowledge of various protective schemes used for feeders and bus bars.
5. Explain the principle and operation of different types of static relays and different types of lightning arresters.

**UNIT -I** (9 Lectures)

**Circuit Breakers**

Miniature Circuit Breaker (MCB)– Elementary principles of arc interruption– Re-striking Voltage and Recovery voltages– Re-striking phenomenon - RRRV– Average and Max. RRRV– Current chopping and Resistance switching– Introduction to oil circuit breakers–Description and operation of Air Blast– Vacuum and SF6 circuit breakers– CB ratings and specifications– Concept of Auto reclosing.

**UNIT—II** (9 Lectures)

**Electromagnetic Protection**

Relay connection – Balanced beam type attracted armature relay - induction disc and induction cup relays–Torque equation - Relay's 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-III** (9 Lectures)

**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**

**Protection of transformers:** Percentage differential protection– Design of CT's ratio– Buchholz relay protection.

**UNIT-IV** (8 Lectures)

**Feeder and Bus bar Protection**

Protection of lines: 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.

**UNIT – V** (10 Lectures)

**Static and Digital Relays**

Static relays: Static relay components– Static over current relays– Static distance relay– Microprocessor based digital relays

**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– Insulation coordination-Neutral grounding - Methods of neutral grounding**:** Solid–resistance–Reactance–Arcing grounds and grounding Practices.

**Text Books:**

1. Power System Protection and Switchgear by Badari Ram and D.N Viswakarma,TMH Publications
2. Power system protection- Static Relays with microprocessor applications by T.S.MadhavaRao, TMH

**Reference Books:**

1. Fundamentals of Power System Protection by Paithankar andS.R.Bhide.,PHI, 2003.
2. Art & Science of Protective Relaying – by C R Mason, Wiley Eastern Ltd.
3. Protection and Switch Gear by Bhavesh Bhalja, R.P.Maheshwari, Nilesh G.Chothani, OxfordUniversity Press, 2013.
4. Power System Protection and Switchgear, "Ravindranath, Chander, " Wiley Eastern, 1994.

**Web Resources:**

1. https://books.google.com.bd/books?id=AZLbHTJEDFIC&printsec=copyright#v=onepage&q&f=false.
2. https://rmd.ac.in/dept/eee/sp/7/PSG/unit1.pdf

**PROFESSIONAL ELECTIVE-II**

**B.Tech IV Year – I Semester** **L T P C**
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# HIGH VOLTAGE ENGINEERING

**Internal Marks: 40**

**Course Code: P18EEE05** **External Marks: 60**

**Course Prerequisite**: **Power Systems**

**Course Objectives:**

1. To understand electric field distribution and computation in different configuration of electrode systems.
2. To understand HV breakdown phenomena in gases, liquids and solids dielectrics.
3. To acquaint with the generating principle of operation and design of HVDC, AC and Impulse voltages and currents.
4. To realize various techniques of AC, DC and Impulse measurement of high voltages and currents.
5. To study the various testing techniques of HV equipment's.

**Course Outcomes:**

After going through this course, the student will be able to

1. Acquainted with the performance of high voltages with regard to different configurations of electrode systems.
2. Understand theory of breakdown and withstand phenomena of all types of dielectric materials.
3. Acquaint with the techniques of generation of AC, DC and Impulse voltages.
4. Apply knowledge for measurement of high voltage and high current AC, DC and Impulse.
5. Know the techniques of testing various equipment's used in HV engineering.

**UNIT–I:**

**Introduction to High Voltage Technology** **(7 Lectures)**

Electric Field Stresses – Uniform and non–uniform field configuration of electrodes – Estimation and control of electric Stress.

**UNIT–II:**

**Break down phenomenon in gaseous, liquid and solid insulation** **(7 Lectures)**

Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases – Paschen's law.

**UNIT–III:** **(7Lectures)**

Generation of High voltages and High currents Generation of high DC voltages – Generation of high alternating voltages – Generation of impulse voltages and currents.

**UNIT–IV:** **(7 Lectures)**

Measurement of high voltages and High currents Measurement of high AC, DC and Impulse voltages – Voltages and measurement of high currents – Direct, alternating and Impulse.

