CURRICULUM – 2009
(C- 09)

DIPLOMA IN
ELECTRICAL & ELECTRONICS
ENGINEERING

State Board of Technical Education &
Training
Andhra Pradesh: Hyderabad

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING
CURRICULUM- C-09
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CURRICULUM (C-09) FOR DIPLOMA COURSES IN ANDHRA PRADESH

Preamble

The State Board of Technical Education and Training, Andhra Pradesh under the aegis of the Department of Technical Education, Andhra Pradesh generally reviews the Curricula once in every five years. However, recognizing the changing needs as stated by the user industries, the board has decided to bring forward the revision of curriculum by a year. Consequently, the Board with the assistance of the faculty made a thorough assessment of the curricular changes that have to be made. It was felt that there is an urgent need to improve hands-on experience among the students pursuing diploma courses. Further, the urgency of enhancing communication skills in English was also highlighted in the feedback and suggestions made by the user industries. Keeping these in view, a number of meetings and deliberations were held at district and state level, with experts from industry, academia and senior faculty of the department. The new Curricula for the different diploma courses have been designed with the active participation of the members of the faculty teaching in the Polytechnics of Andhra Pradesh. This will be implemented from the academic year 2009-10.

The primary objective of the curricular change is to produce best technicians is the country by correlating growing needs of the industries with the academic input.

Salient Features:

1. Duration of course is modified from 3 years of academic instruction to 2½ years of academic instruction and 6 months of industrial training

2. Every student will get the benefit of Exposure to industry, hands on training; understand the industrial environment and the behavioural pattern while working in an industry.

3. The Curriculum is prepared on Semester Pattern sandwiched with One semester of Industrial Training at 5th Semester level. However, First Year is maintained as Year-wise pattern.

4. The policy decisions taken at the State and Central level are implemented with regard to environmental science by including relevant topics in Chemistry. This is also in accordance with the Supreme Court guidelines issued in Sri Mehta's case.

5. Keeping in view the increased need of communication skills which is playing a major role in the success of Diploma Level students in the Industries, emphasis is given for learning and acquiring listening, speaking and writing skills in English. Further as emphasized in the meetings, teaching of the language has been spread over all the three years of the course and special emphasis is also on areas of employability skills.

6. Advanced topics not relevant at diploma level of education are deleted.

7. Modern topics relevant to the needs of the industry and global scenario suitable to be taught at Diploma level are incorporated in the curriculum.

8. AutoCAD specific to the branch has been given more emphasis in the curriculum. Preparing drawings using Computer has been given more importance using CAD softwares

9. Every student is exposed to the computer lab at the 1st year stage itself in order to familiarize him with skills required for keyboard/mouse operation, internet usage and e-mailing.

10. The number of teaching hours allotted to a particular topic/chapter has been rationalized keeping in view the past experience

11. Elective subjects have been introduced at the 6th semester stage to enable to study certain subjects of importance/specialization.

12. Upon reviewing the existing C-05 curriculum, it is found that the theory content is found to have more weightage than the Practical content. In the revised C-09 curriculum, more attention is given to the practical content of Laboratories and Workshops, thus strengthening the practical side. Industrial Training has been introduced for One full semester to impart Practical Experience during the course of study itself.

13. With increased emphasis for the student to acquire Practical skills, the course content in all the subjects is thoroughly reviewed. While the course content in certain subjects is reduced, in rest of the subjects the content has been enhanced as per the need of the hour.

14. All Practical subjects are independent of each other and the practice of grouping two or more practical subjects is dispensed with.

15. Curricula of Laboratory and Workshops have been thoroughly revised basing on the suggestions received from the industry, faculty, for better utilization of the equipment available at the Polytechnics. The experiments /exercises that are chosen for the practical sessions are identified to confirm to the field requirements of industry.

16. Industrial Training introduced in V semester is aimed at promoting working in groups/Team building skills through *'practice-oriented, project based activities'*. This helps the student in interacting with people in better interaction of students with Industries, R & D Institutions and other developmental/promotional agencies.

17. The Members of the working group are grateful to Sri L.Prem Chandra Reddy, I.A.S., Commissioner of Technical Education & Chairman, S.B.T.E.T. and Sri Somesh Kumar, I.A.S., for their guidance and valuable inputs in revising, modifying and updating the curriculum.

18. The Members acknowledge with thanks the cooperation and guidance provided by Sri. P.T. Prabhakar, Secretary, who has Secretary, SBTET, AP., and Sri G.V.Ranganath, Secretary, SBTET,A.P., and other officials of Directorate of Technical Education and the State Board of Technical Education, A.P, experts from industry, academia from the universities and higher learning institutions and all teaching fraternity from the Polytechnics who are directly and indirectly involved in preparation of the curricula.

RULES AND REGULATIONS FOR DIPLOMA COURSES
UNDER THE CURRICULUM – 2009   (C-09)

1.   DURATION AND PATTERN OF THE COURSES

All the Diploma programs run at various institutions are of either 3 years or 3½ years duration, with Industrial Training of 6 months / one year, sandwiched between two Semesters of Academic Instruction.

All the Diploma courses are run on year wise pattern in the First year, and the remaining two or two & half years are run in the semester pattern. For all conventional branches, the Industrial Training is placed in the fifth semester. For all other courses, the training will be in the fifth & sixth semesters, and seventh semester will be at the institution. In respect of few courses like Diploma in Electronics with specialization in CP/ CN/ IE/ TV/ BM/ Embedded systems, the training will be in the seventh semester.

2.   PROCEDURE FOR ADMISSION IN TO THE DIPLOMA COURSES:

Selection of candidates is governed by the Rules and regulations lay down in this regard from time to time.

i)   Candidates who wish to seek admission in any of the Diploma courses will have to appear for common entrance examination (CEEP) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Hyderabad.

Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Examination (CEEP).

a)   The candidates seeking admission should have appeared for the X class examination, conducted by the Board of Secondary Examination, Andhra Pradesh or equivalent examination thereto, at the time of making application to the Common Entrance Examination for Polytechnics (CEEP). In case candidates who apply pending results of their qualifying examinations, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of interview for admission.

b)   Admissions are made based on the merit obtained in the Common Entrance Examination (CEEP) and the reservation rules stipulated by the Government of Andhra Pradesh from time to time.

c)   For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for CEEP. A separate notification will be issued for admission into these courses.

1). D.H.M.C.T. 2). D.Pharmacy

3.   MEDIUM OF INSTRUCTION

The medium of instruction and examination shall be English.

4. **NUMBER OF WORKING DAYS PER SEMESTER / YEAR:**

    a). The Academic year for all the Courses shall be from Fifteenth June of the year of admission to the 31st March of the succeeding year.

    b). The Working days in a week shall be from Monday to Saturday

    c). There shall be 7 periods of 50 minutes duration on all working days.

    d). The minimum number of working days for each semester / year shall be 90 / 180 days excluding examination days. If this prescribed minimum is not achieved due to any reason, special arrangements shall be made to conduct classes to cover up the curriculum.

5. **ELIGIBILITY OF ATTENDENCE TO APPEAR FOR THE END EXAMINATION**

a). A candidate shall be permitted to appear for the end examination in all subjects, if he or she has attended a minimum of 75% of working days during the year/Semester.

b). Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or 1st year may be granted on medical grounds.

c). Candidates having less than 65% attendance shall be detained.

d). Students whose shortage of attendance is not condoned in any semester / 1st year are not eligible to take their end examination of that class and their admissions shall stand cancelled. They may seek re-admission for that semester / 1st year when offered next.

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

6. **READMISSION**

    Readmission shall be granted to eligible candidates by the respective RJD's / Principals .

1)   Within 15 days after commencement of class work in any semester
    (Except industrial Training)

2)   Within 30 days after commencement of class work in any year (including D.Pharrmacy course or first year course in Engineering and Non Engineering Diploma streams) Otherwise such cases shall not be considered for readmission for that semester / year and are advised to seek readmission in the next subsequent eligible academic year.

    The percentage of attendance of the readmitted candidates shall be calculated from the first day of begining of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not form the day on which he/she has actually reported to the class work, after readmission is granted.

7. SCHEME OF EXAMINATION

THEORY EXAMINATION: Each Subject carries 80% marks with examination of 3 hours duration, along with 20% marks for internal evaluation. (Sessional marks).
    However, there are no minimum marks prescribed for sessionals.

PRACTICAL EXAMINATION: There shall be 40% Marks for regular practical work done, i.e. sessional marks for each practical subject with an end examination of 3 hours duration carrying 60% marks. However, there are no minimum marks prescribed for sessionals.

8. INTERNAL ASSESSMENT SCHEME

a) Theory Subjects: Theory Subjects carry 20 % sessional marks.
Internal examinations will be conducted for awarding sessional marks on the dates specified. Four unit tests will be conducted for I year students and two for semesters. Average marks obtained in all the tests will be considered for awarding the sessional marks.

b) Practicals: Student's performance in Laboratories / Workshop shall be assessed during the year of study for 40% marks in each practical subject. Allotment of marks should be discrete taking into consideration the students skills, accuracy, recording and performance of the task assigned to him / her. Each student has to write a record / log book for assessment purpose. In the subject of Drawing, which is also considered as a practical paper, the same rules hold good. Drawing exercises are to be filed in seriatum.

c) Internal assessment in Labs / workshops / Survey field etc., during the course of study shall be done and sessional marks awarded by Lecturer / Senior Lecturer / Workshop superintendent as the case may be.

d) For practical examinations, except in drawing, there shall be two examiners. External examiner shall be appointed by the Principal in consultation with respective head of the department preferably choosing a person from an Industry. Internal examiner shall be the person concerned with internal assessment as in (c) above. For drawing the end examination shall be held along with all theory papers.

e) Question Paper for Practicals: Question paper should cover all the experiments / exercise prescribed.

f) Records pertaining to internal assessment marks of both theory and practical subjects are to be maintained for official inspection.

g) In case of Industrial Training, the training assessment shall be done and marks be awarded in the following manner. A final decision in this regard would be taken before the end of Academic Year 2009-10.

Industrial assessment   :   200 marks (in Three spells)
Maintenance of log book   :   30 marks
Record Work   :   30 marks
Seminar / viva-voce   :   40 marks

TOTAL   :   300 marks

The assessment at the institute level will be done by a minimum of three faculty members including H.O.D. and be averaged.

9. **MINIMUM PASS MARKS**

THEORY EXAMINATION:

For passing a theory subject, a candidate has to secure a minimum of 35% in end examination and a combined minimum of 35% of both Sessional and end examination marks put together.

PRACTICAL EXAMINATION:

For passing a practical subject, a candidate has to secure, a minimum of 50% in end examination and a combined minimum of 50% of both sessional and practical examination marks put together. In case of D.C.C.P., the pass mark for typewriting and short hand is 45% in the end examination. There are no sessional marks for typewriting and Shorthand subjects of D.C.C.P course.

10. PROVISION FOR IMPROVEMENT

1. Improvement is allowed only after he / she has completed all the subjects from First Year to Final semester of the Diploma.
2. Improvement is allowed in any 4 (Four) subjects of the Diploma.
3. The student can avail of this improvement chance only once, that too within the succeeding two examinations after the completion of Diploma, with the condition that the duration including betterment examination shall not exceed <u>FIVE</u> years from the first admission.
4. No improvement is allowed in Practical / Lab subjects or Project work or Industrial Training assessment. However, improvement is allowed in drawing subject.
5. If improvement is not achieved, the marks obtained in previous Examinations hold good.
6. Improvement is not allowed in respect to the candidates who are punished under Mal-practice in any Examination.
7. Examination fee for improvement shall be paid as per the notification issued by State Board of Technical Education and Training from time to time.
8. All the candidates who wish to appear for improvement of performance   shall deposit the original Marks Memos of all the years / Semesters and also original Diploma Certificate to the Board. If there is improvement in performance of the current examination, the revised Memorandum of marks and Original Diploma Certificate will be issued else the submitted originals will be returned.

11. RULES OF PROMOTION FROM 1ST YEAR TO 3,rd, 4,th 5th, 6th and 7th SEMESTERS:

For Diploma Courses of 3 years duration

1. A candidate shall be permitted to appear for first year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

2. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the first year and pays the examination fee. A candidate who could not pay the first year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

3. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.
   A candidate is eligible to appear for the 4th semester exam if he/she
   i) Puts the required percentage of attendance in the 4th semester
   ii) Should not have failed in more than Four backlog subjects of 1st year

4. A candidate shall be promoted to 5th semester (Industrial Training) provided he / she puts the required percentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.
   A candidate is eligible to appear for 5th semester Industrial Assessment, if he/she
   i) Puts the required percentage of attendance(90%) in 5th semester and
   ii) Should have obtained the eligibility to appear for 4th semester examination

5. A candidate shall be promoted to 6th semester provided he/she has successfully completed Industrial Training (Passed) and he / she puts the required percentage of attendance in the 5th semester and pay the industrial assessment fee. A candidate, who could not pay the 5th semester industrial assessment fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 6th semester.

   A candidate is eligible to appear for 6th semester examination if he/she
   i) Puts the required percentage of attendance in 6th semester and
   ii) Should not have failed in more than six backlogs subjects of 1st year, 3rd & 4th semesters put together.
   iii) Should not have failed in more than Six backlog subjects of 3rd and 4th semesters put together for IVC students.

d) **For Diploma Courses of 3 ½ Years duration:**

 i) MET/ CH/ CHPP/ CHPC/ CHOT/ TT/ SM

1. A candidate shall be permitted to appear for 1st year examination provided he / she puts in 75% attendance (which can be condoned on Medical grounds upto 10%) i.e. attendance after condonation on Medical grounds should not be less than 65% and pay the examination fee.

2. A candidate shall be promoted to 3rd semester if he/she puts the required percentage of attendance in the 1st year and pays the examination fee. A candidate who could not pay the 1st year examination fee has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 3rd semester.

3. A candidate shall be promoted to 4th semester provided he/she puts the required percentage of attendance in the 3rd semester and pay the examination fee. A candidate who could not pay the 3rd semester exam fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 4th semester.

    A candidate is eligible to appear for the 4th semester exam if he/she
    i) Puts the required percentage of attendance in the 4th semester

    ii) Should not have failed in more than <u>Four backlog subjects of 1st year.</u>

4. A candidate shall be promoted to 5th semester provided he / she puts the requiredpercentage of attendance in the 4th semester and pays the examination fee. A candidate, who could not pay the 4th semester examination fee, has to pay the promotion fee as prescribed by State Board of Technical Education and Training from time to time before commencement of 5th semester.

5. Promotion from 5th to 6th semester is automatic (i.e., from 1st spell of Industrial Training to 2nd spell) provided he/she puts the required percentage of attendance, which in this case would be 90 % attendance and attends for the VIVA-VOCE examination at the end of training.

    A candidate shall be promoted to 7th semester of the course provided he/she has successfully completed both the spells of Industrial Training (Passed).
    A candidate is eligible to appear for 7th semester examination if he/she
        (i). Puts the required percentage of attendance in the 7th semester and
        ii) .Should not have failed in more than 6 backlog subjects of 1st year,3rd and 4th semesters put together.
        iii) Should not have failed in more than Six backlog subjects of 3rd and 4th semester put together for IVC students.

ii)   **DIPLOMA IN FOOT WEAR TECHNOLOGY:**

In respect of Diploma in Footwear Technology, the Industrial training is offered in two spells, the 1st spell of Industrial training after the First Year (I.e III Semester of the course) and the second spell of Industrial training after the V Semester (i.e VI Semester of the course). The promotion rules for this course are on par with the other sandwich Diploma courses except that there is no restriction on number of backlog subjects to get eligibility to appear for the 4th semester examination and A candidate is eligible to appear for 5th semester examination if he / she
1. Puts the required percentage of attendance in the 5th semester and
2. Should not have failed in more than four subjects of 1st year.

OTHER DETAILS

a)   In case a candidate does not successfully complete the Industrial training, he / she will have to repeat the training at his / her own cost.
b)   The I spell of Industrial training shall commence 10 days after the completion of the last theory examination of 4th Semester.
c)   The Second spell of Industrial training shall commence within 10 days after the completion of I spell of Industrial training.
d)   Each Semester of Institutional study shall be a minimum of 90 working days. (With 6 working days in a week i.e. from Monday to Saturday, with 7 periods of 50 minutes, duration per day.

12.   STUDENTS PERFORMANCE EVALUATION

Successful candidates shall be awarded the Diploma under the following divisions of pass.
1.   First Class with Distinction shall be awarded to the candidates who secure an overall aggregate of 75% marks and above.
2.   First Class shall be awarded to candidates who secure overall aggregate of 60% marks and above and below 75% marks.
3.   Second Class shall be awarded to candidates who secure a pass with an overall aggregate of below 60%.

The Weightage of marks for various year/Semesters which are taken for computing overall aggregate shall be 25% of I year marks + 100% of 3rd and subsequent Semesters.

With respect to the intermediate vocational candidates who are admitted directly into diploma course at the 3rd semester (i.e., second year) level the aggregate of (100%) marks secured at the 3rd and subsequent semesters levels of study shall alone be taken into consideration for determining the over all percentage of marks secured by the candidates for award of class/division.

4.   Second Class shall be awarded to all students, who fail to complete the Diploma in the regular three years and four subsequent examinations, from the first admission.

13.   EXAMINATION FEE SCHEDULE:

The examination fee should be as per the notification issued by State Board of Technical Education and Training from time to time.

14.   STRUCTURE OF END EXAMINATION QUESTION PAPER

The question paper for theory examination is patterned in such a manner that the Weightage of periods/marks allotted for each of the topics for a particular subject be considered.

Examination paper is of 3/6/9 hour's duration.

1. Each theory paper consists of Section 'A' and Section 'B'.

Section'A'contains 10 short answer questions. All questions are to be answered and each carries 3 marks Max. Marks: 10 x 3 = 30.

Section B contains 8 essay type questions including Numerical questions, out of which 5 questions each carrying 10 marks are to be answered.
Max.Marks: 5 x 10 = 50.

Total Maximum Marks: 80

b) For Engineering Drawing Subject (107) consist of section 'A' and section 'B'.

Section 'A' contains four (4) questions. All questions in section 'A' are to be answered and each carries 5 marks. Max. Marks: 4 x 5=20. Section 'B' contains six (6) questions. Out of which four (4) questions to be answered and each question carries 10 Marks. Max. Marks 4 x 10 = 40.

Practical Examinations

For Workshop practice and Laboratory Examinations,
Each student has to pick up a question paper distributed by Lottery System.
Max. Marks for an experiment / exercise: 50%
Max. Marks for VIVA-VOCE: 10%
Total: 60%
In case of practical examinations with 50 marks, the marks will be worked out basing on the above ratio.
In case of any change in the pattern of question paper, the same shall be informed sufficiently in advance to the candidates.

15.   ISSUE OF MEMORONDUM OF MARKS

All candidates who appear for the end examination will be issued memorandum of marks without any payment of fee. However candidates who lose the original memorandum of marks have to pay the prescribed fee to the Secretary, State Board of Technical Education and Training, A.P. for each duplicate memo.

16. **MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA COURSES**

Maximum period for completion of the course is twice the duration of the course from the date of First admission (includes the period of detention and discontinuation of studies by student etc) failing which they will have to forfeit the claim for qualifying for the award of Diploma (They will not be permitted to appear for examinations after that date). This rule applies for all Diploma courses of 3 years and 3 ½ years of engineering and non-engineering courses.

17. **ELIGIBILITY FOR AWARD OF DIPLOMA**

A candidate is eligible for award of Diploma Certificate if he / she fulfils the following academic regulations.

i.   He / She pursued a course of study for not less than 3 / 3 ½ academic years & not more than 6 / 7 academic years.

ii.   He / she has completed all the subjects.
        Students who fail to fulfill all the academic requirements for the award of the Diploma within 6 / 7 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

18. **RECOUNTING, ISSUE OF XEROX COPY OF VALUED ANSWER SCRIPT & REVERIFICATION:**

(a) A candidate desirous of applying for Recounting/ issue of Xerox copy of valued answer scripts/ Reverification should submit the application to the Secretary, State Board of Technical Education and Training, A.P., Hyderabad – 500 063 within 15 days from the date of receipt of Tabulated Marks Statement by the Principal of concerned Polytechnic or the date specified.

Recounting shall be done for any <u>TWO</u> theory subjects per Year/Semester only, including drawing subjects. No request for recounting shall be entertained from any candidate who is reported to have resorted to Malpractice in that examination. The fee prescribed for Recounting should be paid by way of Demand Draft drawn on any Scheduled Bank payable at Hyderabad in favour of the Secretary, State Board of Technical Education and Training, A.P., Hyderabad. The verification of the totaling will be done by an Officer of the Board and will be intimated to the candidate by post only.

The following documents should be invariably be enclosed with the application failing which the application will not be considered.

a. Marks secured as per Tabulated Marks Sheet certified by the Principal.
b. Demand draft towards the payment of fee
c. Self – addressed and stamped envelopes of 11" X 5" size.

The applications received after the prescribed date will not be accepted and any correspondence in this regard will not be entertained.

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b) **FOR ISSUE OF XEROX COPIES OF VALUED ANSWER SCRIPTS**

1. A candidate desirous of applying for Xerox copy of valued answer script/ scripts should submit the application to the Secretary, State Board of Technical Education and Training, A.P., Hyderabad – 500 063 along with the required fee in the form of Demand Draft within <u>07 days</u> from the date of receipt of Tabulated Marks Statement by the Principal of concerned Polytechnic or the date specified in the covering letter which ever is earlier.
2. Xerox copies of valued answer scripts will be issued to all theory subjects including drawing subjects.
3. The following documents should invariably be enclosed with the application
    (1) Marks secured as per Tabulated Marks Sheets certified by the Principal
    (2) Self-addressed Stamped Envelope/Cloth-line cover of size 10'' x 14''.
    (3) Fee in the form of Demand Draft

c) **FOR RE-VERIFICATION OF THE VALUED ANSWER SCRIPT**

1. A candidate desirous of applying for Re-verification of valued answer script should submit the application to the Secretary, State Board of Technical Education and Training, A.P., Hyderabad – 500 063 along with the required fee in the form of Demand Draft, within <u>15 days</u> from declaration of result.
2. Re-verification of valued answer script shall be done for all theory subjects including drawing subjects.
3. The following documents should invariably be enclosed with the application failing which the application will not be considered.
    (i)   Marks secured as per Tabulated Marks Sheets certified by the Principal.
    (ii)   Fee in the form of Demand Draft.

19.   MAL PRACTICE CASES:

If any candidate resorts to any Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per rules and regulations framed by SBTET from time to time.

20.   DISCREPANCIES/ PLEAS:

Any Discrepancy /Pleas regarding results etc., shall be represented to the Board within one month from the date of issue of results. Thereafter, no such cases shall be entertained in any manner.

21.   ISSUE OF DUPLICATE DIPLOMA

If a candidate loses his/her original Diploma Certificate and desires a duplicate to be issued he/she should produce written evidence to this effect. He / she may obtain a duplicate from the Secretary, State Board of Technical Education and Training, A.P., on payment of prescribed fee and on production of an affidavit signed   before a First Class Magistrate (Judicial) and *non traceable certificate* from the Department of Police. In case of damage of original Diploma Certificate, he / she may obtain a duplicate certificate by surrendering the original damaged

certificate on payment of prescribed fee to the State Board of Technical Education and Training.

In case the candidate cannot collect the original Diploma within 1 year from the date of issue of the certificate, the candidate has to pay the penalty prescribed by the SBTET from time to time.

22. PERMANENT IDENTIFICATION NUMBER (PIN)

A cumulative / academic record is to be maintained of the Marks secured in sessional work and end examination of each year for determining the eligibility for promotion etc., a Permanent Identification Number (PIN) will be allotted to each candidate so as to facilitate this work and avoid errors in tabulation of results.

23. ISSUE OF MIGRATION CERTIFICATE AND TRANSCRIPTS:

The Board on payment of prescribed fee will issue these certificates for the candidates who intend to prosecute Higher Studies in India or Abroad.

24. GENERAL

i.   The Board may change or amend the academic rules and regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students, for whom it is intended, with effect from the dates notified by the competent authority.

ii. All legal matters pertaining to the State Board of Technical Education and Training are within the jurisdiction of Hyderabad.

iii. In case of any ambiguity in the interpretation of the above rules, the decision of the Secretary, SBTET is final.

DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2009 (FIRST YEAR)

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
EE-101	English-I	2	-	60	3	30	70	100
EE-102	Engineering Mathematics - I	5	-	150	3	20	80	100
EE-103	Engineering Physics	4	-	120	3	20	80	100
EE-104	Engineering Chemistry & Environmental Studies	4	-	120	3	20	80	100
EE-105	Basic Electrical Engineering	6	-	180	3	20	80	100
PRACTICAL SUBJECTS								
EE-106	Mechanical Workshop	-	3	90	3	40	60	100
EE-107	Engineering Drawing	-	6	180	3	40	60	100
EE-108	Physics Lab	-	3*	90	3	20	30	50
EE-109	Chemistry Lab	-			3	20	30	50
EE-110	Information Technology Lab	-	4	120	3	40	60	100
EE-111	Electrical Workshop	-	3	90	3	40	60	100
-	Group Task / Seminar	-	2	60	-	-	-	-
	Total	21	21	1260	-	310	690	1000

*Half the class will go to EE-108 and the other half will go to EE-109. Next week vice-versa.

DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2009
(III Semester)

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Practicals		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
EE-301	English - II	3	-	45	3	20	80	100
EE-302	Engineering Mathematics –II	4	-	60	3	20	80	100
EE-303	Electrical Circuits	5	-	75	3	20	80	100
EE-304	D.C.Machines & Batteries	5	-	75	3	20	80	100
EE-305	Electrical & Electronic Measuring Instruments	4	-	60	3	20	80	100
EE-306	Electronics Engg	6	-	90	3	20	80	100
PRACTICAL SUBJECTS								
EE-307	D.C.Machines Lab	-	3	45	3	40	60	100
EE-308	Electrical Measurements lab	-	3	45	3	40	60	100
EE-309	Electrical Wiring Lab	-	3	45	3	40	60	100
EE-310	Electronics lab	-	6	90	3	40	60	100
	Total	**27**	**15**	**630**	**-**	**280**	**720**	**1000**

DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2009
(IV Semester)

Sub Code	Name of the Subject	Instruction Periods/Week Theory	Instruction Periods/Week Practicals	Total Periods Per Semester	Scheme Of Examinations Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
EE-401	English -III	3		45	3	20	80	100
EE-402	A.C. Machines – I	5	-	75	3	20	80	100
EE-403	Power Systems – I	6	-	90	3	20	80	100
EE-404	Electrical Installation & Estimation	4	-	60	3	20	80	100
EE-405	Digital Electronics and Micro Controllers	5	-	75	3	20	80	100
EE-406	General Mechanical Engg	5	-	75	3	20	80	100
PRACTICAL SUBJECTS								
EE-407	A.C. Machines Laboratory - I	-	3	45	3	40	60	100
EE-408	Electrical Engineering Drawing	-	6	90	3	40	60	100
EE-409	Digital Electronics lab	-	3*	45	3	40	60	100
EE-410	Micro controller lab	-			3	40	60	100
	Group Task / Seminar	-	2	30	-	-	-	-
	Total	28	14	630	-	280	720	1000

*Half the class will go to EE-409 and the other half will go to EE-410. Next week vice-versa.

EE-501 INDUSTRIAL TRAINING
(Practical Training)

V SEMESTER

S.NO	Subject	Duration	Items	Max Marks	Remarks
1	**Practical Training in the Industry**	**6 Months**	1.First Assessment (at the end of 3rd month)	100	
			2. Second Assessment (at the end of 6th month)	100	
			3.Training Report a) Log Book b) Record	 30 30	
			4. Seminar	40	
TOTAL PER SEMESTER				**300**	

The industrial training shall carry 300 marks and pass marks is **50**%.A candidate failing to secure the minimum marks should complete it at his own expenses.

During Industrial training the candidate shall put in a minimum of 90% attendance.

DIPLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2009 (VI Semester)

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations			
		Theory	Pract-icals		Duration (hrs)	Sessio-nal Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
EE-601	English -IV	2	-	45	3	20	80	100
EE-602	Industrial Management and Entrepreneurship	5	-	75	3	20	80	100
EE-603	A.C.Machines -II	5	-	75	3	20	80	100
EE-604	Power Electronics	5	-	75	3	20	80	100
EE-605(A) EE-605(B) EE-605(C)	**Elective :** Electrical Utilisation and Automation Electric traction & PLC Electric traction and Renewable energy sources	5	-	75	3	20	80	100
EE-606	Power Systems - II	6	-	90	3	20	80	100
PRACTICAL SUBJECTS								
EE-607	A .C. Machines Laboratory – II	-	6	90	3	40	60	100
EE-608	Power Electronics Lab	_	3	45	3	40	60	100
EE-609	Electrical CAD Lab	-	3*	45	3	20	30	50
EE-610	Industrial Automation Lab	-			3	20	30	50
EE- 611	Project WorK	-	2	30	-	40	60	100
	Total	**28**	**14**	**630**	**-**	**280**	**720**	**1000**

*Half the class will go to EE-609 and the other half will go to EE-610. Next week vice-versa.

1ST YEAR

ENGLISH -1

Subject Title : English - I

Subject code : EE-101

Periods / Week : 2

Periods / Year : 60

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of marks	No. of Short questions	No. of Essay questions
1.	FUNCTIONAL ENGLISH	10	13	1	1
2.	SITUATIONAL GRAMMAR	19	31	7	1
3.	THE ART OF READING	18	33	1	3
4.	THE CRAFT OF WRITING	13	33	1	3
	TOTAL	**60**	**110**	**10**	**8**

INTRODUCTION:

Globalisation has made English language the need of the hour. Indian professionals are in great demand around the world. In this backdrop, English is felt as a bridge to make Polytechnic students employable soon after obtaining their Diploma Certificate.

In C-09 curriculum, the focus is on enhancing the students, communicative abilities as well as job-ready skills.

OBJECTIVES:

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

- Become communicatively competent
- Write and speak English confidently
- Read, listen and understand all kinds of communication
- Learn the modern methods of communication such as sending receiving emails
- Use English at social milieu or at work place

COURSE CONTENTS:

1. Functional English

- Need analysis
- Using a dictionary
- Introducing self / others
- Describing objects
- Vocabulary building
- Sounds and syllables
- Sentence structures

2. Situational Grammar

- Tense and Time
- Present, Past and Future Tenses
- Concord
- Yes/No, Wh-questions and Question Tags
- Voice
- Reported Speech
- Linkers
- Error Analysis

3. Art of Reading

- Note Taking
- Note Making and Summarising
- Preparing for Examination
- Enhancing Vocabulary through reading
- Reading for Pleasure
- Reading Strategies
- Drawing Inferences

4. Craft of Writing

- Mechanics of Writing
- Paragraph Writing
- Persuasive Writing
- Effective Correspondence
- E-mail
- Resume

ENGINEERING MATHEMATICS – I
(Common Subject)

Subject title   :   **Engineering Mathematics -I**
Subject code   :   **EE - 102**
Periods per week   :   **05**
Total periods per Year   :   **150**

TIME SCHEDULE

S.No.	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	**Unit- I -** Bridging of fundamentals In mathematics	12	06	2	-
2	**Unit -II-Algebra** Matrices	15	10	-	1
3	Partial Fractions	05	03	1	-
4	**Unit-III-Trigonometry** Compound Angles	05	03	1	-
5.	Multiple and Sub-multiple angles	05	03	1	-
6.	Transformations	06	05	-	$\frac{1}{2}$
7	Inverse Trigonometric Functions	05	05	-	$\frac{1}{2}$
8	Trigonometric Equations	05	05	-	$\frac{1}{2}$
9.	Properties of Triangles and Solution of Triangles	08	05	-	$\frac{1}{2}$
10	Complex Numbers	06	03	1	-
11	**Unit- IV** **Co- ordinate Geometry** Straight Lines	02	03	1	-
12	Circles	05	03	1	-
13	Elements of Conics	01	00	-	
14	Parabola	05	05	-	$\frac{1}{2}$
15	Ellipse	05	05	-	$\frac{1}{2}$
16	Hyperbola	05	05	-	$\frac{1}{2}$
17	Three Dimensional Geometry	08	05	-	$\frac{1}{2}$
18	**Unit-V: Differential Calculus**	05	03	1	-

	Limits				
19	Methods of Differentiation	20	13	1	1
20	**Unit-VI Applications of the Derivative** Geometrical Applications	06	05	-	$\frac{1}{2}$
21	Physical Applications	06	05	-	$\frac{1}{2}$
22	Maxima and Minima	06	05	-	$\frac{1}{2}$
23	Errors and Approximations	04	05	-	$\frac{1}{2}$
	Total	**150**	**110**	**10**	**8**

Objectives:

Unit-1.Bridging of fundamentals in Mathematics:

1.1 Explain the bracket operations such as $a+\{b+(c-d)\}, \frac{-1}{2}m-\{-\frac{1}{2}m-\overline{m-n}\}$ etc.

1.2 Explain the ratios and properties such as componendo, dividendo, Componendo and dividendo rules such as

$\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a+b}{b} = \frac{c+d}{d}$ (componendo) $\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a-b}{b} = \frac{c-d}{d}$ (dividendo)

$\frac{a}{b} = \frac{c}{d} \Rightarrow \frac{a+b}{a-b} = \frac{c+d}{c-d}$ (componendo and dividendo)

Also explain the variation concept (direct and inverse) such as

x varies as y $\Leftrightarrow \frac{x}{y} = $ constant., x varies inversely as y $\Leftrightarrow$ xy=constant. Solve simple problems.

1.3. Explain Literal Values and Literal Coefficients. Solve simple problems such as $p = 2a - 3b, \ q = 3b - 4c, \ r = 5a - 2b$ find $3p + 2q - 5r$.

multiply p with q and divide p by q when $p = 2x^2 + 3x + 4$ and $q = 3x - 1$

1.4. Explain the procedure of Handling Vulgar fractions such as

$\dfrac{\dfrac{x}{2x-1}+\dfrac{2x+4}{x-2}}{1-\dfrac{x+3}{2x-4}}, \quad \dfrac{4}{1-\dfrac{1}{x}}+\dfrac{2}{2-\dfrac{3}{y}}$ etc.

1.4.1 Explain the formulae for basic algebraic identities in the form of forward and backward applications like

$(a+b)^2 = a^2 + b^2 + 2ab$ and also $a^2 + b^2 - ab = (a+b)^2 - 3ab$ or $(a-b)^2 + ab$.

And also express $x^2 + 3x + 5$ in the form of $\left(x + \frac{3}{2}\right)^2 + \left(\frac{\sqrt{11}}{2}\right)^2$ etc.

1.6 Explain the functional notation $y = f(x), \ z = f(x,y)$ and $u = f(x,y,z)$ with simple

illustrative examples and their evaluation. Also explain the definition of a function classically as *f : A→ B*, Domain ,Range , interval as subset of set of real numbers.

1.7   Explain the polynomials of Second, Third and fourth degree definitions, rational functions with arithmetic operations on them, Homogeneous functions, symmetric expressions and $\sum$ notations with suitable examples in each case.

1.8   Explain surds and rationalizing factors with suitable simple examples.

1.9   Explain logarithms with basic properties.

1.10   Explain solving a quadratic equation by factorization and formula methods and solving fourth and third degree equations using remainder theorem with simple constructed examples.

1.11   State the definitions of $\lfloor n, \; {}^{n}\mathrm{p}_{r}, {}^{n}C_{r}$.

1.12   State Binomial expansions of the type $(x \pm a)^{n}, (1 \pm x)^{-1}, (1 \pm x)^{-2}, (1 \pm x)^{-3}$.

1.13   Explain the exponential constant e, exponential function, exponential series, Logarithmic Series, and also define Hyperbolic and inverse Hyperbolic functions with useful identities.

1.14   Define the basic Trigonometric ratios, their properties and allied angles formulae.

1.15   Explain two dimensional co-ordinate system, distance and ratio formulae centroid and the meaning of the graph of a function with suitable examples.

Unit-II. **Algebra**
Matrices

2.1   Definition of a matrix, various types of matrices with examples, define the order of a matrix- define square matrix and 3rd order square matrix with examples.

2.2   Define sum, scalar multiplication and product of matrices, algebra of matrices (associative, distributive, commutative properties) with examples and counter examples.

2.3   Define the transpose of a matrix, symmetry and non -symmetry of matrices, resolving a square matrix in to a sum of a symmetric and non- symmetric matrices- Examples in all cases.

2.4   Define minor, cofactor of an element of a 3x3 square matrix as determinant of 2x2 square matrix with examples. Define and determine the adjoint of a square matrix give examples.

2.5   Define determinant of a 3x3 matrix- Laplacian expansion with examples. Define singular and non singular matrices.

2.6   Define the multiplicative inverse of a 3x3 matrix, relation between the Adjoint and inverse leading to the formula A^{-1} = *adj A/ det A*.(proof not necessary) with examples.

2.7   System of 3 linear equations in 3 unknowns, matrix representation, solution by matrix inversion method and Cramer's rule-examples

2.8   Elementary row and column operations on a 3x3 matrix-examples, Gauss-Jordan method to solve a system of 3 linear equations in 3 unknowns with examples.

2.9   Row operations for evaluating the determinant of a 3x3 matrix with simple illustrative examples. Also state properties of determinants with illustrative examples.

3. Partial Fractions

3.1 Define rational, proper and improper fractions of functions.
3.2 Explain the Procedure of resolving rational fractions of the type mentioned below into partial fractions.

$$\text{i)} \quad \frac{f(x)}{(x+a)(x+b)(x+c)}$$

$$\text{ii)} \quad \frac{f(x)}{(x+a)^2(x+b)(x+c)}$$

$$\text{iii)} \quad \frac{f(x)}{(x^2+a)(x+b)}$$

$$\text{iv)} \quad \frac{f(x)}{(x+a)(x^2+b)^2}$$

Unit-III Trigonometry

4.0 Compound Angles

4.1 Define compound angles, State the formulas of *Sin(A±B), Cos(A±B), tan(A±B) and cot(A±B),* simple examples, derive the values of *sin15⁰ cos15⁰, sin75⁰, cos75⁰, tan 15⁰, tan75⁰* etc.

4.2 Derive identities like *sin(A+B) sin(A-B) = sin² A –sin² B* etc.
Solve simple problems on compound angles.

5.0 Multiple and Sub multiple Angles

5.1 Derive the formulae of multiple angles *2A, 3A* etc and sub multiple angle *A/2* in terms of angle *A* of trigonometric functions.
5.2 Derive useful allied formulas like sinA=√*(1-cos2A)/2* etc
5.3 Provide examples on the above formulae

6.0 Transformations

6.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa- examples on these formulae.
6.2 Apply these formulae to sum or difference or product of three or more terms and solve problems.

7.0 Inverse Trigonometric Functions

7.1 Understand the concept of the inverse of a trigonometric function by selecting an appropriate domain and range. Define inverses of six trigonometric functions along with their domains and ranges.

7.2 To derive relations between inverse trigonometric functions so that given $A= sin^{-1}x$, to Express angle A in terms of other inverse trigonometric functions- with examples.

7.3 State various properties of inverse trigonometric functions and identities like $sin^{-1}x+cos^{-1}x = \pi/2$ etc. Derive formulae like $tan^{-1} x + tan^{-1} y = tan^{-1} ((x+y)/(1-xy))$etc., and solve simple problems.

8.0 Trigonometric Equations

8.1 Explain what is meant by the solution of trigonometric equations. To find the general solutions of $sin\ x=k, cos\ x =k$ and $tan\ x=k$ with appropriate examples.

8.2 To solve models of the type $a\ sin^2 x + b\ sin\ x +c=0, a\ cos\ x + b\ sin\ x=c$ etc., and problems using simple transformations.

9.0 Properties and Solutions of Triangles

9.1 To state sine rule, cosine rule, tangent rule and projection rule.

9.2 Give the formulas for $sin\ A/2, cos\ A/2, tan\ A/2$ and $cot\ A/2$ in terms of semi-perimeter and sides a,b,c and solve problems.

9.3 Give various formulae for the area of a triangle. Solve problems on the above formulae.

9.4 Explain what is meant by solving a triangle; solve a triangle given (i) three sides, (ii) two sides and an included angles, (iii) two sides and an opposite angle-case of two solutions and (iv) one side and two angles.

10. 0 Complex numbers:

10.1 Give the definition of a complex number, its modulus and Conjugate of a complex number and their properties.

10.2 Define the arithmetic operations on Complex numbers with examples.

10.3 Define amplitude of a complex number and give the modulus-amplitude (polar) form ,Exponential (Euler)form of a complex number - illustrative examples on all the above.

10.4 State DeMoivre's Theorem (proof not necessary) and its applications to complex numbers eg. Finding the roots, powers, simplifications of a complex number with illustrative examples.

Unit-IV Coordinate Geometry

11.0 Locus, Translation of axes and Straight lines

11.1 Explain the concepts of locus of a point, shifting of origin(translation of axes) with illustrative examples.

11.2 Provide equations of a straight line in various forms, explain the slope, angle between two lines, point of intersection of lines, perpendicular distance from a point to a line, distance between two parallel lines, provide examples.

12.0 Circles
12.1 Define a circle, provide circle equation given (i) center and radius, (ii) given two ends of a diameter with examples.

12.2 State the general equation of a circle and explain the procedure to find the centre, radius from it with examples.

12.3 Problems on finding the equation of circle passing through three given points.

12.4 Define the tangent and normal at a point on the circle and problems relating to finding their equations (Derivation of general Equations not necessary.). Define the pole and polar of a circle and find the pole of a line and polar of a point w.r.t. a circle.(Derivation of general Equations not necessary)-Simple examples only.

13.0 Elements of Conics

13.1. Define a conic, explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic.

13.2 Find the Equation of a Conic, given its focus, eccentricity and directrix.

14.0 Parabola

14.1 Derive the standard equation of a parabola with vertex at origin and one of the coordinate axes as its axis (four forms) and also the standard forms with translation of axes (shifting of origin, vertex at *(h,k)* and axis parallel to one of the coordinate axes).

14.2 Given the equation of parabola, explain how to reduce it to standard form and find its vertex, focus, directrix, axis, latus rectum etc.-illustrative examples.

14.3 To find the equation of a parabola given any two of focus, vertex and directrix-examples

14.4 To find the equation of a parabola passing through 3 given points.

14.5 Applications of parabola to practical problems.

15.0 Ellipse

15.1 Derive the standard equation of an ellipse , Types of ellipse with (i) center at origin, coordinate axes as axes and (ii) center at *(h,k)* and axes parallel to coordinate axes.

15.2. Find the foci,centere, vertices, axes, directrices, latera recta for an ellipse in standard form and Their length and prove that sum of focal distances from any point on the ellipse is equal to length of major axis-solve problems.

15.3 To find the equation of an ellipse (i) given focus, eccentricity and equation of directrix and (ii) in standard form and passing through two given points.

15.4 Applications of ellipse to practical problems-simple cases.

16.0 Hyperbola

16.1 Derive the standard equation of hyperbola, explain different forms, define rectangular and conjugate hyperbola.

16.2 Mention the properties of hyperbola with examples.

16.3 To find the equation of a hyperbola given its (i) focus, directrix and eccentricity, (ii) asymptotes.

16.4 To find the centre, foci, vertices, axes, directrices, latera recta and the length of latus rectum given equation of a hyperbola in standard form.

17.0 Three Dimensional Geometry

17.1   Explain the three dimensional coordinate system.
17.2   Explain the distance between two points with problems.
17.3   Explain the ratio formula with examples.
17.4   State the formulae to find the centroid of a triangle and the tetrahedron with simple examples.
17.5   Define the direction cosines and direction ratios of a line, angle between two lines with Illustrative examples.
17.6   State the general equation of a plane, its intercept form, plane passing through a given point and perpendicular to a line whose direction ratios are given-angle between two planes -simple illustrative examples and problems

Unit-V Differential Calculus

18.0 Limit and Continuity

18.1   Explain the concept of limit and meaning of $\lim\limits_{x \to a} f(x) = l$ and State the properties of limits .

18.2   Mention the Standard limits $\lim\limits_{x \to a} \dfrac{x^n - a^n}{x - a}$, $\dfrac{Sinx}{x}$, $\dfrac{Tanx}{x}$, $\dfrac{a^x - 1}{x}$, $\dfrac{e^x - 1}{x}$, $(1+x)^{\frac{1}{x}} as\ x \to o$ and

$also\ \lim\limits_{x \to \infty} \left(1 + \dfrac{1}{x}\right)^x$ (All without proofs) with illustrative examples applying the above and

also evaluate the limits of the type $\lim\limits_{x \to a} \dfrac{ax^2 + bx + c}{\alpha x^2 + \beta x + \gamma}$, $\lim\limits_{x \to \infty} \dfrac{f(x)}{g(x)}$.

18.3   Explain the concept of continuity of a function at a point and in an interval. Some examples whether a given function is continuous or not can be mentioned.

19.0 Methods of differentiation

19.1   State the concept of derivative of a function $y = f(x)$ –definition, first principle as $\lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$ and also use the appropriate standard notations to denote the derivative of a function. Mention the significance of derivative in scientific and engineering applications.
19.2   Find the derivatives of elementary functions like x^n, a^x, e^x,*Logx ,Cosx, Sinx, Tanx, Secx,Cosecx* and *Cotx* using the first principles and also find the derivatives of simple functions from the first principle .
19.3   State the rules of differentiation of *Sum, Difference Scalar multiplication, Product and Quotient* of functions with illustrative and simple examples .
19.4   Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as
        i) $2t^2 + 3/\sqrt{t}$
        ii) $x^2\ sin^2x$

iii) $x/\sqrt{x^2}+1$

iv)   log [sin (cos x)].

19.5   Find the derivatives of Inverse Trigonometric functions and examples using the Trigonometric transformations.

19.6   Explain the method of differentiation of a function with respect to another function and also Differentiation of Parametric functions with illustrative examples.

19.7   Explain the procedure of differentiating of hyperbolic and implicit functions with examples.

19.8.   Explain the need of taking logarithms for differentiating some functions with illustrative examples like $[f(x)]^{g(x)}$.

19.9.   Explain the concept of successive differentiation –derivatives of second and higher order-examples.

19.10   Explain the concept of functions of several variables, partial derivatives and difference between the ordinary and partial derivatives with simple illustrative examples.

19.11   Explain the definition of Homogenous function of degree n and Statement of Euler's Theorem
for Homogeneous functions with applications to simple problems.

Unit-VI Applications of the Derivative

20.0 Geometrical Applications of Derivatives

20.1   State the geometrical meaning of the derivative as the slope of the tangent to the curve $y=f(x)$ at any point on the curve.

20.2.   To find the tangent and normal to the curve $y=f(x)$ at any point on the curve using the slope found using the derivative.

20.3.   Define the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve
$y=f(x)$ – Provide formulae and examples.

20.4   Explain the concept of angle between two curves and procedure for finding the angle between two given curves with illustrative examples.

21.0 Physical Applications of Derivatives

21.1   Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples.

21.2   Explain the derivative as a rate measurer in the problems where the quantities like volumes areas vary with respect time- illustrative examples.

22.0 Derivatives to find extreme values

22.1   Define the concept of increasing and decreasing functions. Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

22.2   Explain the procedure to find the extreme values (maxima or minima) of a function of single variable-simple problems yielding maxima and minima.