**UNIT–V:**

**High voltage testing of electrical apparatus (7 Lectures)**

Testing of insulators and bushings – Testing of isolators and circuit breakers – Testing of cables – Testing of transformers – Testing of surge arresters

**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.

**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 RavindraArora, Wolfgang Mosch, New Age International (P)Limited,1995.

**Web Resources:**

1. https://nptel.ac.in/courses/108/104/108104048/
2. https://www.academia.edu/12268238/High_Voltage_Engineering_CL_Wadhwa_PDF_BOok_Download

**B.Tech IV Year – I Semester**

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# ELCTRICAL DISTRIBUTION SYSTEM

**Internal Marks: 40**

**Course Code: P18EEE06** **External Marks: 60**

**Course Prerequisite**: Power Systems

1. To study different factors of Distribution system.
2. To study and design the substations and distribution systems.
3. To study the concepts of voltage drop and power loss.
4. To study the distribution system protection and its coordination.
5. To study the effect of compensation for power factor improvement and the effect of voltage control on distribution system.

**Course Outcomes:**

After completion of this course, the student is able to:

1. Understand various factors of distribution system.
2. Design the substation and feeders.
3. Determine the voltage drop and power loss
4. Understand the protection and its coordination
5. Understand the effect of compensation for p.f improvement and Able to understand the effect of voltage control.

**UNIT – I** (7 Lectures)

**General Concepts**

Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor, loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial)

**UNIT – II** (7 Lectures)

**Substations**

Location of substations: Rating of distribution substation – Service area with‘n’ primary feeders – Benefits and methods of optimal location of substations.

**Distribution Feeders**

Design Considerations of distribution feeders: Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

**UNIT –III** (7 Lectures)

**System Analysis**

Voltage drop and powerloss calculations: Derivation for voltage drop and power loss in lines – Uniformly distributed loads and non-uniformly distributed loads – Numerical problems.

**UNIT- IV** (7 Lectures)

**Protection**

Objectives of distribution system protection – Types of common faults and procedure for fault calculations for distribution system – Protective devices: Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers.

**Coordination**

Coordination of protective devices: General coordination procedure –Various types of coordinated operation of protective devices.

**UNIT – V** (7 Lectures)

**Compensation for Power Factor Improvement**

Capacitive compensation for power factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation– Procedure to determine the best capacitor location.

**Text Books:**


1. "Electric Power Distribution System Engineering " by Turan Gonen, McGraw-Hill Book Company,1986.
2. Electric Power Distribution-by A.S.Pabla, Tata McGraw-Hill Publishing Company, 4th edition, 1997.
3. Electric Power Distribution and Automation by S.Sivanagaraju and balasubbareddy


**Reference Books:**


1. Electrical Distribution V.Kamaraju-McGraw Hill
2. Handbook of Electrical Power Distribution – Gorti Ramamurthy-Universities press


**Web References:**

1. https://allbookserve.org/downloads/electric_power_distribution_system_engineering_by_turan_gonen_free.pdf
2. https://thebookee.net/el/electrical-power-distribution-book-by-as-pabla-in-pdf

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**B.Tech IV Year – I Semester**

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# ENERGY AUDIT, CONSERVATION & MANAGEMENT

**Internal Marks: 40**

**Course Code: P18EEE07** **External Marks: 60**

**Course Prerequisite**: Power Systems

**Course Objective:**

1. To understand energy efficiency, scope, conservation and technologies.
2. To design energy efficient lighting systems.
3. To estimate/calculate power factor of systems and propose suitable compensation techniques.
4. To understand energy conservation in Space Heating and Ventilation – Air–Conditioning systems.
5. To calculate life cycle costing analysis and return on investment on energy efficient technologies.

**Course Outcomes:**

After completion of this course, the student is able to:

1. Explain energy efficiency, conservation and various technologies.
2. Design energy efficient lighting systems.
3. Calculate power factor of systems and propose suitable compensation techniques.
4. Explain energy conservation in Space Heating and Ventilation – Air–Conditioning systems.
5. Calculate life cycle costing analysis and return on investment on energy efficient technologies.