22.3 Solve problems on maxima and minima in applications like finding areas, volumes etc.

23.0. Derivatives to find Errors and Approximations

23.1 Use the definition of derivative to find the approximate values of a function of single variable and to find the errors in dependent or independent variables as the case may be-appropriate applications.

23.2 Provide formulae for relative error and percentage error in evaluating the dependent variable given the corresponding errors in independent variable. Provide simple examples with functions of one variable.

COURSE CONTENT

UNIT – I

1. **Bridging of fundamentals in mathematics**:
    Bracket operations-examples-Ratio and Proportion, Variation-examples-Literal values-examples- Literal coefficients-examples-Identities-examples with forward and backward applications-Polynomials-examples-Rational functions-examples-Homogenous expressions-examples-Symmetrical expressions-examples-Functional notation-Exponential, logarithmic, hyperbolic functions and their series—Elementary combinatorial concepts -examples -Binomial expansion- examples -Vulgar fractions – examples- Elementary theory of equations-examples-Surds- examples-Logarithms- examples-Trigonometric ratios-examples-Basic concepts of coordinate geometry- examples.

UNIT-II
2.Matrices:

Matrices of 3rd order: Definition of a matrix-types of matrices-examples-algebra of matrices-Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion-singular and non singular matrices-Adjoint and multiplicative inverse of a square matrix-examples-System of linear equations in 3 variables-Solutions by Cramers's rule, Matrix inversion method-examples-Elementary row and column operations on matrices and determinants-Gauss-Jordan method to solve a system of equations. **.**

3. **Partial Fractions** : Procedure for resolving rational functions of the types mentioned below in to into partial fractions.

i) $$\frac{f(x)}{(x+a)(x+b)(x+c)}$$

ii) $$\frac{f(x)}{(x+a)^2(x+b)(x+c)}$$

$$f(x)$$

iii) $\dfrac{}{(x^2+a)(x+b)}$

iv) $\dfrac{f(x)}{(x+a)(x^2+b)^2}$

UNIT –III

Trigonometry

4   Compound angles-Formulas of *Sin(A±B), cos(A±B), tan(A±B),cot(A±B),* and related identities with problems.

5   Multiple and sub multiple angles-trigonometric ratios of multiple angles *2A,3A* and submultiple angle *A/2* - problems.

6   Transformations of products into sums or differences and vice versa-simple problems

7   Inverse trigonometric functions-definition, domains and ranges-basic properties-problems.

8   Trigonometric equations- concept of a solution, principal value and general solution of trigonometric equations : *sin x =k , cos x= k, tan x =k.* – Solutions of simple quadratic equations, equations involving multiple angles and usage of transformations- problems.

9   Properties and solutions of triangles- relation between sides and angles of a triangle- sine rule, cosine rule, tangent rule and projection rule-area of a triangle-solving a triangle- problems.

10   Complex Numbers : Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitue (polar) form , Exponential form(Euler) form of a complex number-Problems.DeMoivre's Theorem and its applications in complex numbers- Simple problems.

UNIT-IV

Coordinate geometry

11   Concepts of locus, change of axes- various forms of straight lines – angle between lines, perpendicular distance from a point, distance between parallel lines-examples.

12   Circle-definition-Circle equation given center and radius- circle equation with given diameter-general equation-finding center, radius-tangent, normal, pole and polar of a circle.

13   Definition of a conic- focus, directrix and eccentricity-finding the equation of a conic given focus, directrix and eccentricity

14   Parabola- Standard forms- finding focus, vertex, directrix etc. of a parabola-simple applications-

15   Ellipse- Standard forms- finding foci, vertices, directrices etc. of an ellipse-

properties of ellipse- simple application problems.

16   Hyperbola- Standard forms- finding foci, vertices, directrices etc. of a hyperbola-
      properties of hyperbola- simple problems

17   Three dimensional geometry: Coordinate system-distance between two points-ratio
      formula-direction cosines and ratios of a line- angle between two lines-centroid of a
      triangle and tetrahedron-simple equation of a plane-general form-angle between
      planes.

UNIT-V

Differential Calculus

18   Concept of Limit- Definition- Properties of Limits and Standard Limits - Simple
      Problems-Continuity of a function at a point- Simple Examples only.

19   Concept of Derivative- Definition(first Principle)- different notations-Derivatives of
      elementary functions- problems. Derivatives of Sum, Product,Quotient,Scalar
      multiplication of functions- problems. Chain rule, derivatives of Inverse
      Trigonometric functions, Derivative of a function with respect to another function,
      Derivative of parametric equations, Derivative of hyperbolic, Implicit functions
      Functions, Logarthmic Differentiation –problems in each case.Successive
      differentiation- examples-.Partial differentiation, Euler's Theorem-simple problems.

UNIT-VI

Applications of the Derivative:

20   Geometrical meaning of the derivative,equations of Tangentand normal to acurve at
      any point. The lengths of Tangent, Normal, Subtangent and Subnormal to the curve
      at any point .Angle between the curves- problems.

21   Physical applications of the derivative –velocity, acceleration, derivative as a rate
      Measure –Problems.

22   Applications of the derivative to find the extreme values – Increasing and
      decreasing functions, finding the maxima and minima of simple functions -problems
      leading to applications of maxima and minima.

23   Applications of derivative in finding errors and approximations of functions and
      simple problems.

REFERENCE:

   (1) **Text book of Engineering Mathematics –I** by G.Srinagesh, and others –
       FALCON publishers
   (2) **Text book of Engineering Mathematics –I** by Dr.J.Sairam and others – UNI-
       TECH SERIES.
   (3) **A Text book of intermediate Mathematics –I & II** by Telugu Academy.
   (4) **Differential Calculus by ManicavachagomPillai**
   (5) **Elementary Algebra by Hall & Knight.**
   (6) **Text book of Engineering Mathematics –I** by Radiant publishers.
   (7) **Trigonometry** By S.L Loney

ENGINEERING PHYSICS

Subject Title : **Engineering Physics**
Subject Code : **EE -103**
Periods per week : **04**
Total periods per year : **120**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Answer Type	Essay Type
1.	Units and Dimensions	08	03	1	-
2.	Elements of Vectors	10	13	1	1
3.	Kinematics	13	13	1	1
4.	Friction	08	03	1	-
5.	Work, Power and Energy	10	10	-	1
6.	Simple Harmonic Motion	11	13	1	1
7.	Heat & Thermodynamics	13	13	1	1
8.	Sound	11	13	1	1
9.	Properties of matter	14	13	1	1
10	Electricity & magnetism	14	13	1	1
11.	Modern Physics	08	03	1	
	Total:	120	110	10	8

OBJECTIVES

1.0   UNITS AND DIMENSIONS

1.1   Introduction to units
1.2   Define Physical quantity, fundamental physical quantities and derived physical quantities
1.3   Define unit
1.4   Define fundamental units and derived units
1.5   State SI units with symbols
1.6   State Multiples and submultiples in SI system
1.7   Rules of writing S.I. units
1.8   State advantages of SI units
1.9   Define Dimensions and Dimensional formulae
1.10   Derive dimensional formulae of physical quantities

1.11   List dimensional constants and dimensionless quantities
1.12   State the principle of Homogeneity of Dimensions
1.13   Explain the applications of Dimensional Analysis with examples
1.14   State the limitations of dimensional analysis
1.15   Solve problems

2.0   ELEMENTS OF VECTORS

2.1   Introduction to Vectors
2.2   Define Scalar and Vector quantities
2.3   Give examples for scalar and vector quantities
2.4   Represent vectors graphically
2.5   Types of Vectors (Proper Vector, Null Vector, Unit Vector, Equal Vectors, Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).
2.6   Explain addition and subtraction of vectors
2.7   Represent a vector in space using unit vectors (I, j, k)
2.8   Resolution of vectors
2.9   Resultant of the vectors by component method
2.10   State parallelogram law of vectors and illustrations
2.11   Derive formula for resultant (Magnitude and direction)
2.12   State and Explain triangle law of vectors
2.13   State and Explain polygon law of vectors
2.14   Define Dot product of two vectors with examples (Work done, Gravitational P.E)
2.15   Mention the properties of Dot product
2.16   Define Cross products of two vectors with example (Torque ,Linear velocity)
2.17   Mention the properties of Cross product.
2.18   Solve problems

3.0   KINEMATICS

3.1   Recapitulation of equations of motion in a straight line
3.2   Define acceleration due to gravity
3.3   Derive expressions for Maximum Height, time of ascent, time of descent, time of flight and velocity on reaching the point of projection
3.4   Derivation for height of a tower when a body projected vertically upwards from the top
3.5   Define projectile motion with examples
3.6   Explain Horizontal projection
3.7   Derivation for the path of a horizontal projectile
3.8   Explain oblique projection
3.9   Derivation for the path of a oblique projectile
3.10   Derive formulae for maximum height, time of flight and Horizontal Range of a projectile, maximum range in oblique projection
3.11   Derive formula for magnitude and direction of resultant velocity in oblique projection
3.12   Solve problems

4.0   FRICTION

4.1   Introduction to friction
4.2   Examples of friction in daily life
4.3   Definition of friction
4.4   Types of friction
4.5   Concept of Normal reaction
4.6   State laws of static friction
4.7   State laws of kinetic friction
4.8   Define coefficients of friction
4.9   Angle of friction w.r.t. rough horizontal surface
4.10   Derivations for displacement and time taken to come to rest over a rough
         horizontal surface and work done by frictional force
4.11   Define Angle of repose
4.12   Explain Motion of a body on a rough inclined planes
4.13   Derive expressions for acceleration of a body on a rough inclined plane
         (UP &DOWN)
4.14   Derive expressions for acceleration of a body on a smooth inclined plane
         (UP &DOWN)
4.15   List the Advantages and Disadvantages of friction
4.16   Mention the methods of minimizing friction
4.17   Solve problems

5.0.   WORK, POWER AND ENERGY

5.1   Define work
5.2   State SI units, dimensional formula for work
5.3   Explain the concept of power
5.4   Define power
5.5   State SI units, dimensional formula for power
5.6   Define energy
5.7   State SI units, dimensional formula for energy
5.8   Define potential energy
5.9   Derive the expression for Potential energy, with examples
5.10   Define kinetic energy
5.11   Derive the expression for kinetic energy, with examples
5.12   Work Energy theorem
5.13   Relation between Kinetic energy and momentum
5.14   State the law of conservation of energy and verify in the case of freely falling body
5.15   Law of conservation of energy in the case of simple pendulum-theory only
5.16   Define conventional and non conventional energy sources with examples
5.17   Solve problems

6.0   SIMPLE HARMONIC MOTION

6.1   Define S. H. M
6.2   State the conditions of S. H. M
6.3   Give examples of S. H. M

6.4   Derive the equation for S H M as projection of particle executing uniform circular motion
6.5   Derive expression for displacement
6.6   Derive expression for velocity
6.7   Derive expression for acceleration
6.8   Derive expression for period and frequency of S H M
6.9   Define phase of S H M
6.10   Derive expression for period of simple pendulum
6.11   Experiment for determination of acceleration due to gravity using simple pendulum.
6.12   Seconds pendulum
6.13   Solve problems

7.0   HEAT AND THERMODYNAMICS

7.1   Introduction to expansion of gases
7.2   Explain Boyle' s law
7.3   Experimental verification of Boyle's law
7.4   Explain absolute scale of temperature
7.5   State Charles laws
7.6   Derive ideal gas equation
7.7   Define gas constant and Universal gas constant
7.8   Explain why universal gas constant is same for all gases
7.9   State SI unit and value of universal gas constant
7.10   State the gas equation in terms of density
7.11   Differences between r and R
7.12   Concept of internal energy
7.13   Definition of external work
7.14   Calculate external work done by a gas
7.15   Explain Isothermal process and Adiabatic process
7.16   State laws of thermodynamics
7.17   Define specific heats & molar specific heats of a gas
7.18   Derive relation $C_p - C_v = R$
7.19   Solve problems

8.0   SOUND

8.1   Introduction to sound
8.2   Distinguish between musical sound and noise
8.3   Explain noise pollution and state SI unit for noise
8.4   Explain causes of noise pollution
8.5   Explain effects of noise pollution
8.6   Explain methods of minimizing noise pollution
8.7   Explain the phenomenon of beats
8.8   Explain the applications of beats
8.9   Explain Doppler effect
8.10   Derive formula for apparent frequency – (i) Source in Motion and observer at rest (ii) Observer in motion and source at rest
8.11   Applications of Doppler effect

8.12   Explain reverberation and reverberation time
8.13   Write Sabine's formula
8.14   Explain echoes
8.15   Solve problems

9.0   PROPERTIES OF MATTER

9.1   Introduction to Elasticity
9.2   Definitions of Stress and strain, their units and dimensional formulae
9.3   Statement of Hooke's law
9.4   Types of Stress
9.5   Types of strain
9.6   Types of moduli of elasticity
9.7   Definition of Surface Tension and examples
9.8   Explanation to Surface Tension with reference to molecular theory
9.9   Definitions of angle of contact and capillarity
9.10   State formula for Surface Tension based on capillarity
9.11   Experimental determination of surface tension by capillarity method
9.12   Concept of Viscosity, definition and examples
9.13   Newton's formula for Viscous force and definition of coefficient of Viscosity.
9.14   Effect of temperature on viscosity of liquids and gases
9.15   State Poiseulle's equation for coefficient of viscosity
9.16   Experimental determination of coefficient of viscosity
9.17   Solve problems

10.0   ELECTRICITY AND MAGNETISM

10.1   Introduction to Electricity
10.2   Ohm's law and explanation
10.3   Definitions of specific resistance, conductance and their units
10.4   Statements of Kichoff's laws and explanation
10.5   Wheatstone's bridge
10.6   Meter bridge
10.7   Experimental determination of specific resistance using Meter Bridge
10.8   Introduction to magnetism
10.9   Coulomb's inverse square law of magnetism
10.10 Defition of magnetic field and magnetic lines of force
10.11 Magnetic induction field strength-units and dimensions
10.12 Moment of couple on a bar magnet placed in a uniform magnetic field
10.13 Derivation for Magnetic induction field strength at a point on the axial line
10.14 Derivation for Magnetic induction field strength at a point on the equatorial line
10.15 Solve problems

11.0   MODERN PHYSICS

11.1   Explain Photo-electric effect
11.2   Einstein 's photoelectric equation
11.3   State laws of photoelectric effect

11.4　Working of photoelectric cell
11.5　Applications of photoelectric effect
11.6　Recapitulation of refraction of light and its laws
11.7　Critical angle
11.8　Total Internal Reflection
11.9　Explain the principle and working of Optical Fiber
11.10　Mention types of optical fibbers
11.11　List the applications of Optical Fiber
11.12　Definition of super conductor and superconductivity\
11.13　Examples of superconducting materials
11.14　Properties of Superconductors
11.15　Applications of superconductors

COURSE CONTENTS

1. UNITS AND DIMENSIONS:

 Introduction – Physical quantity – Fundamental and Derived quantities – Fundamental and Derived units- SI units –Multiples and Sub multiples – Rules for writing S.I. units-Advantages of SI units – Dimensions and Dimensional formulae- Dimensional constants and Dimensionless quantities- Principle of Homogeneity- Advantages and limitations of Dimensional analysis- - Problems.

2. ELEMENTS OF VECTORS:

Scalars and Vectors –Types of vectors- Addition of vectors- Representation of vectors- Resolution of vectors - Parallelogram, Triangle and Polygon laws of vectors– Dot and Cross products of vectors-Problems

3. KINEMATICS:

Introduction- Concept of acceleration due to gravity- Equations of motion for a freely falling body and for a body thrown up vertically- Projectiles- Horizontal and Oblique projections- Expressions for maximum height, time of flight, range and resultant velocity-problems

4. FRICTION:

Introduction to friction- Causes- Types of friction- Laws of friction- Angle of repose-Angle of friction-- Motion of a body over a horizontal surface- smooth inclined plane- rough inclined plane- Advantages and disadvantages of friction- Methods of reducing friction – Problems

5. WORK, POWER AND ENERGY:

 Work, Power and Energy- Definitions and explanation- potential energy-kinetic energy-Derivations of Potential and Kinetic energies-K.E and Momentum relation - Work-Energy theorem- Conservation law of energy- Conventional and Non conventional energy sources-Problems

6. SIMPLE HARMONIC MOTION:

Introduction- Conditions of SHM- Definition- Examples- Expressions for displacement, velocity, acceleration, Time period, frequency and phase in SHM- Time period of a simple pendulum- Experimental determination of acceleration due to gravity-seconds pendulum- Problems

7. HEAT AND THERMODYNAMICS:

Expansion of Gases- Boyle's law-Experiment of Boyle's law- Absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant-Differences between r and R- Internal energy-External work done by a gas- Isothermal and adiabatic processes- Laws of thermodynamics- Two specific heats of a gas- Relation between Cp and Cv- Problems

8. SOUND:

Sound- Nature of sound- Musical sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation- Reverberation time-Sabine 's formula- Problems

9. PROPERTIES OF MATTER:

Introduction to Elasticity- Stress and Strain- Hooke's law- Types of Stress and Strain- Types of moduli of elasticity- Introduction to Surface Tension- Definition and examples- Molecular theory- Angle of contact and capillarity- Experimental determination of surface tension by capillary method- Effects of temperature and impurities- Introduction to Viscosity- Definition and examples- Newton's formula for viscosity- Experimental determination of viscosity by Poiseuille's method- Effect of temperature- Problems

10. ELECTRICITY & MAGNETISM:

Ohm's law and explanation- Specific resistance- Kirchoff's laws- Wheatstone's bridge- Meter bridge- Coulomb's inverse square law - magnetic field- magnetic lines of force- Magnetic induction field strength- magnetic induction field strength at a point on the axial line - magnetic induction field strength at a point on the equatorial l line –problems.

11. MODERN PHYSICS;

Photoelectric effect –Einstein's photoelectric equation-laws of photoelectric effect -photoelectric cell –Applications of photo electric effect-critical angle – Total internal reflection- fiber optics- -principle and working of an optical fiber-types of optical fibers - Applications of optical fibers- concepts of superconductivity - applications

Reference Books

1.   Intermediate Physics Volume 1 and 2   Telugu academy.
2.   Intermediate Physics Volume 1 and 2   Deepthi Publications
3.   Unified Physics Volume 1,2,3 and 4   Dr. S.L. Gupta and Sanjeev Gupta.
4.   Text book of Physics Volume 1 and 2   Resnik and Halliday
5.   Text book of applied physics   Dhanpath Roy
6.   Fiber optics   D.A. Hill
7.   Engineering Physics   M. Raghavendra

ENGINEERING CHEMISTRY & ENVIRONMENTAL STUDIES
(Common Subject)

Subject Title	:	Engineering Chemistry & Environmental studies			
Subject Code	:	EE -104			
Periods per week	:	04			
Total periods per year	:	120			

TIME SCHEDULE

S.No	Major Topic	No. of Periods	Weightage of Marks	No. of Short Questions	No. of Essay Questions
I.	**ENGINEERING CHEMISTRY**				
1.	FUNDAMENTALS OF CHEMISTRY	18	16	2	1
2.	SOLUTIONS	10	08	1	1/2
3.	ACIDS AND BASES	10	08	1	1/2
4.	PRINCIPLES OF METALLURGY	10	10	-	1
5.	ELECTROCHEMISTRY	12	13	1	1
6.	CORROSION	09	10	-	1
7.	WATER TECHNOLOGY	13	13	1	1
8.	POLYMERS	12	13	1	1
9.	FUELS	08	03	1	-
II.	**ENVIRONMENTAL STUDIES**	18	16	2	1
	Total	120	110	10	08

OBJECTIVES: **After the completion of the study of these units the student should be able to comprehend the following**

I. ENGINEERINGCHEMISTRY

1.0 Fundamentals of Chemistry
Atomic Structure:
1.1   Fundamental particles of an atom
1.2   Understand the concept of atomic number and mass number
1.3   Postulates of BOHR'S atomic theory and its limitations
1.4   Briefly explain Quantum numbers
1.5   Define and explain Aufbau principle, Hund's rule and Pauli's exclusion principle.
1.6   Define Orbital
1.7   Draw the shapes of s, p and d Orbitals
1.8   Distinguish between Orbit and Orbital

1.9   Understand electronic configuration of elements (up to element atomic number 30)

   Periodic Table
1.10 State modern periodic law
1.11   Salient features of modern periodic Table (Periods & Groups)

   Chemical bonding
1.12   Introduction
1.13   Postulates of Electronic theory of valency
1.14   Types of Chemical bonds
1.15   Define ionic bond and explain ionic bond formation in NaCl and MgO
1.16   Properties of Ionic compounds
1.17   Define covalent bond and explain Covalent bond in H_2, O_2 and N_2 using Lewis dot method.
1.18   Properties of Covalent compounds
1.19   Explain Metallic bond

   Oxidation-Reduction:
1.20   Definition of Oxidation and Reduction
1.21   Definition of Oxidation Number and its calculations
1.22   Difference between Oxidation Number and Valency

2.0   Solutions
2.1   Define Solution, solute and solvent
2.2   Types of solutions
2.3   Define mole and understand Mole concept
2.4   Define and explain Molarity
2.5   Define and explain Normality
2.6   Define and explain equivalent weight using acids, bases and salts
2.7   Numerical problems on Mole, Molarity and Normality

3.0   Acids and bases
 3.1   Explain Arrhenius theory of Acids and Bases and its limitations
 3.1   Explain Bronsted – Lowry theory of acids bases and its limitations
 3.2   Explain Lewis theory of acids and bases and its limitations
 3.3   Explain Ionic product of water
 3.4   Define pH and explain Sorenson scale
 3.5   Numerical problems on pH (Strong Acids and Bases)
 3.6   Define buffer solution with examples
 3.7   Applications of buffer solutions

4. 0 Principles of Metallurgy
 4.1   Characteristics of Metals
 4.2   Distinction between Metals and Non Metals
 4.3   Definitions of Metallurgy, Mineral, Ore, Gangue, Flux and Slag
 4.4   Methods of concentration of ore – Hand picking, Levigation, Froth Floatation
 4.5   Extraction of crude metal – Roasting, Calcination, Smelting
 4.6   Purification of Metals – Electrolytic Refining

4.7   Define an Alloy
4.8   Composition and uses of following Alloys: Brass, German silver, Nichrome

5.0   Electrochemistry
5.1   Define conductor Insulator, Electrolyte and Non – electrolyte
5.2   Explain Arrhenius theory of electrolytic dissociation
5.3   Define and explain electrolysis by taking example fused NaCl
5.4   Explain Faraday's laws of electrolysis
5.5   Define chemical equivalent and electrochemical equivalent
5.6   Numerical problems based on Faraday's laws of electrolysis
5.7   Define Galvanic cell and explain its construction
5.8   Distinguish between electrolytic cell and galvanic cell
5.9   Understand the standard electrode potentials
5.10 Understand electrochemical series and its significance
5.11 Understand emf of a cell
5.12 Numerical problems on emf of cell

6.1   Corrosion
6.1   Define corrosion
6.2   Factors influencing the rate of corrosion
6.3   Understand the concept of electrochemical theory of corrosion
6.4   Describe the formation of a) composition cells b) stress cells c) concentration cells
6.5   Understand rusting of iron
6.6   Explain the mechanism of rusting of iron
6.7   Explain the methods of prevention of corrosion a) protective coatings b) cathodic
         protection (Sacrificial anode process and Impressed – voltage process)

7. 0 Water Technology
7.1   Sources of water
7.2   Define soft and hard water
7.3   Understand temporary and permanent hardness and the compounds causing
         hardness (with Formulae)
7.4   State the disadvantages of using hard water in industries
7.5   Define Degree of hardness, units of hardness (ppm)
7.6   Explain the methods of softening of hard water: a) permutit process b) ion-
         Exchange process
7.7   Know the essential qualities of drinking water
7.8   Describe the method of municipal treatment of water for drinking purpose.
7.9   Explain Osmosis and Reverse Osmosis. Advantages of Reverse Osmosis

8.0   Polymers
8.1   Basic concepts of polymerisation
8.2   Describe the methods of polymerisation a) addition polymerisation of Ethylene b)
         condensation polymerisation of phenol and formaldehyde
          (Only flow chart i.e. without chemical equations)
8.3   Define the term plastic
8.4   Classification of plastics with examples
8.5   Distinguish between thermo and thermosetting plastics

8.6   Characteristics of plastics
8.7   Advantages of plastics over traditional materials
8.8   Disadvantages of using plastics.
8.9   Methods of preparation and uses of the following plastics: 1. Polythene 2. PVC
       3.Teflon 4. Polystyrene 5. Urea formaldehyde
8.10   Know the term natural rubber
8.11   State the structural formula of Natural rubber
8.12   Explain the processing of Natural rubber from Latex
8.13   Characteristics of natural rubber
8.14   Explain the process of Vulcanization
8.15   Characteristics of Vulcanized rubber
8.16   State the term Elastomer
8.17   Describe the preparation and uses of the following synthetic rubbers
       a) Buna-s b) Neoprene rubber

9.0   Fuels
9.1   Define the term fuel
9.2   Classification of fuels based on physical state – solid , liquid and gaseous fuels,
       and based on occurrence- primary and secondary fuels
9.3   Understand characteristics of good fuel
9.4   Extraction and Refining of Petroleum
9.5   State the composition and uses of gaseous fuels: a) water gas b) producer
       gas c) natural gas d) coal gas e) Bio gas f) acetylene

II. ENVIRONMENTAL STUDIES

1.1   Define terms environment and environmental studies. explain the scope and
              importance of environmental studies
1.2   Understand the terms – lithosphere, hydrosphere, atmosphere, biosphere, biotic
       component, energy component, pollutant, pollution, contaminant receptor - sink,
       particulates, dissolved oxygen, Threshold limit value, BOD, COD
1.3   Define   air pollution
1.4   Classification of air pollutants- based on origin and state of matter
1.5   State and explain the causes of air pollution
1.6   Explain the use and over exploitation of forest resources and deforestation
1.7   Explain the effects of air pollution on human beings, plants and animals
1.8   Explain the green house effect- ozone layer depletion and acid rain
1.9   Understand the methods of control of air pollution
1.10   Define water pollution
1.11   Explain the causes of water pollution
1.12   Explain the effects of water pollution on living and non living things
1.13   Understand the methods of control of water pollution
1.14   knows growing energy needs renewable and non-renewable energy sources.
       Understand the use of alternate energy sources
1.15   Define an Ecosystem
1.16   Define producers, consumers and decomposers with examples.
1.17   Define biodiversity and threats to biodiversity

COURSE CONTENTS

I ENGINEERING CHEMISTRY

1. **Fundamentals of Chemistry**
   Atomic Structure: Introduction - Fundamental particles – Bohr's theory – Quantum numbers - Aufbau principle - Hand's rule - Pauli's exclusion Principle- Orbitals, shapes of s, p and d orbitals - Electronic configurations of elements

   Periodic Table: Modern Periodic Law, salient features of Modern Periodic Table

   Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples – Properties of Ionic and Covalent compounds – Metallic bond

   Oxidation-Reduction: Concepts of Oxidation-Reduction, Oxidation Number -calculations, differences between Oxidation Number and Valency

2. **Solutions**
   Introduction-concentration methods – Mole concept, Molarity, Normality,

   Equivalent weights, Numerical problems on Mole, Molarity and Normality

3. **Acids and Bases**
   Introduction – theories of acids and bases and limitations – Arrhenius theory- Bronsted –Lowry theory – Lewis acid base theory – Ionic product of water - P^H and related numerical problems – buffer solutions –Applications.

4. **Principles of Metallurgy**
   Characteristics of Metals and distinctions between Metals and Non Metals, Metallurgy, ore, Gangue, Flux, Slag - Concentration of Ore –Hand picking, Levigation, Froth floatation – Extraction of crude Metal – Roasting, Calcination, Smelting – Alloys – Composition and uses of Brass, German silver and Nichrome

5. **Electrochemistry**
   Conductors, insulators, electrolytes - Arrhenius theory of electrolytic dissociation – electrolysis – Faraday's laws of electrolysis- numerical problems – Galvanic cell – standard electrode potential – electro chemical series –emf and numerical problems on emf of a cell

6. **Water technology**
   Introduction –soft and hard water – causes of hardness – types of hardness – disadvantages of hard water – degree of hardness (ppm) – softening methods – permutit process – ion exchange process – numerical problems related to degree of hardness – drinking water – municipal treatment of water for drinking purpose – Osmosis, Reverse Osmosis - advantages of Reverse osmosis

7. Corrosion

Introduction - factors influencing corrosion - electrochemical theory of corrosion

- composition, stress and concentration cells– rusting of iron and its mechanism – prevention of corrosion by coating methods, cathodic protection

8. Polymers

Introduction – polymerization – types of polymerization – addition, condensation with examples – plastics – types of plastics – advantages of plastics over traditional materials – Disadvantages of using plastics – preparation and uses of the following plastics: 1. Polytehene 2. PVC   3. Teflon 4. Polystyrene   5. Urea formaldehyde – Rubber – Natural rubber – processing from latex –Vulcanization – Elastomers – Buna-s, Neoprene rubber and their uses.

Fuels

Definition and classification of fuels – characteristics of good fuel - Extraction and Refining of petroleum - composition and uses of gaseous fuels.

II. ENVIRONMENTAL STUDIES

Introduction – environment –scope and importance of environmental studies important terms – air pollution - causes-Effects – forest resources : uses and over exploitation, deforestation, acid rain, green house effect –ozone depletion – control of air pollution – Water pollution – causes – effects – control measures, renewable and non renewable energy sources – Concept of ecosystem, producers, consumers and decomposers – Biodiversity, definition and threats to Biodiversity.

Reference books

1. Intermediate Chemistry Vol 1& 2   Telugu Academy

2. Intermediate Chemistry Vol 1& 2   Vikram Publishers

3. Intermediate Chemistry Vol 1 & 2   Vignan Publishers & Deepthi publishers

4. Engineering Chemistry   Jain and Jain

5. Engineering Chemistry   O.P.Agarwal, Hi-Tech.

6. Engineering Chemistry   M.S.N.Raju, etc, Hi-Tech.

7. Applied Chemistry   V.Subrahmanyam

8. Engineering Chemistry   Sharma

9. Environmental chemistry   A.K. De

10.Engg. Chemistry & Env. Studies   Dr. G. Venkatanarayana

BASIC ELECTRICAL ENGINEERING

Subject Title : **Basic Electrical Engineering**
Subject Code : **EE-105**
Periods/Week : **06**
Periods/Year : **180**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short questions	Essay questions
1.	Electric Current-Ohm's law, Resistance, Energy	30	16	2	1
2.	Conducting Materials.	16	8	1	1/2
3.	Heating effects of electric Current	15	10	_	1
4.	Magnetic effects of Electric current	25	13	1	1
5.	Electromagnetic Induction	30	16	2	1
6.	Electrostatics	22	13	1	1
7.	Insulating Materials	18	13	1	1
8.	Special Purpose Materials	8	8	1	1/2
9.	Semiconductor Devices	16	13	1	1
	Total	**180**	**110**	**10**	**8**

OBJECTIVES
On completion of the course the student should be able to

1.0 Comprehend the basic Principles of Electricity
1.1 Distinguish between conductor, insulator and semi-conductor with respect
to valence electrons and energy level diagrams.
1.2 Infer Ohm's Law and state it.
1.3 State the limitations of Ohm's law
1.4 Give the concept of Resistance to flow of electrons,
Define the terms specific resistance and conductivity.
Deduce the relation $R = (\rho l) / a$
1.5 Solve simple problems based upon the above formula.
1.6 Effect of Alloying on Resistivity.
1.7 Explain the effects of temperature on resistance and
define temperature co- efficient of resistance.
1.8 Explain the variation of temperature co-efficient of resistance.
1.9 Develop the formula for resistance at any temperature
As $R_t = R_o (1 + \propto_{os} t)$
1.10 Solve problems based on the above formula.

1.11   Explain equivalent resistance of a network, develop the expressions for equivalent resistance with simple series and parallel connections.
1.12   Give the guide lines for calculations of equivalent resistance in the case of series - parallel networks.
1.13   Solve problems on the above
1.14   Give the idea of division of current in parallel circuits
1.15   Solve numerical problems on the above.
1.16   Give the expressions and units of electrical Power and electrical Energy.
1.17   Calculation of electricity bill for domestic consumers.

2.0 **Conducting Materials.**

2.1   Explain the Terms (a) Hardening (b) Annealing
2.2   Explain the effects of these on copper regarding Electrical and Mechanical properties
2.3   State the main requirements of Low Resistivity Materials. List some Examples.
2.4   Mention the properties & applications of Copper and Aluminium
2.5   Distinguish between Copper and Aluminium
2.6   Mention the properties, applications and advantages of ACSR Conductors and AAAC.
2.7   State the requirements of High Resistive Materials.
2.8   State the types of High Resistive Materials.
2.9   List the properties & Applications of High Resistive Materials.
   a. Manganin
   b. Eureka
   c. Constantan
   d. Nichrome
   e. Tungsten
   f. Platinum
   g. Mercury and
   h. Carbon

3.0   **Know the heating effects of Electric Current*:***
3.1   Explain the Mechanical equivalent of heat.
3.2   State the heat produced due to flow of current
3.3   Explain the practical applications of heat produced due to Electric current in metal filament lamps, Electric - kettle, Electric cooker, Electric Iron, Space heaters, Geyser, Infrared lamp.
3.4   Define thermal efficiency.
3.5   Solve problems on the above.

4.0   **Know the magnetic effects of Electric Current**
4.1   Develop the idea of lines of force & magnetic Field.
4.2   Plot the field pattern due to
   a. Straight current carrying conductor
   b. Solenoid and
   c. Toroid.
4.3   Give expressions for field strength (No derivation)
   a. At Centre of a circular conductor
   b. At any point on the axis of a circular conductor

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c. Around a Straight conductor
d. On the axis of a solenoid
4.4 Explain the Mechanical force on a current carrying
Conductor in a Magnetic field.
4.5 Give the expression for magnitude of the force
on a conductor in a magnetic field
4.6 State the Flemming's left hand rule
4.7 Develop the expression for the force between two
parallel current carrying conductors
4.8 State the nature of the force with different directions of the currents
4.9 Define ampere
4.10 Solve problems on the above.
4.11 Define magnetizing force, permeability, flux and Reluctance
4.12 Develop the concept of the Magnetic circuits
4.13 Solve problems on simple magnetic circuits
4.14 Compare magnetic circuit with electric circuit
4.15 Draw B.H. Curves and Hysteresis loop and Explain them
4.16 Explain Hysteresis loss and State Steinmetz equation (No-Problems)
4.17 Classify the Magnetic Material as:
(a) Ferro (b) Para (c) Dia-Magnetic materials with examples
4.18 State Curie Point
4.19 Define Magnetostriction.
4.20 Explain the Soft & Hard Magnetic materials with examples.

5.0 Understand Electro Magnetic Induction:

5.1 State Faraday's laws of electro - magnetic induction
5.2 Explain dynamically and statically induced E.M.F.
5.3 State Lenz's law and explain Flemming's right hand rule
5.4 Develop the concept of self and mutual inductance
5.5 Derive the expressions for self and mutual inductances
5.6 State co-efficient of coupling
5.7 Explain the total inductance with series connections
with reference to direction of flux.
5.8 Explain the energy stored per unit volume in a magnetic field.
5.9 Calculate energy stored per unit volume
5.10 Develop an expression for lifting power of a magnet.
5.11 Solve problems on the above.

6.0 Understand Electric Charge and Electrostatic Field

6.1 State Coulomb's law of electrostatics and define unit charge
6.2 Define absolute and relative permittivity.
6.3 Solve problems on the above
6.4 Explain electrostatic field.
6.5 Plot electrostatic field due to
a. Isolated positive charges
b. Isolated negative charge
c. Unlike charges side by side

        d. Like charges side by side
6.6   Compare electrostatic and magnetic fields
6.7   State field intensity
6.8   State Gauss theorem
6.9   Explain electric potential and potential difference
6.10 Explain di-electric strength and di-electric constant
6.11 Give the Permitivity of commonly used die- electric materials
        a. Air
        b. Bakelite
        c. Glass
        d. Mica
        e. Paper
        f. Porcelain
        g. Transformer oil
6.12 Explain Polarisation.
6.13 Explain Dielectric Loss
6.14 State the application of Dielectrics.
6.15 Define capacitance and its unit
6.16 Derive the formula of capacitance
6.17 State different capacitors
6.18 Give uses of different capacitors
6.19 Explain equivalent capacitance of
        a. Capacitors connected in series;
        b. Capacitors connected in parallel
6.20 Derive an expression for energy stored in a capacitor
6.21 Solve problems on the above
6.22 List the color codes of the resistors and capacitors as per BIS

7.0   Insulating Materials.

7.1   State the important electrical properties of Insulating materials.
        a. Insulating resistance
        b. Volume and Surface resistance
7.2   Explain factors affecting insulating resistance.
7.3   State the classification of Insulating materials on the basis of temperature like Y,A,E,B,F,H and C class.
7.4   State the classification of insulating materials.
7.5   Mention the properties & applications of Impregnated paper, Wood, Cardboard, Asbestos, Mica, Ceramics and Glass.
7.6   Explain Thermoplastic & Thermosetting resins with examples.
7.7   Explain the properties & applications of PVC
7.8   State the effects of the following on P.V.C
    (a) Filler (b) Stabilizer (c) Plasticizer (d) Additives.
7.9   State the Properties and application of following gasses.
    (a) Air (b) Nitrogen (c) Hydrogen (d) Sulphur – HexaFluoride

8.0   Special Purpose Materials.
8.1   State the various protective materials Lead, Paints, Steel Tapes.
8.2   Explain the thermo couple materials,

8.3   State the Bi-metals
8.4   State the soldering materials
8.5   State fuse and fuse materials
8.6   Explain the process of galvanising and impregnation
8.7   State Enamel coated copper wires: thin, medium and thick.

9.0   Know the semi-conductor Devices
9.1   Distinguish between intrinsic and extrinsic semi-conductors
9.2   Distinguish between P and N type semi-conductors
9.3   Explain the working of PN Junction diode with no bias, forward bias and reverse
       bias .
9.4   Draw the characteristics of PN Junction diode with forward bias and reverse bias
9.5   Explain the operation of Zener diode.
9.6   Draw the characteristics of Zener diode.
9.7   Explain formation of PNP and NPN transistors
9.8   State the different transistor configurations
9.9   Sketch the characteristics of CB, CE configurations.
9.10   Compare the performance characteristics of CB and CE configurations.
9.11   List the manufacturer specifications of PN, Zener diode and Transistor.

COURSE CONTENTS

1.   Electric Current - Ohm's Law - Resistance:
       Conductor, Insulator , semi-Conductor – Ohm's law – Resistance – Specific
       Resistance – Conductivity – Temperature coefficient of Resistance – Resistance in
       series, parallel and series parallel combinations, Calculation of electrical Power and
       Energy.

2.   Conducting Materials
       Hardening, Annealing - Low Resistive Materials – requirements – properties and
       applications of copper and aluminium - Comparison between Copper and
       Aluminium - ACSR Conductors, AAAC, -High Resistive Materials - properties –
       applications.

3.   Heating Effects of Electrical Current
       Mechanical Equivalent of Heat - Heat produced due to flow of current in resistance-
       applications
4.   Magnetic Effects of Electric Current
        Lines of force - Field pattern due to long straight current carrying conductor-Field
        pattern of solenoid and Toroid -Field strength at centre and any point on the axis of
        a circular current carrying conductor- Field Strength around a straight current
        carrying conductor- Field strength on the axis of a solenoid-Mechanical force on a
        current carrying -   conductor in magnetic field - Direction of force - Fleming's left
        hand rule -Force between two parallel current carrying conductors – Ampere -
        Magnetic circuit-   Magnetising force – permeability - flux - reluctance -
        Magnetisation of Magnetic materials - Cycles of Magnetisation -B-H Curves -
        Hysteresis loop - Hysteresis loss - Steinmetz constant -Comparison of Magnetic

circuit with electric circuit - Magnetic materials.- classification –Curie Point – Magnetostriction -Soft & Hard - Magnetic materials

5.   Electro Magnetic Induction
Faraday's laws - Dynamically and statically induced E.M.F -Lenz's Law & Fleming's right hand rule -Self and mutual inductance - Co-efficient of coupling - Inductances in series -Energy stored in a magnetic field - Energy stored per unit volume - Lifting power of magnet .

6.   Electrostatics
Atom,Ion,positive and Negative charges -Laws of Electrostatics – coulomb - Permittivity - Electrostatic induction -Electrostatic field - lines of force -Comparison of electrostatic and magnetic lines of force -Strength of electric field- Flux density - Gauss theorem - Electric potential - potential difference –Polarisation - Dielectric Loss - Application of Dielectrics –
Dielectric strength - dielectric constant - Capacitance -Capacitor - types - Capacitors in series and parallel – color codes of resistors and capacitors as per BIS

7.   Insulating Materials
Properties -Insulation resistance - factors effecting Insulation resistance - Classification of Insulation materials - properties - applications

8.   Special Purpose Materials
Protective materials – Thermocouple - Bi-Metals- Soldering- Fuses -Galvanizing and Impregnating

9.   Semi-conductor Devices
Intrinsic and extrinsic semi-conductors, `P'  and  `n' type materials, PN Junction, forward and reverse bias- Zener diode, Zener diode characteristics - formation of PNP and NPN transistors- Transistor configurations- CB, CE - Input and output characteristics of CB,CE - comparison of CB,CE, configurations.

<u>**REFERENCE BOOKS**</u>

1. Electrical Technology Vol.I   by B.L.Theraja

2. Electrical Technology by Hughes

3. Electrical Techology Vol.I by J.B.Gupta

4. Electrical Engg.Materials G.V. Baradhwajan

5. Electronic Components- Dr. K.Padmanabham

6. ElectronicComponents-D.V.Prasad

7. Electrical Engineering Materials - T.T.T.I Publications

8. Basic electronics and linear circuits – Bhargava, TMH Publishers

9. Electronic Principles - Malvino

MECHANICAL WORKSHOP

Subject Title	:	Mechanical Workshop
Subject Code	:	EE-106
Periods/Week	:	03
Periods/year	:	90

OBJECTIVES

Upon completion of the practice the student - will be able to

1.0. DEVELOP CARPENTRY SKILLS
1.1 Practice on planning sawing and chiselling
1.2 Prepare a Half Lap joint
1.3 Prepare a Dovetail joint
1.4 Prepare a Mortise joint
1.5 Prepare a 20 cm x 15 cm Teakwood Switch board with hinges and botton hook
1.6 Fix the laminate sheet to the above box and cut suitable holes to mount one flush type switch,socket

2.0. DEVELOP FITTING SKILLS
2.1 Cut a metal conduit,G.I.pipe and solid using hack saw
2.2 Thread cutting G.I.pipe, metal conduit and solid rod using Die set
2.3 Internal thread cutting using Tap set reamers
2.4 Thread Cleaning
2.5 Make a hexagonal nut from a round rod

3.0. DEVELOP WELDING SKILLS
(Resistance and Arc welding):
3.1 prepare a job and make a Spot weld.
3.2 prepare a job and make a seam weld.
3.3 prepare a job and make a butt weld.
3.4 Prepare a job and make a lap joint and finish it using grinder
3.5 Prepare the job and make T joint

ENGINEERING DRAWING

Subject Title : **Engineering Drawing**
Subject Code : **EE – 107**
Periods/Week : **06**
Periods Per Year : **180**

TIME SCHEDULE

S. No	Major Topics	Periods	Weightage of marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	03	-	-	-
2	Drawing instruments				
3	Free hand lettering & Numbering	06	5	1	-
4	Dimensioning Practice	12	5	1	-
5	Geometrical construction	24	10		1
6	Projection of points, Lines, Planes and solids	30	10		1
7	Orthographic Projection	30	15	1	1
8	Sectional views	18	10		1
9	Auxiliary views	06	5	1	
10	Pictorial drawing	30	10		1
11	Development of surfaces	21	10		1
Total		**180**	**80**	**04**	**06**

OBJECTIVES

On   completion of the study of this subject the student should be able to

    1.0   Understand the Importance of Engineering Drawing

    1.1   State the importance of drawing as an engineering communication medium.

    1.2   State the necessity of I.S. Code of practice for Engineering Drawing.

    1.3   Appreciate the linkages between Engineering drawing and other subjects of study in Diploma course.

2.0   **Use Engineering Drawing Instruments**
    2.1   Select the correct instruments and draw lines of different orientation.
    2.2   Select the correct instruments and draw small and large Circles.

2.3   Select the correct instruments for measuring distances on the drawing.

2.4   Use correct grade of pencil for different types of lines, thickness and given function.

2.5   Select and use appropriate scales for a given application.

2.6   Identify different drawing sheet sizes as per I.S. and Standard Layouts.

2.7   Prepare Title block as per I.S. Specifications.

2.8   Identify the steps to be taken to keep the drawing clean and tidy.

3.0   Write Free Hand Lettering and Numbers

3.1   Write titles using sloping lettering and numerals as per B.I.S (Bureau of Indian standards)

3.2   Write titles using vertical lettering and numerals as per B.I.S.

3.3   Select suitable sizes of lettering for different layouts and applications.

3.4   Make the use of lettering stencils.

4.0   Understand Dimensioning Practice

4.1 State the need of dimensioning the drawing according to accepted standard.

4.2 Define "Dimensioning".

4.3 Identify notations of Dimensioning used in dimensioned drawing.

4.4 Identify the system of placement of dimensions in the given dimensioned drawing.

4.5 Dimension a given drawing using standard notations and desired system of dimensioning.

4.6 Dimension standard features applying necessary rules.

4.7 Arrange dimensions in a desired method given in a drawing.

4.8 Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly.

5.0   Apply Principles Of Geometric Constructions

5.1 Divide a given line into desired number of equal parts internally.

5.2 Draw tangent lines and arcs.

5.3 Construct a Hexagon from the given data.

5.4 Define ellipse, parabola hyperbola, involute, cycloid, and helix.

5.5 Construct ellipse by concentric circles method and using a paper trammel.

5.6 Construct parabola, rectangular hyperbola involute, cycloid and helix from the given data.

5.7 State the applications of the above constructions in Engineering practice.

6.0   Apply Principles of Projection of points, lines & planes

6.1 Explain the projection of a point with respect to reference planes (HP & VP)

6.2 Explain the projections of straight lines with respect to two reference planes.

6.3 Explain the projections of perpendicular planes.

7.0 Apply principles of Orthographic Projection

7.1 Explain the principles of Orthographic projection with simple sketches.

7.2 Prepare an Engineering Drawing of a given simple Engineering part in first angle projection.

7.3 Draw the orthographic view of an object, given its pictorial drawing.

7.4 Sketch the minimum number of views needed to represent a given object fully.

7.5 identify the object, from a number of orthographic views given.

7.6 Supply the missing view when given two other views of an object.

8.0 Appreciate the need of Sectional Views

8.1 Explain the need to draw sectional views.

8.2 Select the section plane for a given component to reveal maximum information.

8.3 Draw sectional view for the component in 8.2.

8.4 Apply conventional practices and identify the parts, which should not be shown in section while drawing sectional views.