**UNIT – I: General Concepts of Energy Auditing (7 Lectures)**

Basic Principles of Energy Audit and management Energy audit – Definitions – Concept – Types of audit– Sankey diagrams– Energy conservation schemes and energy saving potential– Principles of energy management – Role Energy manager.

**UNIT – II: Energy Efficient Lighting System (7 Lectures)**

Lighting Modification of existing systems – Replacement of existing systems –Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED -Energy conservation measures.

**UNIT- IV: Energy efficiency in Space Heating and Ventilation – Air–Conditioning systems (7 Lectures)**

Space Heating and Ventilation – Air–Conditioning and Water Heating: Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Electric water heating systems – Energy conservation methods.

**UNIT – V: Economic Aspects and Financial Analysis (7 Lectures)**

Economic Aspects and Analysis Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis –Calculation of simple payback method – Net present worth method, Case study in Energy auditing.

**Text Books:**

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy efficient electric motors by John.C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

**Reference Books:**

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
2. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
3. Energy management hand book by W.C.Turner, John Wiley and sons.
4. Energy management and conservation–k v Sharma and Pvenkata Seshaiah-I K International Publishing House pvt.ltd,2011.

**Web References:**

1. https://iare.ac.in/sites/default/files/iare_EAM_lecture%20notes.pdf
2. https://www.jntufastupdates.com/jntuk-r16-3-2-eacm-material-pdf/

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**B.Tech. IV Year I Semester** **Course Structure**

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# SPECIAL ELECTRICAL MACHINES

**Internal Marks: 40**

**Course Code: P18EEE08** **External Marks: 60**

**Course Prerequisite:** Electrical machines-I& Electrical Machines-II

**Course Objectives:**

1. To give overview of switched reluctance motors and its applications.
2. To discuss about various steppers motors used in industrial applications.
3. To study variable reluctance stepper motors.
4. To gain the knowledge on permanent magnet brushless DC motors and its applications.
5. To discuss the other special machines used in industrial applications.

**Course Outcomes:**

At the end of this course the student will able to:

1. Ability to acquire the knowledge on construction and operation of switched reluctance motors.
2. Ability to acquire the knowledge on stepper motors and their applications.
3. Gain the knowledge on variable reluctance motors.
4. Ability to acquire the knowledge on principle of operation of permanent magnet brushless dc motors.
5. Ability to acquire the knowledge on some other special machines used in industrial applications.

**UNIT – I Stepper Motors:** **(7 Lectures)**

Introduction-synchronous inductor (or hybrid stepper motor), Hybrid stepping motor, construction, principles of operation, Energisation with two phase at a time essential conditions for the satisfactory operation of a 2-phase hybrid step motor.

**UNIT – II Variable Reluctance Stepping Motors:** **(7 Lectures)**

Variable reluctance (VR) Stepper motors, single stack VR step motors, Multiple stack VR motors-Open-loop control of 3-phase VR step motor-closed-Loop control of step motor.

**UNIT-III Switched Reluctance Motors (SRM):** **(7 Lectures)**

Constructional features -Principle of operation- Torque Production-Characteristics, Steady state performance, Power converters – Control of SRM drive- Sensor less operation of SRM – Applications.

**UNIT-IV**

**Permanent Magnet Brushless D.C. Motors: (7 Lectures)**

Fundamentals of Permanent Magnets- Types- Principle of operation of BLDC Motor- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers - Characteristics and control- Applications. Comparison between BLDC and PMSM.

**UNIT-V**

**Other Special Machines**: **(7 Lectures)**

Hysteresis motor: Constructional features – Principle of operation and Characteristics. Synchronous Reluctance Motor-Linear Induction Motor-Repulsion motor- Applications.

**Text Books:**

1. K.Venkata Ratnam, Special Electrical Machines, Universities Press (India),Private Limited 2008
2. E.G.Janardanan, Special Electrical Machines, PHI Learning Private Limited Delhi 2014.

**Reference Books:**

1. R.Krishnan-Switched reluctance motor drives-design and applications-New York, 2001
2. R.Srinivasan-Special electrical machines-Lakshmi Publications,2013
3. T.J.E.Miller,Brushless Permanent Magnet and Reluctance Motor drives.

**Web Resources:**

1. http://www.facstaff.bucknell.edu/mastascu/elessonshtml/Specialmachines /MeasIntro.htm
3. http://www.electrical4u.com/special electrical machines--types-construction –operation - applications/

**B. Tech IV Year I Semester**

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# EMPLOYABILITY SKILLS

**Course Code: P18MCT10**

**Course Objectives:**

To learn how to make effective teams, personality development and leadership skills.

- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

**Course Outcomes:**

By the end of this course, the student is able to

- Recite the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Apply their core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

**UNIT-1**

Career Mapping: Inculcate workplace and professional etiquettes. Tips for Success. Etiquette and Manners – Social and Business. Time Management – Concept, Essentials, Tips.

**UNIT-2**

Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.

Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills, Case studies and discussions etc.

**UNIT-3**

Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution.

Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress.

**UNIT-4**

Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.

Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behavior; Assertiveness Skills.

**UNIT-5**

Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

**References Books:**

1) Wallace, Personality Development, India Edition, CENGAGE Learning, 2008.
2) P.Subba Rao, Personnel and Human Resource Management , Himalaya Publishing House; Fifth Edition,2015
3) Ramachandran and Karthik, From campus to Corporate, India, PEARSON Publication, 2016.
4) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
5) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
6) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

**Related Activities**

- Comparing company Work culture, Nature and Management styles - company information.
- Handling personnel matters – eg Time management, Communication at work.
- Role plays of chairing business meetings and negotiations.
- Conflicts resolution Games
- Team building and leadership skills Case studies and discussions
- Find out the leadership styles of various companies CEO's.
- Tips for Enhancing Your Own Emotional Intelligence or Teams

**B.Tech. IV Year I Semester** **Course Structure**

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# ELECTRICAL SIMULATION LAB

**Internal Marks: 40**

**Course Code: P18EEL07** **External Marks: 60**

**Course Prerequisite**: Electrical Circuit Analysis, Power Systems and Power Electronics

**Course objectives:**

1. To simulate integrator circuit, differentiator circuit, Boost converter, Buck converter, full convertor and PWM inverter.
2. To simulate transmission line by incorporating line, load and transformer models.
3. To perform transient analysis of RLC circuit.

**Course outcomes:**

After going through this course, the student will be able to

1. Able to simulate integrator circuit, differentiator circuit, Boost converter, Buck converter, full convertor and PWM inverter.
2. Able to simulate transmission line by incorporating line, load and transformer models.
3. Able to perform transient analysis of RLC circuit.

**Following experiments are to be conducted:**

1. Simulation of transient response of RLC circuits
    a. Response to pulse input
    b. Response to step input
    c. Response to sinusoidal input
2. Analysis of three phase circuit representing the generator transmission line and load. Plot three phase currents & neutral current.
3. Simulation of single–phase full converter using RLE loads
4. Single phase AC voltage controller using RL loads
5. Plotting of Bode plots, Root locus and Nyquist plots for the transfer functions of systems up to $5^{th}$ order
6. Simulation of Boost and Buck converters.
7. Integrator & Differentiator circuits using op–amp.
8. Simulation of single-phase inverter with PWM control.

**Any 2 of the following experiments are to be conducted:**

1. Modeling of transformer and simulation of lossy transmission line.
2. Dynamic stability analysis of power systems.
3. Simulation of three phase full converter using MOSFET and IGBTs.
4. Transfer function analysis of a given circuit.
5. Simulation of D.C separately excited motor using transfer function approach.

**Reference Books:**


1. "Simulation of Power Electronic Circuit" ,by M.B.patil, V.Ramanarayan, V.T.Ranganathan.Narosha,2009.
2. Pspice for circuits and electronics using PSPICE – by M.H.Rashid, M/s PHI Publications
3. Pspice A/D user`s manual – Microsim,USA
4. Pspice reference guide – Microsim, USA
5. MATLAB user`s manual – Mathworks,USA
6. MATLAB – control system tool box – Mathworks, USA
7. SIMULINK user`s manual – Mathworks,USA
8. EMTP User`sManual.
9. SEQUEL– A public domain circuit simulator available atwww.ee.iitb.ac.in/~sequel

**IV Year – I SEMESTER**

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## POWER SYSTEMS LAB

**Internal Marks: 40**
**Course Code: P18EEL08** **External Marks: 60**

**Course Prerequisite**: Power Systems and power system operation and control.

**Course Objectives:**

1. To understand the fault analysis of the 3 – phase transformer and 3-phasealternator.
2. To determine the ABCD parameters of transmission lines, dielectric strength of the transformer oil and to calibrate the tong tester.
3. To identify the earth fault.
4. To analyze the AC and DC load flow studies.
5. To control the load frequency of two area systems and to understand the economic load dispatch.