8.5 Make conventional representation of Engineering materials as per latest B.I.S. Code.

8.6 Apply principles of hatching.

8.7 Draw simple sections (full, half, revolved and removed part) for a range of simple Engineering objects.

8.8 Draw the component from a given set of sectional views.

9.0 Understand the need for Auxiliary Views

9.1 State the need of Auxiliary views for a given Engineering Drawing.

9.2 Sketch the auxiliary views of a given Engineering component to indicate the true shape and size of component.

9.3 Draw the auxiliary views of a given Engineering drawing.

10.0 Prepare Pictorial Drawings

10.1 State the need for commonly used type of pictorial drawings.

10.2 Given the objects, draw their orthographic views.

10.3 State the need of isometric scale and isometric projection.

10.4 Prepare Isometric projections for the given orthographic drawings.

10.5 Prepare oblique drawing cavalier, cabinet of simple Engineering objects from the given data.

10.6 Identify the correct pictorial views from a set of Orthographic drawings.

11.0 Prepare Development Drawings

11.1   State the need for preparing development drawing.
11.2   Prepare development of simple Engineering objects using parallel line and radial line method.
11.3   Prepare development of Surface of Engineering components like trays, funnel, 90^0 elbow & rectangular duct.

COURSE CONTENTS

NOTE

1.   **I.S. / B.S Latest Specification should invariably be followed in all the topics.**
2.   **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**

Understand the importance of Engineering Drawing

Explanation of the scope and objectives of the subject of Engineering Drawing its importance as a graphic communication
Need for preparing drawing as per standards – SP-46 –1988
Mention of I.S.O and B.I.S-Role of drawing in -engineering education
Link between Engineering drawing and other subjects of study.

Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines,
tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine . Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged
Lines: Types of lines, selection of line thickness - Selection of Pencils
Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents - Care and maintenance of Drawing Sheet,   To draw "Lay out of sheet " – and as per SP-46-1988 to a suitable scale.
Simple Exercises on the use of Drawing Instruments.
 Importance of Title Block.
Drawing Plate 1: (Consisting of about two exercises)
   To draw geometric shapes (standard) using drawing instruments -To draw   layout of sheet and title block.

Free hand lettering & numbering

Importance of lettering – Types of lettering
Guide Lines for Lettering
Recommended sizes of letters & numbers –
Advantages of single stroke or simple style of lettering –
Use of lettering stencils
Drawing plate 2: (Consisting of about 5 to 6 exercises)

To print the table of Types of lines as per latest ISI Standards.
To print the table of "Recommended sizes of letters and numerals" – as
per Standards.
Selection of suitable size of letters and numbers and draw the given titles,
phrases using both vertical and sloping styles.

Dimensioning practice

Purpose of engineering Drawing, need of I.S.I code in dimensioning –Shape
description of an Engineering object -Definition of Dimensioning size description -
Location of features, surface finish, fully dimensioned Drawing -Notations or tools of
dimensioning, dimension line extension line, leader line, arrows, symbols, number
and notes, rules to be observed in the use of above tools -Placing dimensions:
Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions
Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-
The rules for dimensioning standard, features "Circles (holes) arcs, angles, tapers,
chamfers, and dimension of narrow spaces.

Drawing Plate 3: (Consisting of above 12 to 15 exercises)
Dimensioning a given drawing using the above tools, rules and systems of
dimensioning.
Dimensioning practice in various methods of dimensioning stated above.
Dimensioning, given common features listed.
Exercise in identifying the departures made in a given dimensioned
drawing from I.S.I. Code of practice.

Geometric Construction

Division of a line: to divide a straight line into given number of equal parts
internally examples in Engineering application.
Construction of tangent lines: to draw tangent lines touching circles
internally and externally.
Construction of tangent arcs
i) To draw tangent arc of given radius to touch two lines inclined at given
   angle (acute, right and obtuse angles).
ii)Tangent arc of given radius touching a circle or an arc and a given line.
iii)Tangent arcs of radius R, touching two given circles internally and
    externally.
Hexagon: Inscribing a Hexagon in a circle of given dia and circumscribing a
given circle, using
i) Set squares.
ii) Compass – given a side to construct a Hexagon using set squares or
    compass.
Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a
double cone and a loci of a moving point, Eccentricity of above curves – Their
Engg. Application viz. Bolts and Nuts, Projectiles, reflectors P.V. Diagram of a
Hyperbolic process, Construction of Ellipse using.

i)   Concentric circles method.

ii) Paper trammel, method.

iii) Construction of parabola by rectangular method.

iv) Construction of Rectangular Hyperbola when given the position of a point on the curve.

General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their Engineering application, viz, Gear tooth profile, screw threads, springs etc. Their construction:

Drawing Plate: 4 (Consisting of about 12 to 15 exercises)

Exercises mentioned above at the rate of at least one problem on each "construction".

Projection of points, lines and planes.

Projecting a point on two planes of projection

Projecting a point on three planes of projection

Projection of straight line.

(a) Parallel to one or both the planes.

(b) Contained by one or both the planes.

(c) Perpendicular to one of the planes.

(d) inclined to one plane and parallel to other planes.

Projection of perpendicular planes

(a) Plane perpendicular to both HP and VP

(b) Plane perpendicular to HP and parallel to VP and Vice versa.

(c) Plane perpendicular to HP and inclined to VP and vice versa.

Projection of Regular solids in simple positions

7.0   Orthographic Projections

Meaning of Orthographic Projection -Using a viewing Box and a model – Number of views obtained on the six faces of the box, - Neat sketches of only 3 views for describing object -Concept of front view, top views, and sides view sketching these views for a number of Engg. Objects -Explanation of "First angle projection". – Positioning of three views in First angle projection -   Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe an object fully.

Drawing Plate 5: (Consisting of about 10 to 12 Number of exercises)

Given an engineering object(s) to sketch the three views.

Given the pictorial view of simple objects to sketch the three views in
First and third angle projections.

Given the object (pictorial Drawing) and 3 views identifying the surface
on the views with reference to the object.

Given two views and a simple object – Draw the mission of third view.

Drawing Plate 6: (Consisting of about 6 to 8 exercises)

Given the engineering objects (Pictorial views) Drawing the three views
in First angle projection.

Identifying the object, when given a number of objects and the
orthographic views (matching exercises).

8.0   Sectional views

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) -Meaning of Full, half revolved and removed, local or partial sections - Hatching – adjacent components (two or more) large areas, a part in different parallel planes-Conventional practices to represent sections of ribs, shafts, bolts, nuts, screws, rivets, spokes, webs, keys, cotters, thin sections etc., as per B.I.S. specifications – Conventional representation of materials as per B.I.S. Standards.

Drawing Plate 7: (Consists of about 8 to 10 exercises)

Preparing conventional representation of a materials as per latest/ B.I.S. Code.

Given the object (pictorial or orthographic view), and cutting plane line to draw sectional view.

Given the object to select the correct cutting plane line and then to draw the sectional view.

To identify the object when given number of objects and number of sectional views (Matching exercise.)

9.0   Auxiliary views

Need for drawing auxiliary views -Explanation of the basic principles of drawing an auxiliary views explanation of reference plane and auxiliary plane - Partial auxiliary view.

Drawing plate No.8: (Consisting of about 8 exercises)

Given a set of objects, state whether an auxiliary view is needed – if required sketch the same.

Given the object and its auxiliary view (partial or full, to sketch the auxiliary plane on the pictorial view)

10.0   Pictorial Drawings

Brief description of different types of pictorial drawing viz., Isometric, oblique,

and perspective – Use of these - Isometric drawings: Iso axis, angle between

them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale, and ordinary scale difference between Isometric drawing (or view, and Isometric Projection) and orthographic drawing - Isometric and non-Isometric lines -Isometric drawing of

common features like rectangles, circular - shapes, non-isometric lines, Use of

box and offset construction -Oblique drawings: Their use -Cavalier and cabinet drawings – Oblique drawing of common features like rectangular, circular and inclined, surfaces -Selection of the face of the object to be included in the front view.

Draw plate 9: (Consists of about 10 to 12 exercises)

Given the Orthographic views to draw isometric views,

Construction of isometric scale.

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Given the Orthographic views to draw isometric Projections.
Given the Orthographic views to draw cavalier Drawings.
Given the Orthographic views to draw cabinet Drawings.

11.0 Development of Surfaces

Need for preparing development of surface with reference to sheet metal Work - Concept of true length of a line with reference to its Orthographic projection when the line is (i) parallel to the plane of projection (ii) When it is inclined to one principal and parallel to the other -Development of simple Engineering common solids like Cubes, prisms, Cylinders, Cones, Pyramid (sketches only) -Types of Development: Parallel line and radial line development -Procedure of drawing development, drawings of trays funnels, 90^0 elbow pipes and rectangular ducts.
Drawing plate No. 10: (Consists of about 10 exercises)
Development drawings by " Parallel – line " method such as prisms and Cylinders (Truncated).
Development drawing by "Radial – line " method such as cones and pyramids (Truncated)
Development drawings of a tray: funnel 90^0 elbow and rectangular duct.

REFERENCE BOOKS

First Year Engineering Drawing – B.R. Gupta.

Engineering Drawing by N.D.Bhatt.

"A First Year Engineering Drawing" – A.C. Parkinson (Metric Edition).

T.S.M. & S.S.M on " Technical Drawing" prepared by T.T.T.I., Madras.

SP-46-1998 – Bureau of Indian Standards.

Introduction to Engineering Drawing   R.C.Mouli – V.Rama Rao –
                                             M. Venkateswarlu.

PHYSICS LAB
(Common to All Courses)

Subject title : **Physics LAB**
Subject code : **EE -108**
Periods / week : **03**
Total periods / Year : **45**

List of Experiments	No. of Periods
1. Vernier calipers	3
2. Screw gauge	3
3. Parallelogram law of forces and Triangle law of forces (verification)	3
4. Simple pendulum	3
5. Velocity of sound in air (Resonance method)	3
6. Focal length and focal power of convex lens (separate and combination)	3
7. Refractive index of solid using traveling microscope	3
8. Surface tension of liquid using traveling microscope	3
9. Coefficient of viscosity by capillary method	3
10. Boyle's law verification	3
11. Meter bridge	3
12. Mapping of magnetic lines of force	3
Revision	6
Test	3

Total	45

SUBJECT : PHYSICS LAB
SUBJECT CODE: EE-108

SPECIFIC OBJECTIVES OF PHYSICS LABORATORY

1. **VERNIER CALIPERS** - To determine the volumes of a cylinder and a sphere

2. **SCREW GAUGE** – To determine the thickness of a glass plate and area of cross section of a wire

3. **PARALLELOGRAM LAW AND TRIANGLE LAW VERIFICATION –** To verify laws and determination of unknown weight of an object

4. **SIMPLE PENDULUM –** To determine the value of acceleration due to gravity using law of length and to draw l-T and l- T^2 curves.

5. **VELOCITY OF SOUND IN AIR** – To determine velocity of sound in air at room temperature and to calculate its value at 0^0 C using two tuning forks.

6. **FOCAL LENGTH AND FOCAL POWER OF CONVEX LENSES –** To find focal length and focal power of a single convex lens and combination of convex lenses respectively using U-V method and draw U-V and 1/U – 1/V curves for single convex lens experiment only.

7. **REFRACTIVE INDEX OF A SOLID** – To determine the refractive index of material of a glass slab using traveling microscope.

8. **SURFACE TENSION OF A LIQUID** – To determine the surface tension of water using traveling microscope (Capillary method.)

9. **VISCOSITY OF A LIQUID** – To determine viscosity of water by using capillary method

10. **BOYLE'S LAW VERIFICATION** – To experimentally verify Boyle's law employing a Quill tube.

11. **METER BRIDGE** – To find specific resistance of the material of a wire

12. **MAPPING OF MAGNETIC LINES OF FORCE** – To locate the positions of neutral points using N-S and N-N method with the help of magnetic compass

CHEMISTRY LAB

Subject Title   :   **Chemistry LAB (COMMON TO ALL)**
Subject Code   :   **EE - 109**
No of periods   :   **03 (Per week)**
Total periods   :   **45**

List of Experiments

1. Introduction to volumetric analysis

2. Preparation of Standard Na_2CO_3 solution
3. Estimation of HCl solution   using Std. Na_2CO_3 solution

4. Estimation of NaOH using Std. HCl   solution

5. Estimation of Mohr's Salt using Std. $KMnO_4$ solution

6. Determination of acidity of water sample

7. Determination of alkalinity of water sample

8. Determination of total hardness of water using Std. EDTA solution

9. Estimation of Chlorides present in water sample

10. Estimation of Dissolved Oxygen (D.O) in water sample

DEMONSTRATION EXPERIMENTS

11. Determination of pH using pH meter

12. Determination of conductivity of water

13. Determination of turbidity of water

14. High volume air sampler

15. Estimation of total solids present in water sample
    Revision

INFORMATION TECHNOLOGY LAB

Subject Title : **Information Technology Lab**
Subject Code : **EE -110**
Periods/Week : **04**
Periods per Semester : **120**

SPECIFIC OBJECTIVES

On completion of this subject the student would be able to

- Identify the various components of a Computer system

- Differentiate between hardware and software

- State the functions of each component of a computer a system

- State the configuration of a computer system

- Identify the various peripherals

- Know how to open an application program

- Know how to create a folder in a specified location

- Open MS-word and Identify the components on the screen

- Create a document using MS-word and save it

- Create a table using MS-Word and save it

- Create mailing letters using mail merge tool of MS-word

- Open MS-Excel and identify the components on the screen

- Create a Worksheet in MS-Excel and save it

- Generate a Chart using the data in Excel-worksheet

- Automate calculations in a worksheet using formula

- Sort and filter data in a worksheet

- Create a simple Power point presentation for a small topic

- Backup required files and folders to a CD-ROM

- Introduction to the internet technology and imparting training to use searching of required sites and using e-Mails etc..

COURSE CONTENT:

1. Study of a computer system
2. Familiarise with basic MS-WINDOWS facilities like opening programs, searching, creating folders, copying and shifting data , etc.
3. Create a formatted word document using MS-Word
4. Familiarise with spell checker facility of MS-Word
5. Print the Word document using page setup and Print facilities
6. Create a soft copy of a given table using MS-Word
7. Create mailing letters for a given information using MS-Word
8. Create a soft copy of the given statistical data using MS-Excel
9. Generate Appropriate Chart for the statistical data using MS-Excel
10. Generate the soft copy of a worksheet using formula facility of MS-Excel
11. Create a soft copy of a simple database using Excel. Run sort and filter facilities for the database
12. Create a power point presentation for a simple technical topic using MS-PowerPoint.
13. Create a backup CD for a data using NERO or similar CD writing software
14. Create an user account on the Internet and e-mail and sending a document to from a given e-mail address. To another e-Mail ID as attachment.
15. Using different search engines finding required sites to collect information on engineering related topics including down loading the contents.

ELECTRICAL WORKSHOP

Subject Title	:	**Electrical Workshop**
Subject Code	:	**EE-111**
Periods/Week	:	**03**
Periods/year	:	**90**

OBJECTIVES

Upon completion of the practice the student - will be able to

1.0.   WIRING TOOLS AND ACESSORIES

1.1 Study the following electrical wiring tools:
1. Screw drivers
2. Pliers
3. Drilling machines
4. Rawl plug jumper, and poker
5. Voltage/line tester
6. Splicers (insulation remover)
7. Standard Wire gauge

1.2 Study different types of Electrical Wiring accessories
1. Switches
2. Ceiling roses
3. Lamp holders and adopters
4. Sockets
5. Plug
6. Fuses

1.3 Study different types of main switches (DP mains, ICDP, ICTP)
1.4 Study of MCB's
1.5 Study different types of wires and cables (1/18,3/20,7/20, H, SL,, HSL)

2.0.   ELECTRICAL WIRING JOINTS

2.1   Perform straight joint and solder
2.2   Perform T joint and solder
2.3   Perform Western union joint and solder
2.4   Perform Married joint and solder
2.5   Perform pigtail joint and solder

3.0.   SIMPLE LAMP CIRCUITS

3.1   One lamp controlled by one switch with PVC surface conduit system
3.2   Stair case wiring
3.3   Two lamps controlled by two switches with PVC surface conduit system
3.4   One lamp controlled by one switch and provision of 2/3-pin socket.
3.5 Prepare extension board with series lamp test, indicator, fuse and 2/3 pin socket.

4.0. SOLDERING PRACTICE

4.1 Familiarisation and use of various soldering tools and components

4.2 Solder simple electronic circuits with discrete components and IC's

4.3 Use instant soldering gun

4.4 Use solder squeezer on electronic PCB's

5.0 FIRST AID

5.1 Know the procedures of First aid for shock treatment to an electrocuted person

5.2 Understand electrical fire extinguisher

5.3 DemonstrateTypes of fire extinguishers.

6.0 EARTHING

6.1 Perform pipe earthing

6.2 Perform plate earthing

Reference Book :

   Electrical work shop By R.P.Singh

III SEMESTER

ENGLISH – II
(Common Subject)

Subject title : **English -II**
Subject code : **EE-301**
Periods per week : **03**
Periods / Semester : **45**

TIME SCHEDULE

S.No.	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type

ENGINEERING MATHEMATICS – II
(Common to AEI/C/M/EE/EC/MIN/PKG)

Subject title   **: Engineering Mathematics -II**
Subject code   **: EE-302**
Periods per week   **: 04**
Periods / Semester **: 60**

TIME SCHEDULE

S.No.	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type
1	**Unit –I** Integration Methods of Integration	18	35	5	2
2	**Unit-II** Definite Integrals and Applications	14	26	2	2
3	Numerical Integration	03	05	-	½
4	**Unit-III** Differential Equations	25	44	3	$3\frac{1}{2}$
	Total	**60**	**110**	**10**	**8**

Objectives:
On completion of the study of the subject the student should be able to comprehend the following

Unit-I

Methods of Integration:

1.0 Understand the concept of Indefinite integral:

1.1 Explain that $\dfrac{d}{dx}\big(f(x)\big) = F(x) \Rightarrow \int F(x)dx = f(x) + c$,where c is arbitrary constant.

1.2. State the indefinite integral of standard functions and properties of Integrals with examples.

1.3. Integrate simple functions using the rule for $\int (u + v)\, dx$ and $\int ku\, dx$ where k is constant and u, v are functions of $x.$

1.4. Evaluate arbitrary constant and determine particular integrals in problems of the following type:

  a. Find the equation of the curve passing through (1, 1) and whose slope at any point (x , y) is $2x^2 + 1/\sqrt{x}.$

  ii) If the velocity at time $'t'$ is given by
    $V = \sqrt{t} + 3$ find the displacement "S" at time $t = k$ given that
    S = 0 when t = 0.

1.5. Explain various methods of integration with examples.

1.6. Integrate simple functions by decomposition of the integrand

1.7 Integrate simple functions of the following type by substitution.

  i) $\int f(ax + b)\, dx$ where $f(x)\, dx$ is in standard form.
  ii) $\int [f(x)]^n\ f'(x)\, dx$
  iii) $\int f'(x)/[f(x)]\, dx$
  iv) $\int f\{g(x)\}\ g'(x)\, dx$

1.8. Explain finding the Integrals of *tan x, cot x, sec x* and *cosec x* using the above

1.9. Evaluate the integrals of the form $\int Sin^m \theta \; Cos^n \theta. \, d\theta$ where m and n are positive integers.

1.10. Evaluate Integrals of powers of *tan x* and *sec x.*

1.11. Evaluate the integrals of the form $\int e^x [f(x) + f'(x)] \, dx.$

1.12 Evaluate the Standard Integrals of the functions of the type

$$i) \frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2}$$

$$ii) \frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}}$$

$$iii) \sqrt{x^2 - a^2}, \sqrt{x^2 + a^2}, \sqrt{a^2 - x^2}$$

1.13. Evaluate the Integrals of the

type $\int \frac{1}{a \pm bSin\theta} d\theta, \int \frac{1}{a \pm b\cos\theta} d\theta$ and $\int \frac{1}{a\cos\theta \pm b\sin\theta \pm c} d\theta$.

1.14. Evaluate integrals using integration by parts with examples State the Bernoulli's rule for evaluating the integrals of the form $\int u.vdx$.

Unit-II
2.0 Definite Integrals and its applications
2.1 Understand the concept of definite integrals and define the definite integral over an interval.
2.2 State various properties of definite integrals.
2.3 Evaluate some problems on definite integrals using the above properties.
2.4. Identify a definite integral as a limit of sum by considering an area.
2.5. State the fundamental theorem of integral calculus.
2.6. Find the areas under plane curves and area enclosed between two curves using integration.
2.7 Obtain the volumes of solids of revolution.
2.8. Obtain the mean value and root mean square value of the functions in any given interval.

3. 0 Numerical Integration
3.1 Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of Integrals and provide some examples.
Unit –III
4.0 Differential Equations
4.1. Definition of a Differential equation – order, degree and solution of a differential equation – formation of differential equations - solutions of ordinary differential equations of the first order and first degree of the type:
    i.   Variables Separable.
    ii   Homogeneous Equations.
    iii.   Exact Differential Equations
    iv.   Linear differential equation of the form dy/dx + Py = Q, where P and Q are functions of x or constants.
    v.   Bernoulli's Equation (Reducible to linear form.)
4.2 Solution of second order differential equation of the type f(D)y=0

4.3 Solution of nth order differential equation of the type *f(D) y = X* where *f(D)* is a polynomial of nth order and *X* is a function of the form *k, e^{ax} , Sinax, Cosax, x^n* .

COURSE CONTENTS
Unit-I
1. Methods of Integration.
1. Integration regarded as reverse of differentiation – Indefinite integral and constant of integration – standard forms.   Integration by decomposition of the integrand into simple rational, algebric functions-Integration by substitution or change of variable. Integrals of the form $\sin^m\theta . \cos^n\theta$. where m and n are positive integers. Integrals of tan x, cot x, sec x, cosec x and powers of tan x, sec x by substitution.

Integrals of:

$$i) \frac{1}{a^2+x^2} , \frac{1}{a^2-x^2} , \frac{1}{x^2-a^2}$$

$$ii) \frac{1}{\sqrt{a^2+x^2}} , \frac{1}{\sqrt{a^2-x^2}} , \frac{1}{\sqrt{x^2-a^2}}$$

$$iii) \sqrt{x^2-a^2} , \sqrt{x^2+a^2} , \sqrt{a^2-x^2}$$

Integration by parts including Bernoulli's rule.

Unit-II
2. Definite Integral and its applications:
Definite integral – Properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum. Area under plane curves – Area enclosed between two curves. Volumes of solids of revolution. Mean value and RMS value of a function in a given interval.

3. Numerical Integration:
Trapezoidal rule, Simpson's 1/3 rules for approximation of Integrals.

Unit -III
4. Differential Equations:
Definition of a differential equation-order and degree of a differential equation- formation of differential equations-solution of differential equation of the type first order, first degree, variable-separable, homogeneous, exact, linear differential equation of the form dy/dx + Py = Q, Bernoullis equation, nth order linear differential equation with constant coefficients both homogeneous and non homogeneous and finding the Particular Integrals for the functions *k, e^{ax} ,Sinax,Cosax , x^n.*

Reference books:
1 Text book of Engineering Mathematics –II by G.Srinagesh, and others – FALCON publishers
2 Text book of Engineering Mathematics –II by Dr.J.Sairam and others – UNI-TECH SERIES.
3 A Text book of intermediate Mathematics –I & II by Telugu Academy.
4 Integral Calculus by Manicavachagom Pillai
5 Text book of Engineering Mathematics –II by Radiant publishers.