**Course Outcomes:**

After going through this course, the student will be able to

1. Understand the fault analysis of the 3 – phase transformer and 3-phasealternator.
2. Determine the ABCD parameters of transmission lines, dielectric strength of the transformer oil and to calibrate the tong tester.
3. Identify the earth fault.
4. Analyze the AC and DC load flow studies.
5. Control the load frequency of two area systems and to understand the economic load dispatch.

**Any 6 of the Following experiments are to be conducted:**

1. Sequence impedances of 3-PhaseTransformer.
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. Over current relay with earth fault.
6. Over voltage relay with earth fault.
7. Dielectric strength of Transformer oil.
8. Calibration of Tong Tester.

**Any 4 of the Following experiments are to be conducted:**

9. Load flow studies using Gauss-seidel method.
10. Load flow studies using N-R method.
11. DC Load flow studies in Power systems.
12. Transient Stability Analysis.
13. Two area load frequency control with & without controller.
14. Economic load dispatch with & without losses.
15. V-I Characteristics of Solar PV system.

**B.Tech. IV Year II Semester** **Course Structure**

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## HVDC TRANSMISSION

**Internal Marks:** 40

**Course Code:** P18EET15 **External Marks:** 60

**Course Prerequisite**: Power Systems

**Course Objectives:**

6. To understand basic concepts of HVDC Transmission.
7. To analyze the converter configuration.
8. To know the control of converter and HVDC Transmission.
9. To understand the significance of reactive power control and AC/DC load flow.
10. To know different converter faults, protection and effect of harmonics. To leave high pass filters.

**Course Outcomes:**

After completion of this course, the student is able to:

1. Explain different types of HVDC levels and basic concepts
2. Analyze the operation of converters configuration.
3. Acquire control concept
4. Signify reactive power control and AC/DC load flow.
5. Understand converter faults, protection and harmonic effects & Design high pass filters

**UNIT – I: BASIC CONCEPTS (8 Lectures)**

Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

**UNIT – II: ANALYSIS OF HVDC CONVERTERS (8 Lectures)**

Choice of Converter configuration – analysis of Graetz – characteristics of 6 Pulse & 12 Pulse converters – Cases of two 3 phase converters in star –star mode – their performance.

**UNIT –III: CONVERTERS & HVDC CONTROL SYSTEM (9 Lectures)**

Principal of DC Link Control – Converters Control Characteristics – Firing angle control – Current and extinction angle control – Effect of source inductance on the system; Starting and stopping of DC link; Power Control.

**UNIT- IV: REACTIVE POWER CONTROL IN HVDC (10 Lectures)**

Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies-sources of reactive power– shunt capacitors-synchronous condensers.

**POWER FLOW ANALYSIS IN AC/DC SYSTEMS**

DC Network-DC Converter-Controller Equations-Solution of DC load flow – P.U. System for DC quantities-solution of AC-DC Power Flow

**UNIT – V: CONVERTER FAULT & PROTECTION (10 Lectures)**

Converter faults, protection -against over current, over voltage, quenching, and arc backs in converter station – surge arresters – smoothing reactors – DC breakers -Radio interference.

**HARMONICS**

Generation of Harmonics –Characteristics harmonics, calculation of AC Harmonics, Total Harmonic Distraction (THD), Simulations of THD

**FILTERS**

Types of AC filters, Design of Single tuned filters –Design of High pass filters.

**Text Books:**

1. HVDC Transmission by S.Kamakshaiah and V.Kamaraju-Tata McGraw–Hill
2. HVDC Power Transmission Systems: Technology and system Interactions – byK.R.Padiyar,New Age International (P) Limited, and Publishers.

**Reference Books:**

1. HVDC Transmission – J.Arrillaga.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.
3. Power Transmission by Direct Current – by E.Uhlmann,**B.S.Publications.**

**Web References:**

1. https://mrcet.com/downloads/digital_notes/EEE/EHVAC%20AND%20HVDC%20DIGITAL%20NOTES.pdf
2. https://easyengineering.net/hvdc-power-transmission-systems-by-padiyar/
3. https://www.pdfdrive.com/high-voltage-direct-current-transmission-e175261038.html

**PROFESSIONAL ELECTIVE -III**

**B.Tech. IV Year II Semester** **Course Structure**

| L | T | P | C |
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## FLEXIBLE AC TRANSMISSION SYSTEM

**Internal Marks: 40**

**Course Code: P18EEE09** **External Marks: 60**

**Course Prerequisite**: Power Electronics, Power System Operation & Control

**Course Objectives:**

1. To Study power flow control in transmission lines using FACTS controllers
2. To understand the operation and control of voltage source converter and current source converter.
3. To understand the methods to improve stability and reduce power oscillations in the transmission lines.
4. To learn the methods of shunt compensation using static VAR compensators
5. To Understand methods of compensations using series compensators and operation of combined controllers.

**Course Outcomes:**

After completion of this course, the student is able to:

1. Understand the power flow control in transmission lines using FACTS controllers.
2. Explain operation and control of voltage source converter and current source converter.
3. Analyze the methods to improve stability and reduce power oscillations in the transmission lines.
4. Explain method of shunt compensation using static VAR compensators.
5. Analyze the methods of compensations using series compensators and operation of combined controllers.

**UNIT – I** (7 Lectures)

**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– Losses and speed of switching of high power devices.

**UNIT – II** (7 Lectures)

**Voltage source and Current source converters:** Concept of voltage source converter (VSC) – Three phase six pulse converter– Square–wave voltage harmonics for a Three–phase bridge converter –Three–phase current source converter with R Load – Comparison of current source converter with voltage source converter.

**UNIT –III** (7 Lectures)

**Shunt Compensators–1:** Objectives of shunt compensation – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.

**Methods of controllable VAR generation:** Variable impedance type static VAR generators – Thyristor Controlled Reactor (TCR) and Thyristor Switched Reactor (TSR) - Applications

**UNIT- IV** (7 Lectures)

**Shunt Compensators–2:** Thyristor Switched Capacitor (TSC)– Thyristor Switched Capacitor – Thyristor Switched Reactor (TSC–TCR). Static VAR compensator (SVC) and Static Compensator (STATCOM)

**UNIT – V** (7 Lectures)

**Series Compensators:** Static series compensators**:** Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. GTO thyristor-controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC) controls.

**Textbooks:**

1. "Understanding FACTS" N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition is available:—Standard Publications, 2001.
2. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.Mohan Mathur and Rajiv K.Varma, Wiley.

**Reference Books:**

1. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
2. "Flexible AC Transmission system: Modelling and Control" by Xiao ping zahang,
   a. Bikash Pal, Springer publications.

**Web References:**

1. https://www.electrical4u.com/facts-on-facts-theory-and-applications/
2. https://1lib.in/book/821545/eb1426
3. https://1lib.in/book/668950/e05748
4. https://www.elprocus.com/flexible-ac-transmission-system-need-definition-types/
5. https://en.wikipedia.org/wiki/Flexible_AC_transmission_system
6. https://www.gegridsolutions.com/facts.htm
7. http://www.betaengineering.com/high-voltage-industry-blog/facts-about-facts-flexible-ac-transmission-systems

**B.Tech. IV Year II Semester** **Course Structure**

| L | T | P | C |
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## SMART GRID TECHNOLOGIES

**Internal Marks: 40**
**Course Code: P18EEE10** **External Marks: 60**

**Course Prerequisite**: Renewable Energy Systems, Power Electronics and Power Systems

**Course Objectives:**

1. To understand concept of smart grid and its advantages over conventional grid.
2. To understand the smart substation and automation
3. To understand the Micro Grid and its integration
4. To know smart metering techniques and measuring techniques
5. To understand the problems associated with integration of distributed generation &its solution through smart grid.