ELECTRICAL CIRCUITS

Subject Title	:	ELECTRICAL CIRCUITS
Subject code	:	EE-303
Periods/Week	:	05
Periods/semester	:	75

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short Questions	Essay Questions
1.	D.C Circuits	23	31	02	2 ½
2.	Fundamental of A.C.	15	19	03	01
3.	Single phase A.C. circuits	27	44	03	3 ½
4.	Poly phase circuits	10	16	02	01
	Total	75	110	10	08

OBJECTIVES

On the completion of the course the student should be able to comprehend following

1.0 **Understand Kirchoff's laws and star delta Transformations and Network Theorems.**

1.1   Differentiate between active and passive circuits.
1.2   Explain junction, branch and loop in circuits
1.3   State Kirchoff's current law and voltage law and solve simple problems.
1.4   Explain star and delta circuits
1.5   Explain the concept of circuit transformation and   equivalent circuits
1.6   Develop transformation formulae for star- delta transformations
1.7   Solve problems on star and delta transformations.
1.8   Explain ideal voltage source & ideal current source
1.9   Convert ideal voltage source to ideal current source and vice versa
1.10   State super position theorem and solve simple problems
1.11   State Thevenin's theorem and solve simple problems.
1.12   State Norton's theorem and solve simple problems
1.13   State maximum power transfer theorem and solve simple problems.
       (All the theorems with reference to D.C only)

2.0   Comprehend the relationship between quantities connected with Alternating current

2.1   Define the terms pertaining to alternating quantities
2.2   Explain simple loop generator concept
2.3   State the relation between poles, speed and frequency
2.4   State the instantaneous value ,maximum value, frequency ,

Time period, Average value, R.M.S value, form factor and peak factor.
2.5   Calculate the Average value, R.M.S value, form factor for half wave and
        Full wave rectified sine wave forms
2.6   Explain the term phase and phase difference
2.7   Using `J' operator perform vector addition, subtraction, multiplication and
        Division
2.8   Convert polar quantities to rectangular quantities and vice-versa

3.0   Comprehend the single phase A.C. circuits
3.1   Define the terms resistance, inductance and capacitance
3.2   Derive relationship between voltage and current in pure resistive,
        Inductive and capacitive circuits
3.3   Calculate the impedance, current; phase angle, power and power factor in
        R-L, R-C, & R-L-C. series circuits.
3.4   Solve Problems on Series Circuits
3.5   Solve Problems on parallel circuits by
                a) Vector method and
                b) Admittance method
3.6   Define resonance in series and parallel electric circuits
3.7.   Know difference between `series resonance' and `parallel resonance'
3.8.   Calculate the resonance frequency for series resonant circuit
3.9.   Define `Q' factor and state the importance of Q factor

4.0   **Poly Phase Circuits**
4.1   Define the term `Poly Phase'
4.2   Explain the methods of generation of 2 phase and 3 phase voltages and
        Currents express them by equation and phasor diagrams
4.3   State the relationship between
                a).2 phase voltages and currents by equation and phasor diagrams
                b).3 phase voltages and currents by equation and phasor diagrams
4.4   Derive the relation between line and phase values of current and voltage
        in 3 phase star and delta circuits
4.5   Derive the equation for power in 3 phase circuit
4.6   Solve numerical problems for 3 phase balanced loads
4.7   State the advantages of 3 phase system over single phase system

COURSE CONTENTS

1.   Kirchoff's Laws - Star - Delta Transformation - Network Theorems.
Active and Passive circuits - Junction, branch and loop in circuits , Kirchoff's laws - Star -
Delta configurations, Concept of transformation - Ideal Voltage , Ideal current source &
Conversion - Superposition theorem, Thevenin's Theorem -Norton's Theorem, Maximum
power transfer theorem with reference to D.C.-Problems on the above.

2. Fundamentals of A.C
Simple loop Generator - Relation between poles, speed and frequency, Sinusoidal emf
equation - derivation - other wave forms, Definition of Alternating quantity, cycle, period,
frequency, amplitude, instantaneous value and angular velocity **-** Average value - effective
value/R.M.S value definitions and derivations - calculations of these values for half wave

rectified sine wave, full wave rectified sine wave - forms-form factor- peak factor **-** Representation of alternating quantities by equation, graphs and phasor diagrams **-** Phase and phase difference **-** Applications of `J' notation for alternating quantities - addition, subtraction, multiplication and division applied to alternating quantities **-** Polar form of representation of alternating quantities ,transformation from polar to rectangle notations and Vice-versa.

3. Single phase A.C. Circuits

Resistance, inductance and capacitance as circuit elements - concept of reactance, Purely resistive, purely inductive and purely capacitive circuits - Derivation of voltage , current, power relations including phase relationships, wave forms and phasor diagrams **-** R-L, R-C , R-L-C series circuits - Derivation of relation between voltage, current, impedance, power including wave forms and phasor diagrams. Impedance triangle, phase angle, power factor, active and reactive components of current and power in above circuits -Effective resistance of iron cored choke coil -Problems on series circuits **-** Parallel circuits - solution by vector method, admittance method- problems **-** Resonant circuit - Definition of resonance – Series and parallel resonant circuit - Resonant frequency - problems on series resonant circuits - Voltage and current magnification, `Q' factor of coil - applications.

4. Poly phase circuits

Definition of Poly phase - Generation of 2 phase and 3 phase EMF's - Location of coils for obtaining required phase difference - Representation of 2 phase,3 phase EMF's by equations, graphs and phasors - phase sequence **-** Current in neutral in 2 phase and 3 phase system - Method of connection – star and delta - phasor diagram showing relation between phase and line quantities, Relation between phase and Line values of voltages and currents -power equation - Problems on 3 phase balanced circuits – advantages of poly-phase systems over single-phase systems.

REFERENCE BOOKS

1. Electrical Technology - Vol - I by B.L. Theraja
2. Introduction to Electrical Engg. By V.K.Mehtha
3. Electrical Technology by Hughes.
4. Problems in Electrical Engg. By Parker Smith
5. Network Theory by CL Wadhwa
6. Circuit Theory by AK Chakraburthy

D.C. MACHINES & BATTERIES

Subject Title : **D.C. Machines & Batteries**
Subject Code : **EE - 304**
Periods/Week : **05**
Periods/Semester : **75**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short Questions	Essay Questions
1.	Fundamentals of D.C Generators	14	21	02	01 ½
2.	Armature Reaction and Characteristics and applications of D.C Generator s.	16	26	02	02
3.	Fundamentals of D.C Motors	12	16	02	01
4.	Speed Control and Starters for D.C Motors	10	16	02	01
5.	Testing of D.C Motors	08	10	----	01
6.	Batteries	15	21	02	01 ½
	TOTAL	**75**	**110**	**10**	**08**

OBJECTIVES
On completion of the study of the subject the student should be able to comprehend the following

1.0 Fundamentals of D.C Generators
1.1 State the method of dynamically induced E.M.F.
1.2 Fleming's right hand rule.
1.3 Electromechanical energy conversion.
1.4 Explain the working of simple loop generator.
1.5 Principle of working of D.C generator.
1.6 State the functions of each part of D.C generator with neat sketches.
1.7 Explain the working of D.C Generator.
1.8 Types of windings --- (i) Lap (ii) Wave.
1.9 Classification of generators based on excitation.
1.10 Derive the E.M.F equation of D.C generator.
1.11 Voltage and Current equations for different types of D.C Generators.
1.12 State the losses incurred in the D.C machines.
1.13 Explain power stages in D.C. machine
1.14 Problems on the above.

2.0 Armature Reaction and Characteristics of D.C Generators.
2.1 State and explain the Armature reaction with sketches.
2.2 Explain the phenomenon of Demagnetization & Cross magnetization.

2.3   Derive the formula for AT_d , AT_c / Pole.
2.4   Solve the simple problems on AT_d , AT_c / Pole
2.5   State and explain Commutation.
2.6   State the methods of improving commutation and explain inetrpole method.
2.7   O.C.C, internal and external characteristics of
   (i) Separately excited   (ii) Shunt
   (iii) Series   (iv) Compound generators.
2.8   State the conditions for (i) Building up (ii) Non building up of E.M.F.
2.9   Calculation of Critical field resistance and critical speed from O.C.C
2.10 Explain the necessity of parallel operation.
2.11 Conditions for parallel operation of generators. (No- Problems)
2.12 Use of Equalizer ring in parallel Operation.
2.13 Applications of D.C generators.
2.14 Explain the working of welding Generator.

3.0   Fundamentals of D.C Motors

3.1   State and explain Fleming's left hand rule.
3.2   Explain the working of D.C motors and classify them.
3.3   Explain the significance of back E.M.F and its formula.
3.4   Write the formulas for back E.M.F for different D.C motors.
3.5   Problems on E.M.F equation.
3.6   Torque equation of D.C motor.
3.7   Develop the formulas for armature torque (T_a) , shaft torque (T_{sh}) and loss torque.
3.8   State the different losses in D.C motors and explain power stages in D.C. motor.
3.9   Problems on the above.
3.10 Explain and plot the electrical and mechanical characteristics of D.C Shunt, Series and compound motors.
3.11 Applications of D.C motors.

4.0 Speed Control and Starters for D.C Motors

4.1   Explain the necessity of speed control of DC Motors.
4.2   Explain the different methods (Flux, Armature and Voltage) of speed controls for D.C shunt motors.
4.3   State the advantages and disadvantages of above methods.
4.4   Explain the different methods of speed control for series motors
4.5   Explain the necessity of starter.
4.6   Explain 3-point starter with neat sketch.
4.7   Explain 4-point starter with neat sketch.
4.8   Drum controlled starter for Series Motor.

5.0   Characteristics and Testing of D.C Motors

5.1   State and explain the different performance curves.
5.2   Explain the method of conducting brake test on different types of D.C motors.
5.3   Explain the method of conducting Swinburne's test.
5.4   Explain the method of conducting Hopkinson's test.

6.0   Understand Batteries

6.1   Classification of Primary and Secondary cells.
6.2   Explain storage cells.
6.3   Name types of storage cells as lead acid, Nickel iron and Nickel cadmium
6.4   Write chemical reaction during charging and discharging of each.
6.5   Explain theory of lead acid cell
6.6   Select suitable materials for separators and containers.
6.7   Explain the effect of temperature on specific gravity of electrolyte.
6.8   State variations in specific gravity during charging And discharging
6.9   Explain the effect of Specific gravity on EMF
6.10   Explain construction of Nickel - iron cells
6.11   State chemical reactions during charging & discharging.
6.12   State applications of
a) Lead acid cell   b) Nickel iron cell   c) Nickel cadmium cell
6.13   Comparision of
a). Primary (Vs) Secondary Cell
b). Lead-Acid (Vs)Nickel-Iron / Nickel –cadmium Cell

6.14   Explain charging of batteries by
a). Constant Current method   b). Constant Voltage method
6.15   State precautions during charging & discharging
6.16   Explain trickle charging
6.17   Explain indications of full charging
6.18   State capacity of a battery and factors affecting it Viz:
a). Temperature b). Rate of discharge c).Density of electrolyte
6.19   State efficiency of a battery:
a). Ampere - Hour Efficiency   b) . Watt - Hour Efficiency
6.20   Solve problems on the above
6.21   Define maintenance free battery
6.22   Differentiate between maintenance free batteries and lead-acid batteries
6.23   Explain the construction and action of maintenance free batteries
6.24   State the applications of maintenance free batteries

COURSE CONTENTS

1. Fundamentals of D.C Generators

Dynamically induced   E.M.F- Flemming's right hand rule - electromechanical energy conversion - simple loop generator - principle of D.C generator- functions of each part of D.C generator with neat sketches- windings - (i) Lap   (ii) Wave -Classification of

generators based on excitation- E.M.F equation - losses incurred in the D.C machines - Voltage and Current equations for different types of D.C Generators- simple problems.

2. Amature Reaction and Characteristics of D.C Gen.

Armature reaction, Demagnetization & Cross magnetization-Derive for AT_d, AT_c / Pole.,- simple problems –Commutation - methods of improving commutation – Method of improving Commutation by Interpole method - O.C.C, internal, external characteristics of Separately excited, Shunt, Series and Compound generators- Conditions for (i) Building up (ii) Non building up of E.M.F.- Critical field resistance and critical speed from O.C.C - parallel operation of generators - Applications of D.C generators – Welding Generator.

3. Fundamentals of D.C Motors

Fleming's left hand rule - working of D.C motors – classification - significance of back E.M.F. Write the formulas for back E.M.F for different D.C motors-Problems on E.M.F equation - Torque equation - Armature torque (T_a) , shaft torque (T_{sh}) and loss torque - Different losses - electrical and mechanical characteristics of D.C Shunt, Series and compound motors. Applications of D.C motors.

4. Speed Control and Starters for D.C Motors

 Necessity of speed control- different methods (Flux, Armature and Voltage) of speed controls for D.C shunt motors-State the advantages and disadvantages of above methods- different methods of speed control for series motors- problems -necessity of starter- 3-point starter, 4-point starter, Drum Controlled starter.

5. Testing of D.C Motors

  Performance curves- brake test on different types of D.C . Motors - Swinburne's Test - Hopkinson's test .

6. Batteries

      Classification of Primary cell and secondary cells-Lead acid, Nickel iron and Nickel - cadmium-Chemical reaction during charging and discharging - Materials used for Separators, containers and Electrolyte in batteries – Effect of temperature on Specific gravity of electrolyte – Effect of specific gravity on EMF – Construction of Nickel Iron Cell and its chemical reactions – applications and Comparisions of Lead-Acid cell, Nickel –Iron and Nickel–Cadmium cell and comparision between them -Charging of Batteries: Constant current method and constant voltage method-Trickle charging - Capacity of Battery - Effects of temperature, rate of discharge and density of electrolyte - Ampere-hour efficiency and watt-hour efficiency- problems - Maintenance free batteries and its applications.

REFERENCE BOOKS
1. Electrical Technology - Vol - I by B.L. Theraja
2. Electrical Technology - Vol – II by B.L. Theraja
3. Electrical machines   by P.S. Bhimbhra
4. Electrical Machines by M.V.Deshpande
5. Electrical Machines by JB Gupta

ELECTRICAL & ELECTRONIC MEASURING INSTRUMENTS

Subject Title : **Electrical & Electronic Measuring Instruments.**
Subject Code : **EE - 305**
Periods/Week : **04**
Periods/ Semester : **60**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Basics of Measuring Instruments	10	11	02	½
2.	Electrical Measuring Instruments	25	49	03	04
3.	Measurement of Resistance	07	13	01	01
4.	Transducers and Sensors	08	13	01	01
5.	Electronic & Digital Instruments	10	24	03	1 ½
	TOTAL	**60**	**110**	**10**	**08**

OBJECTIVES
On the completion of the course the student will be able to comprehend the following

1.0 Know the classification of different measuring instruments.
   1.1 Distinguish between absolute and secondary instruments.
   1.2 Differentiate among indicating, integrating and recording instruments.
   1.3 State the different types of Measuring Instruments according to Principle of Working.
   1.4 State the purpose and methods of obtaining deflecting, controlling and damping torques in indicating instruments.
   1.5 State the methods of supporting moving system.
   1.6 Describe the pointers and scales used in measuring instruments.

2.0 Understand the construction and working of different electrical measuring instruments.
   2.1 Describe the construction and working of Permanent Magnet Moving Coil Instrument (Voltmeter/Ammeter) .
   2.2 State the applications of M.C Instruments.
   2.3 State the advantages and disadvantages of M.C Instruments.
   2.4 List the errors commonly occurring in moving coil instruments and state their remedies.
   2.5 Describe the construction and working of Moving Iron (Voltmeter / Ammeter) Attraction type & Repulsion type meters.
   2.6 List the errors commonly occurring in M.I. Instruments.

2.7   State the accuracy and standard of the above meters

2.8   Compare M.C. and M.I. instruments.

2.9   Describe the methods of extending the range of ammeters and voltmeters with the help of shunts and multipliers.

2.10   Solve the problems on Shunts and Multipliers.

2.11   Describe the principles, construction and working of a dynamometer type ammeter, Voltmeter and wattmeter.

2.12   List the advantages and disadvantages of dynamometer instruments.

2.13   List the common errors in the Dynamometer Instruments.

2.14   With the circuit diagram explain the method of measuring power with wattmeter in Single - Phase circuit.

2.15   Measurement of 3-Phase Power using 2-Wattmeters and solve problems on balanced circuits.

2.16   Explain the principle, construction and working of a 1-phase induction type Energy meter.

2.17   State Meter Constant and common error adjustments for 1- phase energy meter.

2.18   Describe the construction and connection of a 3-phase energy meter.

2.19   Explain the construction and working of Merz price M.D. Indicator.

2.20   Explain the construction and working of
       (a). Single-phase dynamometer type P.F. meter.
       (b). Weston (M.I) frequency meter.
       (c). Weston synchroscope.
       (d). Trivector meter

3.0   Understand the method of measurement of resistance.

3.1   Classify the resistance into Low-Medium and High Values.

3.2   Explain the construction and working of Megger.

3.3   Explain the method of using megger for the measurement of insulation resistance

3.4   Explain the use of Megger for the measurement of earth resistance.

3.5   Explain the principle and Construction of Potentiometer and List its applications.

4.0   Transducers and Sensors

4.1   Classification of Transducers-factors influencing their choice.

4.2   Basic concept of Transducers and its applications

4.3   Thermocouples, Thermister.

4.4   Basic concept of Sensors and its applications.

4.5   Semiconductor sensors.

5.0   Electronic & Digital Instruments

5.1   Explain the working of Rectifier type voltmeter and ammeter .

5.2   List the advantages of Digital Instruments Over Analog Instruments.

5.3   Explain the Working of ramp type Digital Voltmeter and mention its specifications.

5.4   Explain the Working of Digital Multimeter and mention its specifications.

5.5   Explain the Working of Single Phase Digital Energy meter with block diagram.

5.6 Explain the Working of Three Phase Digital Energy meter with block diagram.

COURSE CONTENTS

1. Basic Measuring instruments:
Classification of instruments - Distinguish between absolute and secondary instruments- State and explain different types of torques (Deflection , Damping and Controlling torques) in the indicating instruments – Description of Pointers ,Scales and supporting systems.

2. Electrical Measuring Instruments: M.C. and M.I types of Ammeters and Voltmeters -
Construction and principle, errors, comparison, shunts and multipliers - their application, problems thereon - Dynamometer type Ammeter, Voltmeter and Wattmeter - construction, principle, errors- Measurement of three –phase power using 2-wattmeters and solve problems to find the power & power factor for balanced loads only- Measurement of energy – Induction type energy meter, configuration, principle of operation, error and adjustments - calibration with R.S.S. meter - M.D. indicator- Merz prize indicator - special meters-single phase P.F. meter- frequency meter- Weston Synchroscope –Trivector meter.

3. Measurement of resistance:
Classification of resistances, Explain the construction and working of ohmmeter, megger – Explain the method of measuring the Insulation resistance and earth resistance using Megger - Explain the construction and working principle of Potentiometer.

4. Transducers and Sensors:
Classsification of Transducers - Factor influencing while its selection -
Applications of Transducers – Thermister – Thermocouple - Strain Gauges- Basic Concepts of Sensors and its applications – Semiconductor sensors .

5. Electronic & Digital Instruments :
Working of Rectifier type Voltmeter and Ammeter – distinguish between analog and electronic instruments - working of ramp type digital voltmeter , digital multimeter and its specifications, working of single phase & three phase digital energy meters .

References:

1. Electrical and Electronic measuring instruments – by A. K.SAWHNEY.
2. Electrical Measurements – by E.W. Golding.
3. Electrical Technology -- by B. L. Theraja.
4. Modern Electronic Equipment – by Khandpur
5. Electrical and Electronic measuring instruments – by J.B. Gupta.
6. Electrical and Electronic measuring instruments – by A. Siva Sankar

ELECTRONICS ENGG

Subject Title : **Electronics Engg**
Subject code : **EE-306**
Periods/Week : **06**
Periods/Semester : **90**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Power supplies	15	17½	02½	01
2.	Special devices	15	17½	02½	01
3.	Transistor Biasing	10	13	01	01
4.	Amplifiers	30	36	02	03
5.	Oscillators	10	13	01	01
6.	CRO and Industrial Timers	10	13	01	01
	Total	**90**	**110**	**10**	**08**

OBJECTIVES

On the completion of the course the student should be able to comprehend the following

1.0   Understand the working Principle of Power supply circuits
1.1   Explain the principle of rectifier Power Supply with a Block diagram
1.2   Explain the working principle of half wave rectifier using P.N. junction diodes with waveforms.
1.3   Explain the working principle of full wave rectifier with centre tapped transformer using P.N. junction diodes with waveforms.
1.4   Explain the working principle of bridge rectifier using P.N. junction diodes with waveforms.
1.5   State the need for filter and List the different types of filters.
1.6   Explain the working principle of half wave rectifier using filter circuits
1.7   Explain the working principle of full wave rectifier with centre tapped transformer using filter circuits.
1.8   Explain the working principle of bridge rectifier using filter circuits
1.9   Explain the operation of Zener diode voltage regulator.
1.10   Explain the operation of adjustable voltage regulator (LM317).

2.0   Understand the Performance of Special Devices
2.1   Explain the construction, working principle and applications of JFET
2.2   Explain the construction, working principle and applications of MOSFETS
2.3   Explain the construction, working principle and applications of UJT
2.4   Explain the construction, working principle and applications of LED
2.5   Explain the construction, working principle and applications of LCD
2.6   Explain the construction, working principle and applications of Photo Diode

2.7   Explain the construction, working principle and applications of Photo Transistor
2.8   Explain the construction, working principle and applications of Solar Cell
2.9   Explain the construction, working principle and applications of Opto Coupler

3.0   Understand the Transistor Biasing .
3.1   Explain the operation of transistor as an amplifier.
3.2   Explain the concept of DC load line.
3.3   Determine the Q point (operating point) on the DC load line.
3.4   State the necessity of proper biasing for a transistor amplifier.
3.5   List the causes for instability of biasing in a transistor amplifier.
3.6   Explain the need for stabilization and define the stability factor
3.7   Explain collector to base biasing method.
3.8   Explain potential divider biasing method.

4.0   **Understand the Working Principle of Amplifiers.**
4.1   Classify amplifiers on the basis of frequency, function, type of load, period of
        Conduction and Number of stages.
4.2   Draw the practical transistor CE amplifier and explain the function of each
        component (such as $C_{in}, C_C, C_e, R_1, R_2$ and R_e)
4.3   Need for Multistage amplifier (Cascading of amplifiers).
4.4   Define the terms gain, decibel gain, frequency response and bandwidth of an
        amplifier.
4.5   Explain the principle of operation of two-stage RC coupled amplifier with circuit
        diagram.
4.6   Draw and explain the frequency response of RC coupled amplifier.
4.7   Explain the principle of operation of two-stage transformer coupled amplifier with
        circuit diagram.
4.8   Draw and explain the frequency response of transformer-coupled amplifier.
4.9   Explain the principle of operation of direct coupled amplifier with circuit diagram.
4.10   Compare different types of coupling.
4.11   List applications of RC coupled, Transformer coupled and direct coupled amplifiers.
4.12   Distinguish between voltage and power amplifier
4.13   Explain the working principle of Class-A power amplifier
4.14   Explain the working principle of complementary push-pull power amplifier.
4.15   Define efficiency of power amplifier.
4.16   Explain the effect of feed back on gain, band width, distortion, noise.
4.17   Define feed back factor and draw the Circuit Diagrams of different types of feed
         back amplifiers
4.18   Draw the circuit and explain the operation of Differential Amplifier.
4.19   List the characteristics of an Ideal Operational Amplifier.
4.20   Explain the Operational Amplifier as summer, integrator, differentiator, scale
         changer and inverter.