**Course Outcomes:**

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

1. Students will develop more understanding on the concepts of Smart Grid and its present developments
2. Assess the role of automation in Transmission/Distribution
3. Apply Evolutionary Algorithms for the Smart Grid/Distribution Generation
4. Understand the operation and importance of PMUs, WAMS in industrial and commercial installations
5. Students will acquire knowledge on Voltage and Frequency control in smart Grids

**UNIT -I** (7 Lectures)

**Introduction to Smart Grid:** Introduction to Smart Grid - Need of Smart Grid– Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid.

**UNIT—II** (7 Lectures)

**Smart Grid Architecture:** Components and Architecture of Smart Grid Design – Review of the proposed architectures for Smart Grid-The fundamental components of Smart Grid designs – Transmission Automation

**UNIT-III** (7 Lectures)

**Distribution Generation:** Introduction-necessity of DG– Concept of micro grid-Issues of interconnection-protection & control of micro grid. Sub-Station Automation -Distribution Automation – Feeder Automation, Renewable Integration

**UNIT-IV** (7 Lectures)

**Smart Meters and Advanced Metering Infrastructure:**

Introduction to smart Meters-Advanced Metering infrastructure (AMI) drivers and benefits-AMI protocols-Standards and initiatives-AMI needs in the smart grid, Phasor Measurement Unit (PMU)-Wide Area Measurement Systems (WAMS).

**UNIT – V** (7 Lectures)

**Power quality Management in Smart Grid:**

Power Quality Issues of Grid Connected Renewable Energy Sources,Load Frequency Control (LFC) and Voltage Control in Micro Grid System – Reactive Power Control in Smart Grid.

**Text Books:**


1. James Momoh, "Smart Grid :Fundamentals of Design and Analysis"-Wiley, IEEE Press,2012
2. Ali Keyhani, Mohammad N. Marwali, Min Dai ―Integration of Green and Renewable Energy in Electric Power Systems‖, Wiley
3. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong.Wu, AkihikoYokoyama, Nick Jenkins,"Smart Grid: Technology and Applications"- Wiley, 2012.
4. A.G. Phadke and J.S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer Edition, 2010


**REFERENCE BOOKS:**


1. Yang Xiao, "Communication and Networking in Smart Grids", CRC Press
2. Wiley Blackwell 3.Peter S. Fox Penner, "Smart Power: Climate Changes, the Smart Grid, and the Future of Electric Utilities", Island Press; 1 edition 8 Jun 2010
3. Stuart Borlase, "Smart Grids (Power Engineering)", CRC Press


**WEB RESOURCES:**

1. http://smartgrid.ieee.org/
2. http://www.nptel.ac.in/courses/108108078/pdf/chap10/teach_slides10.pdf
3. http://www.iitk.ac.in/ime/anoops/for15/ppts/

**B. Tech IV Year II Semester**

**Course Structure**

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## POWER QUALITY

**Internal Marks: 40**

**Course Code: P18EEE11** **External Marks: 60**

**Course Prerequisite**: Power Systems

**Course Objectives:**

1. To learn different types of power quality phenomena.
2. To identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
3. Tolearntheprincipleofvoltageregulationandpowerfactorimprovementmethods.
4. To analyze the Harmonic distortion and solutions.
5. To understand the power quality monitoring concept sand the usage of measuring instruments.

**Course Outcomes:**

After going through this course, the student will be able to

1. Learn different types of power quality phenomena.
2. Identify sources for voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.
3. Learn the principle of voltage regulation and power factor improvement methods.
4. Analyze the Harmonic distortion and solutions.
5. Understand the power quality monitoring concept sand the usage of measuring instruments.

**Unit–I: Power quality** (7 Lectures)

Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems–Transients–Voltage unbalance – Waveform distortion – Voltage fluctuation–Power frequency variations.