5.0   **Understand the principles of Oscillators.**
5.1   Establish the conditions for sustained oscillations using Barkhausans criteria.
5.2   Classify different types of oscillators
5.3   Explain the working principle of RC phase shift Oscillator
5.4   Explain the working principle of Tuned Collector Oscillator
5.5   Explain the working principle of Hartley Oscillator

5.6   Explain the working principle of Colpitts Oscillator
5.7   Explain the working principle of Crystal Oscillator
5.8   Explain UJT relaxation oscillator
5.9   Mention the different applications of oscillators

6.0   Cathode Ray Oscilloscope and Industrial Timers
6.1   Explain the block diagram of a simple CRO
6.2   Sketch the CRT and indicate different parts.
6.3   Describe the functions of different parts of C.R.T.
6.4   List the applications of C.R.O.
6.5   Explain the Principle of Dual Trace CRO
6.6   Explain the working principle of function generator
6.7   State the need for an industrial timer.
6.8   Draw and explain the internal block diagram of IC 555
6.9   Draw the circuit of simple timer using IC 555

COURSE CONTENTS

1.   Power supplies
    Half wave, Full wave and Bridge rectifiers - Types of Filters - Zener Voltage Regulator- IC Voltage Regulator,

2.   Special Devices
    JFET, MOSFET, UJT, LED, LCD, Photo diode, Photo transistor, Solar cell, Opto coupler, - characteristics and their applications.

3.   Transistor Biasing
    Transistor as an Amplifier - Biasing and stabilization technique-Operating point and Load line Characteristics.

4.   Amplifiers
    Classification of Amplifiers, Coupling methods, Frequency Response of R.C

    coupled,transformer coupled and Direct coupled Amplifiers and their applications.

    Power amplifier- Class A - Complementary push-pull Amplifiers- Feed back amplifier - Differential amplifier- Operational amplifier - specifications –applications as summer, integrator, differentiator, scale changer and inverter.

5.   Oscillators
    Principle of oscillator –operation of RC phase shift, Tuned Collector,Hartley, Colpitts, Crystal and Relaxation oscillators- Applications.

6.   Cathode ray oscilloscope and Industrial Timers
    Block diagram of simple CRO- Study of different stages - Constructional features of cathode ray tube - Application of CRO –Dual trace CRO - Function generator- Timer 555.

Reference Books

1. Principles of Electronics   by V.K. Mehtha, S CHAND.
2. Basic Electronics and Linear circuits   by Bhargava,TMH Publishers.
3. Electronic Principle   by Malvino
4. Electronic devices and circuits   by Mathur,Chada & Kulakshetra
5. Industrial Electronics   by G.K. Mithal
6. Applied electronics   by G.K.Mithal
7. Electronic Instruments   by David Kooper

D.C. MACHINES LAB

Subject Title : **D.C. Machines Lab**
Subject Code : **EE- 307**
Periods/week : **03**
Periods/Semester : **45**

OBJECTIVES

On completion of the practical course the student should be able to

1.0   Identifying   the D.C. Machine terminals with the use of electrical gadgets.

2.0   Rules to draw the circuit diagram for the given experiment.

3.0   Select the correct type and range of instruments for different tests.

4.0   List the sequence of operation of the experimental work.

5.0   Rules for start and control emf and speed of DC machines (generator & motor).

6.0   Testing of D.C. Motors(Shunt, Series and Compound Motors)

7.0   Represent the experimental data in tabular and graphical form .

8.0   Use the principles and concepts to analyse the experimental tests and its performance results .

9.0   Practice safety precautions while operating electrical machines

LIST OF EXPERIMENTS

1.   Identify the terminals of the following D.C. Machines.

   a). D.C. Shunt motor.   b). D.C. Series Motor.

2. Identify the terminals of a D.C. Compound motor.

3. Study   the parts of D. C. 3 - Point Starter, 4 - Point Starter and Drum controlled Starter.

4. Obtain O.C.C of a DC Shunt Generator at different speeds .

5.   Obtain Internal & external characteristics of D.C. Shunt Generator

6.   Obtain Internal & external characteristics of D.C. Series Generator

7.   Obtain Internal & external characteristics of D.C. Compound Generator

8.   Overhauling of a D.C. Machine.

9. Obtain performance characteristics by conducting brake test on DC shunt motor

10. Obtain performance characteristics by conducting load test on DC series motor

11. Obtain performance characteristics by conducting load test on DC compound motor

12. Speed control of DC shunt motor by
   a) Rheostatic control   b). Field control

13. Obtain the performance of a D.C. Shunt Motor by Conducting Swinburne's test .

ELECTRICAL MEASUREMENTS LAB

SUBJECT TITLE	:	**ELECTRICAL MEASUREMENTS LAB.**
SUBJECT CODE	:	**EE - 308**
PERIODS/WEEK	:	**03**
PERIODS/SEMESTER	:	**45**

0n the completion of the course the student will be able to do:

1. Familiarization of measuring Instruments.

2. Measurement of Low and Medium resistance by volt-ampere method.

3. Measurement of Insulation resistance of an installation using megger and earth resistance of earthing electrode using Ohmmeter.

4. Calibration of dynamometer type wattmeter by direct loading test.

5. Measurement of Power in R-L Circuit by

    a). 3-Volt meter method   b). 3-Ammeter method.

6. Calibration of Single Phase Energy meter by Direct loading test.

7. Measurement of Single Phase electrical energy using Energy meter.

8. Measurement of three-phase power and power factor by 2-Wattmeter method.

9. Measurement of Inductance and power factor of an Inductive coil.

10. Measurement of Idle and Energy component in Single phase circuit using CT's & PT's

11. Verification of Superposition Theorem

12. Verification of Thevenin's Theorem

Name of the Experiments :

1. Study of Measuring Instruments (Ammeter, Voltmeter ,Wattmeter , Power factor and Energy Meter).

2. Measure the Low and Medium resistance by volt-ampere method.

3. Measurement of Insulation resistance of an installation using megger and earth resistance of earthing electrode using Ohmmeter.

4. Calibrate the given dynamometer type wattmeter by direct loading test.

5. Measure the Power in R-L Circuit by

    a). 3-Volt meter method   b). 3-Ammeter method.

6. Calibrate the given Single Phase Energy meter by direct loading test.

7. Measurement of Single Phase Electrical Energy using Energy meter.

8. Measure the three-phase power and power factor by 2-Wattmeter method.

9. Measure Inductance and power factor of an Inductive coil.

10. Measurement of Idle and Energy component in Single phase circuit using CT's & PT's

11. Verification of Superposition Theorem

12. Verification of Thevenin's Theorem

Electrical Wiring Laboratory

Subject Title : **Electrical Wiring Laboratory.**
Subject Code : **EE-309**
Periods/week : **03**
Periods/ Semester : **45**

COURSE CONTENTS

The following exercises are to be practiced (C.T Wiring system, Metal, & PVC system)

I. Simple lamp circuits

1. Two lamps controlled by two, two- way switches in series parallel connection
2. Godown wiring scheme
3. Lamp circuit through 3 phase ceiling rose, incorporate Main switch energy mete and fuse cut out
4. Having two lamps connected in such a way that each lamp may be turned `on' and `off' by operating a single switch
5. Make lamp circuit using intermediate switch
6. Control the Electric bell from three locations with lamp indicators.

II. Special Lamp connections:

7. Draw wiring diagram of connection and practice the wiring for mercury vapour lamp
8. Draw wiring diagram of connection and practice the wiring for fluorescent lamp

III. Motor connections.

9. Draw wiring diagram and prepare switch Board with DOL starter, Main Switch, pilot lamps for 3 phase motor.
10. Draw wiring diagram and prepare switch board with star delta starter, Main switch, pilot lamps for 3 phase motor.

IV. Power wiring

11. Wire up 1.5 ton capacity window type A/C equipment wiring system as per layout and test it.
12. Connect the inverter to back up the power supply.
13. Connect and test the given public address system.
14. Install a main switch board with a miniature circuit breaker to install a Computer in house wiring system.
15. Wiring for serial bulb connection.

ELECTRONICS LABORATORY

Subject Title : **ELECTRONICS LABORATORY**
Subject code : **EE-310**
Periods/week : **06**
Periods/Semester : **90**

OBJECTIVES

On completion of the course the student should be able to
1. Perform tests on semi-conductors devices
2. Perform suitable tests on amplifiers and oscillators and obtain the performance characteristics
3. Use of CRO
4. Use timer circuit

LIST OF EXPERIMENTS

i) Study different types of Resistors, Capacitors, with the colour code values, Inductors and Transformers,
ii) Identify the terminals and testing of different Diodes and Transistors

1. Draw the static characteristics of a Semi-conductor diode

2. Draw the static characteristics of a Zener diode

3. Obtain regulation characteristics of a Half wave rectifier using semi-conductor diodes with and without filter circuits

4. Obtain regulation characteristics of a Full wave rectifier (either Centre taped or Bridge type) using semi-conductor diodes with and without filter circuits

5. Draw the input and output characteristics of a transistor in Common Base Configuration.

6. Draw the input and output characteristics of a transistor in Common Emitter Configurations

7. Draw the drain characteristics of FET

8. Plot the volt ampere characteristics of UJT

9. Conduct experiment to obtain frequency response characteristics of Transistorised RC coupled amplifier

10. Determine the optimum load to be used in : Class A power amplifier

11. Perform experiments to determine the frequency range of RC phase shift oscillator

12. Perform experiments to determine the frequency range of Hartley oscillator

13. Measure voltage(DC & AC), frequency, phase using CRO

14. Assemble and test DC operated timer circuit using, IC 555

IV SEMESTER

ENGLISH – III
(Common Subject)

Subject title   : **English -III**
Subject code   : **EE-401**
Periods per week   : **03**
Periods / Semester   : **45**

TIME SCHEDULE

S.No.	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type

A.C MACHINES - I

Subject Title : **A.C. MACHINES - I**
Subject code : **EE-402**
Periods/Week : **05**
Periods/semester : **75**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage	Short Questions	Essay Questions
1.	Single phase Transformers	30	49	03	04
2.	Three phase Transformers	15	19	03	01
3.	Alternators	20	29	03	02
4.	Parallel Operation of Alternators	10	13	01	01
	Total	75	110	10	08

OBJECTIVES
On the completion of the course the student should be able to comprehend the following

1.0 **Understand the working of single phase transformer**
   1.1 Define the word `Transformer'.
   1.2 Explain the working of single-phase transformer
   1.3 Classify the transformers based on number of phases, construction and function.
   1.4 Explain the constructional details of transformers
   1.5 State the purpose of each part with sketch
   1.6 Distinguish between shell type and core type transformers
   1.7 Derive the E.M.F equation of a single power transformer
   1.8 Define 'transformation' ratio.
   1.9 Explain ideal transformer with vector diagram
   1.10 Draw Vector diagram for a transformer working on no load.
   1.11 Calculate the core loss
   1.12 Explain the procedure for finding R_o and X_o from no load test
   1.13 Develop the vector diagram for a transformer on load for
        (a) Unity power factor
        (b) Lagging power factor
        (c) Leading power factor
   1.14 State the effects of leakage reactance of primary and secondary windings
   1.15 Draw the equivalent circuit of a transformer by approximation
   1.16 Determine the equivalent circuit constants from no-load test and short circuit test
   1.17 Derive the approximate voltage drop equation of a regulation for transformer

1.18 Calculate regulation for
         (i) Unity power factor
         (ii) Lagging power factor
         (iii) Leading power factor
1.19 State the losses taking place in a transformer
1.20 State the condition for maximum efficiency
1.21 Solve simple numerical problems
1.22 Calculate the All day efficiency for given load cycle.
1.23 Differentiate between distribution transformer and power transformer
1.24 Explain the sumpner`s test
1.25 State the need for parallel operation of transformer
1.26 Mention the conditions for paralleling and load sharing
1.27 Simple Problems on equal voltage ratio.

2.0 To Understand Three Phase Transformers

2.1 State the advantages of 3 phase transformer over single phase
     transformer
Types of three phase transformer connections and applications of star-
     star,delta-star, star-delta, delta-delta and open delta connected
     transformer
2.3 State the conditions for parallel operation of 3 phase transformer
2.4 List the special transformers
2.5 Explain auto transformer and relation for saving of copper (no derivation)
2.6 State the advantages and disadvantages of autotransformers (and it's
     applications)
2.7 Describe the salient features of the welding transformers and current regulation
     in it.
2.8 Explain the necessity of instrument transformers briefly (C.T. and P.T.) .
2.9 List the precautions in using C.T. s
2.10 Explain the method of extending range of wattmeter in conjunction
     with instrument Transformers
         (a) Single phase circuits
         (b) Three phase circuits
2.11 Explain the `Scott connection' with phasor diagram
2.12 State the necessity of cooling of power transformers
2.13 Explain the methods of cooling
2.14 list the specifications of oil cooling and maintenance schedule
2.15 Explain the `on load' and `off load' tap changing
2.16 State the location and function of Breather, Explosion vent, Conservator, Oil
     level Indicator
2.17 State the maintenance schedule of transformer
2.18 State the BIS (Bureau of Indian Standards) specifications for cooling system.

3.0 Know the classification, construction, working and testing of alternators
3.1 Describe the Principle, Constructional and working of Alternators.
3.2 Classify the alternators based on rotor construction and explain them.
3.3 State the advantage of Stationary Armature.
     Name the parts along with materials used

3.4 State the effect of Chording and Distribution factor and derive expressions.

3.5 Review on lap and wave windings

3.6 Derive EMF equation of an alternator taking into account distribution factor and pitch factor

3.7 Solve simple problems on E.M.F equation

3.8 State the need for an exciter

3.9 list the various types of exciters (main, pilot and static)

3.10 Explain Armature Reaction of Alternator at different P.F's.

3.11 State the reasons for voltage variations on Load.

3.12 Define the term synchronous impedance.

3.13 State the effects of synchronous impedance.

3.14 Draw the vector diagram for different power factors.

3.15 Define regulation of an alternator

3.16 Describe O.C. and S.C tests conducted on alternator

3.17 Calculate the regulation by synchronous impedance method

4.0 Comprehend the procedure for voltage control and synchronisation

4.1 State the necessity for parallel operation of alternators

4.2 State the conditions for synchronisation

4.3 Explain the procedure of synchronisation using lamps and synchro scope

4.4 Explain the method for adjusting the loads shared by two alternators (or one alternator With infinite bus bars

4.5 Simple problems on the above

COURSE CONTENTS

1. Transformers

Classifications of transformers, Construction of transformers, Theory of an ideal transformer - - emf equation derivation - Ratio of transformation and relation between turn ratio - Voltage ratio and current ratio, Transformer on no load - No load current components and no load power factor

Transformer on load - Equivalent circuit of transformer - Equivalent circuit constants by transformation, Short circuits test , Regulation of transformer - definition and derivation of approximate equation for regulation based on vector diagram for lagging ,leading, unity power factor - determination of regulation from S.C. Test data , Losses -core-copper-determination from O.C. and S.C. tests data, efficiency, condition for maximum efficiency - All day efficiency definition - Calculation for a given load cycle- problems, - Sumpener's test - Efficiency calculation, Parallel operation of single phase transformers - necessity - conditions for paralleling-load sharing problems with equal voltage ratios

2. Three phase transformer

Descriptive treatment of star-star ,delta-delta and delta-star, voltage current and phase relation for the above groups-conditions to be fulfilled for paralleling 3 phase transformer, open delta working of 3 phase transformers, Auto-transformers -copper saving – applications, Welding transformer applications – Instrument transformers and its applications-Scott connection for 3 phase to 2 phase and 2 phase to 3 phase conversion - voltage current relations for balance loading, Necessity of cooling - Methods of cooling - Specifications of oil for cooling - ISI code for cooling systems, Accessories - Functions and location of conservator- oil level indicator, breather, explosion vent, - Tap changing gear - no load and on load tap changing procedure, Maintenance schedule followed in NEC/BIS for transformer maintenance

3. Alternator

Classification of low, medium and high speed alternators - Brief description of parts with sketches and function of each part, construction, Assembly - Exciter and pilot exciter – Stationary armature type construction – Advantages, Concentrated and distributed windings - short pitch and full pitch coils - Effect of chording and distribution factors - EMF equation - Derivation – Problems, Cause for variation of voltage on load - Resistance, leakage reactance - Armature reaction - Synchronous reactance and synchronous impedance concepts - phasor diagram for unity, lagging and leading power factor loads, Regulation - definition - derivation of relation between no load voltage and on load voltage for different power factors - Calculation of regulation by synchronous impedance method, O.C and S.C, tests Data – problems.

4. Parallel operation of alternators

Necessity for parallel Operation - condition to be fulfilled for synchronisation. Synchronisation by lamps and synchroscope- Load sharing – simple problems.

REFERENCE BOOKS

1. Electrical Technology - Vol –II by B.L. Theraja
2. AC machines by M.G Say
3. Electrical machines by P.S. Bhimbra
4. Electrical Machines By Imtiaz ashraf

POWER SYSTEMS - I

Subject Title : **POWER SYSTEMS – I**

Subject Code : **EE – 403**
Periods / Week : **06**
Periods / Semester : **90**

TIME SCHEDULE

SI. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Sources of Energy	05	03	01	
2.	Thermal Power Station	10	13	01	1
3.	Hydro Electric Power Station	08	13	01	1
4.	Nuclear & Gas Power Station	12	18	01	1 ½
5.	Combined Operation and Economics	15	21	02	1 ½
6.	Switch gears and Reactors	15	13	01	1
7.	Protective Relays	10	13	01	1
8.	Protection of alternators and Transformers	15	16	02	1
	Total	**90**	**110**	**10**	**08**

OBJECTIVES:
On the completion of the course the student should be able to
1.0   Understand the various sources of power generation.
   1.1   Know the different sources of energy and classify them into conventional and Non-conventional types.
   1.2   State necessity of developing non-conventional methods of power generation.
   1.3   Describe the construction and working of
         (i) Solar Power plant
         (ii) Tidal Power plant
         (iii) Wind Power plant
         (iv) Biomass Power plant
   1.4   Explain the construction and working principle of flat plate solar type collector
   1.5   State the relative merits and limitations of Conventional and Non-Conventional types of sources
   1.6   Appreciate the need of energy conservation and its methods.

2.0   Understand working of thermal power station.
    2.1   Introduction to thermal power station and general principle of working.
    2.2   Explain the requirement and factors for selection of site.
    2.3   Draw the detailed line diagram of a condensing type thermal power station And explain the principle of working of each component of thermal power station.
    2.4   Comprehend the losses of energy and methods to improve the efficiency.
    2.5   Specifically explain the advantages of
           a). Pulverisation and the machine used for it
           b) .Cooling towers and their types.
    2.6   Comprehend the main controls at i) Boilers, ii) Turbines, iii) Condensers, (iv) Alternators.
    2.7   Comprehend the centralized controls and indications at control room.
    2.8   Energy auditing of thermal power station.
    2.9   Understand causes of pollution and methods to   control them.
    2.10   Scheme of maintenance of Alternator, Turbines, and Boiler.

3.0   Understand Hydro Electric power stations.
    3.1   Comprehend the principle of working of Hydro power station.
    3.2   Comprehend the requirements of Hydro power station.
    3.3   Explain limitations in location and operation – List its merits.
    3.4   Explain Hydrograph.
    3.5   Derive waterpower equation and define various hydraulic terms used – Solve numerical problems.
    3.6   Classify the H.E.P's based upon head, duty, location and hydraulic considerations.
    3.7   Explain with layout diagram working of i) High Head, ii) Medium Head, iii) Low Head Power Stations.
    3.6   Specifically explain the need and working of
           i) Surge Tank, ii) Forebay, iii) Spillgates.
    3.7   Understand the main controls at
           a)   Head works, b) Turbine, c) Alternators.
    3.9   Comprehend the over all scheme of maintenance.

4.0 Understand the working of Nuclear & Gas Power Stations.
    4.1   Introduction to nuclear energy, fission and fusion reactions.
    4.2   Appreciate merits and risks involved in using nuclear energy
    4.3   List out the nuclear fuels.
    4.4   Give specific examples of fission and fusion reactions with mass-energy balance.
    4.5   Explain types of fission reactions and sustained chain reaction.
    4.6   Explain use of moderator in nuclear reactors.
    4.7   Explain the working of a moderated type nuclear power station with a block diagram.
    4.8   Specifically explain the need and working of coolant, reflector, and control rods. Mention the materials used for them
    4.9   Explain the mechanism of power control by control rods.
    4.10   Explain the measures to control radio activity.

4.11 Understand the main controls at the reactor.
4.12 Comprehend the over all scheme of maintenance of nuclear power station.
4.13 Understand the principle of working of gas power station with the help of schematic diagram and mention its merits and demerits
4.14 List main controls for gas turbine.

5.0 Comprehend combined operation and economics of power stations.
5.1 Appreciate increase in use of electrical energy, its production and need for reliability.
5.2 Differentiate between isolated operation and integrated operation of power stations and list the merits of integrated operation.
5.3 Comprehend the process of integrated operation and need for grid at various voltage levels
5.4 Understand the concept of load dispatching and its process.
5.5 List the various charges and expenses in power station and classify them as fixed and running.
5.6 Define the terms load curve, load factor, diversity factor and maximum demand.
5.7 Comprehend the cost of generation and effects of load factor and diversity factor on it.
5.8 Solve numerical problems.
5.9 Explain various types of consumer tariffs and compare them.
5.10 Appreciate the effects of P.F. on electricity charges and mention the methods to improve it. Solve numerical problems on tariff and power factor improvement.

6**.0 Understand different types of switchgears and reactors and their working.**
6.1 Define switch gear and classify.
6.2 Understand isolators, air break switches, their uses and limitations.
6.3 Explain the phenomenon of arc, arc voltage, arc current and its effects.
6.4 State factors responsible for arc and methods of arc quenching.
6.5 Classify the circuit breakers based upon medium of arc quenching.
6.6 Comprehend principle of M.O.C.B and its working.
6.7 Explain properties of SF_6 gas and principle and working of SF_6 circuit breakers.
6.8 Explain principle and working of A.B.C.B.
6.9 Compare M.O.C.B, SF_6C.B and A.B.C.B.
6.10 Understand current limiting reactors and their necessity.
6.11 Draw the scheme of reactor connections and compare them.
6.12 Types of faults in power sys and their effects
6.13 Understand the importance of short circuit KVA calculations

7.0 Protective Relays.
7.1 State the basic requirements of relays and the important activities in relays.
7.2 Classify the relays based upon duty
    i) Principle of Operation ii) Time of operation.
7.3 Describe the construction and working of induction type over current relay.
7.4 Describe the current setting, time setting and application of above relay.

7.5   Describe the working of directional over current induction relay and mention its applications.

7.6   Explain the principle, construction, working and applications of impedance relay.

7.7   Explain distance relay and its uses.

7.8   Describe differential protection and its two types.

8.0   Protection of Alternator and Transformer

8.1   List the probable faults in Alternator Stator and rotor and mention their bad effects.

8.2   Describe the scheme of protection against excessive heating of stator and rotor.   Mention the causes of it.

8.3   Explain the differential protection for alternator stator.

8.4   Explain the earth fault protection for rotor.

8.5   Explain the split phase protection of alternator against inter turn short circuits.

8.6   Explain the need and working of field suppression protection.

8.7   List the possible faults and their types in a transformer – Explain their bad effect.

8.8   List the precautions to be taken for applying differential protection to transformers.

8.9   Explain differential protection of transformer.

8.10   Explain buchholtz relay and its protection scheme for transformer.

COURSE CONTENTS

1. Introduction

Different sources of energy – Conventional and Non-conventional sources – Methods of generation of energy from different sources of power- Construction and working principle of Flat plate solar collector - construction and working principle of Tidal, Wind and Biomass power plants- Merits and limitations of conventional and Non-conventional sources - Need for energy conservation and their methods.