**Unit–II: Voltage imperfections in power systems** (7 Lectures)

Power quality terms – Voltage sags – Voltage swells and interruptions – Sources of voltage sag, swell and interruptions – Nonlinear loads, Compensation methods of Voltage sag and Swell

**Unit–III: Voltage Regulation and power factor improvement:** (7 Lectures)

Principles of regulating the voltage– Device for voltage regulation- Capacitor for voltage regulation–Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

**Unit–IV: Harmonic distortion and solutions** (7 Lectures)

Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters –Passive and active filtering, hybrid filters

**Unit–V:Monitoring and Instrumentation** (7 Lectures)

Power quality monitoring and considerations– historical perspective of PQ measuring instruments – PQ measurement equipment –Application of intelligent systems – PQ monitoring standards.

**Textbooks:**


1. Electrical Power Systems Quality, Dugan R C, Mc Granaghan M F, Santoso S, andBeatyHW,SecondEdition,McGraw–Hill,2012,3rdedition.
2. Electricpowerqualityproblems–M.H.J.BollenIEEEseries-WileyIndiapublications, 2011.


**Reference Books:**


1. Power Quality Primer, Kennedy BW, First Edition, McGraw–Hill,2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen MHJ, First Edition, IEEEPress;2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley&Sons, 2003.
4. Electric Power Quality Control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, NewYork.
5. Power Quality c.shankaran, CRC Press, 2001
6. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor Francis)
7. Power Quality in Power systems and Electrical Machines–Ewald F.fuchs, Mohammad A.S.Masoum–Elsevier.

**B. Tech IV Year II Semester** **Course Structure**

| L | T | P | C |
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## ELECTRIC AND HYBRID VEHICLES

**Subject Code: P18EEE12**

**Internal Marks: 40**
**External Marks: 60**

**Course Prerequisites:** Electrical Machines and Power Electronics.

**Course Objectives:**

1. To understand the upcoming technologies of hybrid and electrical vehicles.
2. To understand the Architecture of Electric Vehicles.
3. To understand the Architecture of Hybrid Vehicles.
4. To analyze the performance vehicles with different electrical motors.
5. To implement action issues of energy strategies.

**Course Outcomes:**

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

1. Understand the upcoming technologies of hybrid and electrical vehicles.
2. Understand the Architecture of Electric Vehicles.
3. Understand the Architecture of Hybrid Vehicles.
4. Analyze the performance vehicles with different electrical motors.
5. Implement action issues of energy strategies.

**UNIT-I** (7Lectures)

**Historical Journey of hybrids and electric vehicles**

A brief History of EVs, Vehicle Basics, Basics of the EV, Basics of the HEV, Basics of Plug-In Hybrid Electric Vehicle (PHEV), Basics of Fuel Cell Vehicles(FCVs).

**UNIT-II** (7 Lectures)

**Architecture of Electric Vehicles**

Electric Vehicles: Advantage of electric vehicle over automotive vehicles - Configurations of Electric Vehicles, Performance of Electric Vehicles, Tractive Effort in Normal Driving, Energy Consumption.

**UNIT-III** (7 Lectures)

**Architecture of Hybrid Vehicles**

Hybrid Electric Vehicles: advantages of hybrid vehicles - Concept of Hybrid Electric Drive trains, Architectures of Hybrid Electric Drive trains, Series Hybrid Electric Drive trains (Electrical Coupling) and Parallel Hybrid Electric Drive trains (Mechanical Coupling).

**UNIT-IV** (7 Lectures)

**A.C Electrical Machines for Electric and Hybrid Vehicles**

Introduction to electric components used in electric vehicles - Configuration and control of DC Motor drives - Configuration and control of Permanent Magnet Motor drives - Configuration and control of Switch Reluctance Motor drives - Drive system efficiency.

**UNIT-V** (7 Lectures)

**Energy Storage**

Introduction to Energy Storage Requirements in Electric Vehicles - Battery based energy storage and its analysis - Fuel Cell based energy storage and its analysis - Super Capacitor based energy storage and its analysis.

**Text Books:**

1. "Electric Vehicles", Modern Technologies and Trends, by Patel, N., Bhoi, A.K., Padmanaban, S., Holm-Nielsen, J.B. (Eds.)
2. Electric and Hybrid VehiclesBy Tom Denton

**Reference Books:**

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.

**Web References:**

https://nptel.ac.in/courses/108/103/108103