2. Thermal Power Station

Thermal Power Station – Principle of working – Factors for selection of site. Block diagram of condensing type thermal power station- Thermal power station – Components and principles of working -Losses of energy and methods to improve the efficiency- pulverization, Cooling towers and their types -Main controls at Boilers, Turbines, Condensers and Alternators - Energy auditing of thermal power station- Causes of pollution and methods to control them - Scheme of overall maintenance.

3. Hydroelectric Power Stations

Principle of working of hydroelectric power station – limitations in location and operation.

Hydraulic terms used – Water power equation – Classification of hydroelectric power stations based on head, duty, location and hydraulic considerations- Layout diagram of

High Head ii) Medium Head iii) Low Head Power Stations- Working of surge tank, fore bay, spill gates- Main controls of head works, turbines and alternators and scheme of their maintenance.

4. Nuclear and Gas Power Stations

Nuclear energy, fission and fusion reactions – Merits and risks in using nuclear energy.

Nuclear fuels - Fission and fusion reactions with mass-energy balance, Fission reactions and sustained chain reaction – Moderator in nuclear reactors – Working of moderate type nuclear power station with a block diagram- Need and working of coolant, reflector, control rods – Materials used for them- Power control by control rods- measures to control radioactivity- main controls at the reactor- overall maintenance of the nuclear power station- Principle and working of gas power plant, main controls for gas turbine.

5. Combined Operation and economics of Power Stations

Isolated operation and integrated operation of power stations – Their merits and limitations – Load dispatching and its process –Charges/Expenses involved in power station – Their classification as fixed and running-

Load curve, load factor, diversity factor and maximum demand – Effects of load factor and diversity factor in power generation – Solve numerical problems. Consumer tariffs and their comparison – Effect of power factor on the electricity charges and methods to improve it – simple problems - Energy management and conservation.

6. Switch Gear and Reactors.

Switch gear and their classification – Isolators, air break switches and explain the phenomenon of arc, arc voltage, arc current and their effects – Factors responsible for arc and arc quenching. Circuit breakers and their classification based on the medium of arc quenching – , M.O.C.B – Properties of SF_6 gas and principles of SF_6 circuit breakers – Working of A.B.C.B, M.O.C.B, SF_6 C.B and their comparisons. Reactors, – Current limiting reactors and their necessity. Types of reactors and their construction – Equation for short circuit KVA and solve problems.

7. Protective Relays.

Requirements, activities of relays – Classifications based on duty, principle of operation and time of operation – Construction and working of induction type over current relays – Directional Over current relay Principle, construction working of impedance, distance relay.

8.   Protection of Alternators and transformers

Protection of Alternators Scheme of protection probable faults in alternators against excessive heating of stator and rotor. Earth fault protection for stator and rotor – Split phase protection for alternator against short circuits. Field suppression protection. Protection of Transformer, Possible faults and their types in the transformer – Precautions required for protection – Differential protections of buchholz relay, protection against excessive heating of transformer oil.

REFERENCE BOOKS

1.   Electrical Power by S.L.Uppal

2.   Switch gear and Protection by Sunil S. Rao

3.   Generation, Transmission and Utilisation by A.T.Starr

4.   Power System   by C.L.Wadhwa

5.   Non Conventional Energy Guide Lines by NEDCAP

6.   Power plant Engineering   By C.Elanchezhian , Sravan Kumar & Vijaya Ramnath

7.   Electrical power plants by J B Guptha

ELECTRICAL INSTALLATION AND ESTIMATION

Subject Title : **ELECTRICAL INSTALLATION AND ESTIMATION**
Subject code : **EE-404**
Periods/Week : **04**
Periods/Semester : **60**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Estimation of Lighting and Power Loads	20	39	03	3
2.	Estimation of OH Lines and Earthing	15	34	03	2 ½
3.	Departmental Test, REC and Electrical Act 2003,	15	21	02	1 ½
4.	Maintenance of Electrical Machines	10	16	02	01
	Total	**60**	**110**	**10**	**08**

OBJECTIVES

On the completion of the course the student will be able to comprehend the following

1.0   Estimation of Lighting and Power loads
1.1   Explain the construction working of different types of lamps and their connections
  i) Incandescent lamps
  ii) Discharge lamps
        a) Sodium Vapour Lamp
        b) Mercury Vapour Lamp
        c) Neon lamps
        d) Fluorescent lamp
        e) Halogen lamp
1.2   Know about making lamp circuits
        draw the circuits for
            1) Series-parallel connection of lamps
            2) Godown wiring scheme
            3) Lamp circuits incorporating main switch, energy meter, fuse cut-out
                and distribution box
1.3   Explain different types of service mains
1.4   Select the service main suited to the given situation
1.5   State the merits and demerits of different systems of interior wiring.
1.6   Select the type of wiring system suitable to the given situation
1.7   List out the electrical materials used in wiring and service mains.
1.8   List the schedule of rates used in preparing estimate

1.9   Estimate the cost of indoor wiring given the plan of a building.
1.10   Drawing the wiring layout for a big office building
1.11   Draw the wiring layout for a workshop/ Electrical Laboratory
1.12   Draw the wiring layout of a Big industry/Milk dairy/cement Factory/Sugar factory
1.13   Draw wiring layout of a Big Hotel with 4 storey Building.
       and with lift arrangement
1.14   Draw the wiring layout of a Residential Building with 2 Bed room house.
1.15   Prepare layout and draw single line wiring diagrams as per standard practise for a
       given set of machines in a shop
1.16   Select type of wiring system and lighting requirements
1.17   Calculate the wire sizes for various circuits
1.18   Specify important materials used under given condition
1.19   Calculate the quantities and cost of all materials required for the above.
1.20   Prepare the estimate of the complete installation as per standard practice
1.21   Select the type of wiring and service mains used for the irrigation pump set.
1.22   Specify the material used in the execution of the irrigation pump set installation
1.23   Calculate the quantities and cost of various materials required in a given situation.
1.24   Prepare an estimate for electrifying the irrigation pump set   Scheme.
1.25   Prepare an estimation for submersible pump installation

2.0   Estimation of OH Lines and Earthing
2.1   Calculate the total number of insulators required for the given scheme
2.2   Select the type of insulators to be used
2.3   Select the type size and number of cross arms required for the overhead line
2.4   Determine the size and total length of overhead conductor required for the line giving
       due consideration for the sag to be allowed
2.5   Number of stays and Guard insulation ,Number of struts, guarding stairs and
       foundation estimate
2.6   Estimate the quantity of all materials required for given 11 KV and 400 v overhead
       lines as per standard practice followed by NEC
2.7   Estimate the quantity of materials required for a pole and plinth mounted transformer
       substation
2.8   Select supporting poles of suitable size and height to install a given transformer as
       per standard practice in NEC
2.9   Estimate the quantity of materials required for a plinth and pole mounted transformer
       substation
2.10   Estimate the quantity of all the electrical accessories and components required for
       the   given
            a) Pole mounted transformer
            b) Plinth mounted transformer including the operating mechanism as per
               standard practice in NEC
2.11   State the purpose of Earthing and types that are normally used.
2.12   Select the suitable type of Earthing for a given installation
2.13   Specify the different components used in electrical Earthing of a given installation
2.14   List the materials that are to be used in the earth pit surrounding the earth electrode
2.15   Prepare the estimate for pipe and plate Earthing

3.0   Departmental Test, REC and Electrical Act 2003
3.1   Know the departmental procedure for obtaining a service connection
3.2   Specify insulation resistance desirable for a given electrical installation
3.3   Specify the value of earth resistance to be maintained for a given electrical installations
3.4   Know the test procedure for continuity of wiring in an electrical installation
3.5   Know the procedure for conducting insulation test of domestic wiring
3.6   Survey the load particulars in a village
          a). Domestic b) industrial C) agricultural
3.7   Calculate the capacity of a transformer required assuming suitable diversity factor
3.8   Determine the location point of transformer and calculate the tail end voltage regulations as per the practice in NEC
3.9   Calculate the quantities of various materials required
3.10   Prepare an estimate for the quantities and cost of material required
3.11   Determine the economic feasibility of the scheme as per the standard norms fixed by REC to execute the scheme.
3.12   State major rules applicable to electrical installations as per Electrical act 2003 and rules
3.13   Follow the Electrical act 2003 and rules regarding procedures to be adopted during execution of electrical installations.
          a) Domestic lighting & Power   b) Industrial
3.14   State the standards and code of practice followed by NEC in respect of electrical installations and OH lines of 11 KV and 400V pole mounted Plinth mounted transformers

4.0   Maintenance of Electrical Machines
4.1   State the importance of plant maintenance
4.2   State the different types of plant maintenance
4.3   State the role of maintenance engineer
4.4   Discuss the different industrial hazards
4.5   Describe the causes of industrial electrical accidents and remedies
4.6   Understand the important steps involved in maintenance of power Transformer

COURSE CONTENTS

1. Estimation of Lighting and power loads

Lamps and Lamp circuits : Types of lamps - construction of different types of lamps - Incandescent lamps - Gas filled incandescent lamps - Discharge lamps - Sodium Vapour lamps - Mercury vapour lamps - Neon lamps - fluorescent lamps - Halogen lamps - different lamp circuits - for godown wiring - lamp circuit incorporating energy meter, cut out and distribution box.

Estimating and costing of domestic lighting installation service main - types of wire - specification - quantity of materials required for service main - estimation of cost selection of interior wiring system suitable to a given building - number of circuits - calculation of length of wire and quantity of accessories required - estimates of cost of materials and Labour for execution of the domestic wiring installation as per National Electrical act 2003 .Power wiring installation Drawing wiring layout for a big office building, electrical laboratory, big industry/milk dairy/auditors/cement factory/sugar factory, Big hotel with 4 storied building with lift arrangement and a residential building with 2 bed room house.- estimation and costing upto 20 kVA calculation of load current based on ratings of various equipment's to be installed - size of wire - length of wire number of circuits - quantity of accessories, Labour cost for execution of work as per standard practice.

Irrigation pump installation - Estimation and coasting upto 10 HP service main - type- calculation of size and quantity of wire and other components required - Labour cost for erection - Type of starter and control panel - accessories quantity and estimation Estimate for the installation of submersible pump.

2. Estimation of OH Lines and Earthing
Distribution lines of 11 kV and 400 v OH lines - estimation only quantity of materials required for lines of length 1 km - of number of poles - Cross arms clamps - insulators - conductor length and size for a given power transmission Distribution transformer erection- Estimation of quantity of materials required for structures, isolators - HG fuse operating mechanism, isolators, lightening arrestors for pole mounted substation and plinth mounted substation Quantity estimation for materials required in electrical Earthing both for pipe earthling and plate Earthing suitable to the given equipment or transformer substation

3. Departmental Tests and REC and Electrical Act 2003
Electrical installation testing - departmental procedure for testing before giving service connection - departmental procedure for obtaining service connection - desirable insulation resistance for domestic and power circuits - Tests for measuring insulation resistance - procedure for conducting insulation resistance test and continuity tests, earth continuity test. Design of rural electrification scheme - Load survey-determination of capacity of transformer - estimation of quantity of materials required for the erection of distribution lines and 11 kV feeder from a nearby 11 kV feeder - determining the economic feasibility of the scheme as per the procedure laid out in NEC, - Extracts from Indian Electricity rules 1956 and code of practice by NEC regarding - domestic power, agricultural industrial wiring installations, erection of 11 kV, 400 v distribution lines - pole mounted transformer .

4. Maintenance of Electrical Machines
 Defects in Commutator and remedies - under cutting mica - resurfacing of commutator brushes - function and requirement - brush holder - function and different types - staggering pf brushes - brush pressure - growler -importance of plant maintenance - types - preventive maintenance - Break down maintenance - production maintenance - Role of maintenance engineer -.Maintenance of Transformer - Important steps in maintenance of power Transformer - Difference in maintenance schedule for attended Transformers - Over heating of Transformer - causes of troubles and failures of cores of power Transformers - Failure of power transformer due to structural defects – precautions to be taken while using

REFERENCE BOOKS

Electrical Wiring ,Estimating & costing by S.L.Uppal
Electrial wiring, Estimating & costing by J.B.Gupta
Electrical Drawing by Balbir Singh
Electrical wiring by Arora
Maintenance and Operation of Electrical Equipment by BVS Rao Vol…I
Testing, Commissioning Operation & Maintenance of Electrical equipment by S.Rao

DIGITAL ELECTRONICS AND MICRO CONTROLLERS

Subject Title : **Digital Electronics and Micro Controllers**
Subject Code : **EE-405**
Periods/We : **05**
Periods/Semester : **75**

TIME SCHEDULE

Sl. No	Major topics	No. of periods	Weightage of marks	Short Questions	Essay Questions
1	Basics of Digital Electronics	20	26	2	2
2	Flip-flops, Registers, Counters and Memories	15	26	2	2
3	Architecture of 8051	15	26	2	2
4	Instruction set of 8051	15	19	3	1
5	Programming concepts	10	13	1	1
	Total	**75**	**110**	**10**	**8**

OBJECTIVES
On completion of the study of the subject the student should be able to comprehend the following

1.0   Know the basics of Digital Electronics
1.1   Explain Binary, Octal, Hexadecimal and BCD number systems and compare with decimal system.

1.2   Convert one number system to another of the above systems.
1.3   Perform binary addition, subtraction, Multiplication and Division.
1.4   Write 1's complement and 2's complement numbers for a given binary number.
1.5   Perform subtraction of binary numbers in 2's complement method.
1.6   State ASCII Code.
1.7   Explain the importance of parity Bit.
1.8   State different postulates in Boolean algebra.
1.9   Explain AND, OR, NOT Gates with truth tables.
1.10   State De-Morgan's theorems.
1.11   Explain the working of NAND, NOR gates using truth tables.
1.12   Explain the working of an Exclusive – OR gate with table.
1.13   State the function of the Half-adder.
1.14   Show that two Half-adders and OR–gate constitute a full-adder.
1.15   Explain the working of 4 Bit parallel adder using full-adders.
1.16   Explain the working of a serial adder with a block diagram.
1.17   Draw and explain the operation of 2 X 4 decoder.
1.18   Draw and explain the operation of 4 X 2 encoder.
1.19   State the need for A/D & D/A converters.
1.20   State the need for a tri-state buffer.

2.0   Understand the working of Flip-flops, Registers, Counters and Memories

2.1   List different types of Flip-flops
2.2   Explain the working of RS and RST flip flops with truth tables
2.3   Explain JK flip flop & J-K Master-Slave Flip-flop with the truth tables
2.4   Study the need for preset and clear inputs
2.5   Explain the D flip-flop, T flip-flop with the help of truth tables
2.6   List the different types of Registers
2.7   Explain the concept of Serial in Serial out, Serial in Parallel out, Parallel in Serial out and Parallel in Parallel out with Left shift and Right shift operation of shift register

   with a block diagram.

2.8   Give an introduction to binary counters

2.9   Differentiate between synchronous and asynchronous counters.

2.10   Explain the working principle of asynchronous 4-bit ripple counter with the help truth table and waveforms.

2.11   Explain the working principle of 4-bit decade counter with the help truth table and waveforms
2.12   Classify the different types of memories
2.13   Differentiate between RAM and ROM
2.14   Explain the working of dynamic memory
2.15   Differentiate between Flash ROM and NV RAM

3.0   **Comprehend the Architecture of Micro controller 8051**
3.1   Know the features of micro controllers.
3.2   Draw the block diagram of a microcomputer and explain the function of each block.
3.3   Give the pin diagram of 8051 micro controller and specify the purpose of each pin.
3.4   Give the functional block diagram of 8051 microcontroller
3.5   Know the register structure of 8051.
3.6   Explain the function of various special function registers.
3.7   Describe internal memory, external memory and ports of 8051.
3.8   Explain timers & counters in 8051
3.9   Explain serial input/output ports of 8051
3.10   Explain interrupt controls in 8051.

4.0   **Know the Instruction set of 8051 Micro controller**
4.1   State the need for an instruction set.
4.2   Give the instruction format of 8051.
4.3   Explain fetch cycle, execution cycle and instruction cycle.
4.4   Distinguish between machine language, assembly language, and High level language
4.5   Classify instruction set of 8051 based on function and length.
4.6   Explain the terms operation code, operand of an instruction.
4.7   Know the various addressing modes of 8051.
4.8   Explain data transfer instructions of 8051.

4.9 Explain the arithmetic instructions and recognise the flags that are set or reset for given data conditions.

4.10 Explain the logic instructions and recognize the flags that are set or reset for given data conditions.

4.11 Explain unconditional and conditional Branching operations and how flags are used to change the sequence of program.

4.12 Illustrate the logic operations and explain their use in making, setting and resetting of individual bits.

5.0 **Programming concepts**

5.1 Know the various symbols used in drawing flow charts.

5.2 Draw flow charts for some simple problems.

5.3 Write programs in mnemonics to illustrate the application of data copy instructions and translate these mnemonics into hex codes.

5.4 Write programs to perform single byte and multi byte addition.

5.5 Write a Program to sum up given N numbers

5.6 Write a Program to sum of first N natural numbers

5.7 Write a Program to multiply two 8-bit numbers using MUL instruction

5.8 Write a Program to find biggest data value in given data array

5.9 Write a Program to convert a given Hex number to BCD number

COURSE CONTENTS

1. **Basics of Digital Electronics**

   Binary, Octal. Hexadecimal numbering systems. Conversion from one system to another number system. Binary arithmetic's – 1's and 2's complements - Logic gates :AND, OR, NOT, NAND, NOR, Exclusive-OR. Boolean algebra. Demorgan's Theorems. Implementation of arithmetic circuits, Half adder, Full adder, Serial and parallel Binary adder. Parallel adder, decoder, encoder, Necessity of A/D and D/A converters, tri-state buffer

2. **Flip-flops, Counters , Registers and Memories**

   Principle of flip-flop operation, RS, RST, JK, JK Master slave, T, D flip-flops. preset

   and clear inputs. Shift Registers- Serial in Serial out, Serial in Parallel out, Parallel in Serial out and Parallel in Parallel out with Left shift and Right - Binary counters -4-bit ripple counter, decade counter. Memories, RAM and ROM, dynamic memory, Flash ROM and NV RAM.

3. **Architecture of Microcontroller 8051**

   Block diagram of microcomputer, Block diagram of 8051, Pin out diagram of 8051, register structure, special function registers internal memory, external memory, timer-counter, serial input/output ports, interrupts,

4.   Instruction set of 8051:

Instruction set of 8051, instruction format, machine language, assembly language, classification of   instructions, addressing modes – opcode , operand Groups of instructions, data transfer instructions arithmetic instructions, logic instructions, branching operations, Boolean group of instructions.

5.   Programming concepts:

Flow charts, Data transfer, single and multi byte addition, sum up given N numbers, multiply two 8-bit numbers, biggest data value in a data array, Hex number to BCD number.

Reference Books

1. Digital Electronics and logic design by B. Somanathan Nair, PHI
2. Digital Computer Electronics by Malvino & Leach., TMH
3. 8051 Micro controller by Mazidi and Mazidi.
4. 8051 Micro controller by Kenneth J.Ayala.
5. Programming customizing the 8051 Microcontroller by Myke Predko TMH
6. Modern Digital Electronics By RP JAIN   TMH
7. Digital Electronics   Tokhem   TMH
8. Digital Electronics Puri   TMH
9. Digital Computer Fundamentals by Barty

GENERAL MECHANICAL ENGG.

Subject title : **General Mechanical Engg.**
Subject Code : **EE-406**
Periods/Week : **05**
Periods/Semester : **75**

TIME SCHEDULE

S.No	Major Topics	Number Of Periods	Weightage of Marks	Short questions	Essay questions
01	Simple Stresses & Strains	14	26	02	02
02	Torsion in Shafts	10	16	02	01
03	I.C Engines, Boilers, Turbines	36	52	04	04
04	Pumps, Lubricants	15	16	02	01
	Total	75	110	10	08

OBJECTIVES
On completion of the course the student should be able to comprehend the following

1.0 Understand the meaning of stress and strain
1.1   Define the terms : stress and strain
1.2   Identify the different types of stresses and strains
1.3   Define Hooke's law
1.4   Define moduli of elasticity
1.5   Draw typical stress-strain curve for an M.s. Specimen under tension
1.6   Define factor of saftey
1.7   Define poisson's ratio
1.8   State the relationship between elastic constants.
1.9   Calculate the dimensional changes in the bodies of uniform cross section subjected
          to tensile and compressive forces
2.0 Appreciate the theory of torsion
2.1   Know the function of shafts.
2.2   Specify the standard sizes
2.3   Write down simple torsion equation
2.4   Design the size of solid shaft
          i) Strength point of view
          ii) stiffness point of view

3.0 I.C.ENGINES - BOILERS - TURBINES
3.1 Know the constructional details of I.C.Engines
3.2 Define I.C. Engine
3.3 Identify the various parts of
   i) Diesel engine
   ii) Petrol engine
3.4 Explain the principle of 4-stroke diesel/petrol engine
3.5 Explain the principle of 2-stroke diesel/petrol engine
3.6 Distinguish between 4-stroke cycle and 2-stroke cycles
3.7 Distinguish between diesel engine and petrol engine
3.8 State the functions of components such as carburettor, fuel pumps and governor
3.9 Explain the function of a boiler
3.10 Compare fire tube boiler with water tube boiler
3.11 Draw the Sketch of Modern High Pressure boiler
3.12 Explain the working of above boiler
3.13 Identify the necessity of mountings such as
   1) water level indicator
   2) Pressure gauge
   3) Stop valve
   4) Feed check valve
   5) safety valve
   6) Fusible plug
3.14 Identify the accessories such as
   1) Economiser
   2) Super heater
   3) Air pre heater
3.15 Mention the working principle of above with sketches.
3.16 Explain the principle of working of a steam turbine
3.17 Classify the turbine based on action of steam
3.18 Compare impulse turbine with reaction turbine
3.19 Study the De Lavel and Parson turbines
3.20 Explain the working of Gas turbine
3.21 State the types of Gas turbine
3.22 Explain the function of jet and surface condensers.
3.23 Explain the principle of working of a water turbine
3.24 Classify the water turbines
3.25 Illustrate the working principle of
   i) Pelton wheel
   ii) Francis turbine
   iii) Kaplan turbine
4.0 *Understand the working of centrifugal pumps.*
4.1 Explain the principle of operation of centrifugal pump
4.2 Explain the constructional details of centrifugal pump.
4.3 Know the method of improving the delivery head by multistage
4.4 Appreciate the importance of priming of centrifugal pumps.
4.5 Explain the principle of operation of reversible turbine pump and jet pump
4.6 Explain the function of bearing
4.7 Classify the bearings
4.8 Explain with a line sketch the journal and collar bearings

4.9   List and explain anti friction bearing
4.10   know the application of ball and roller bearings
4.11   State the specifications of ball and roller bearings
4.12   State the purpose of lubrication
4.13   State the properties of a lubricant
4.14   List the types of lubricants with examples
4.15   Know the application of lubricants.

COURSE CONTENTS

1. Simple stress and strains

Definitions,Tensile stress, Compressive stress, Shear stress, Linear strain, lateral strain and, Poisson's ratio, elastic limit,statement of Hook's law,stress-strain diagram with salient features for ductile materials under tensile stress. Elastic moduli,Definition and explanation of Young's modulus,Modulus of rigidity, Bulk modulus,Working stress,Ultimate stress,Factor of safety. Simple problems on tensile and compressive stress and strains in uniform and varying cross section bar (tapering sections omitted), Relationship between Young's modulus ,rigidity modulus and bulk modulus (without proof) problems thereon

2. Torsion in shafts

Function of shafts, standard shaft sizes, Polar moment of inertia of hallow and solid (no proof)shafts. Torsion equation, and power transmitted,Permissible shear stress .

3. Constructional details of I.C. Engines.

Four stroke and two stroke petrol and diesel engines. petrol engine for 4 stroke / 2 stroke, diesel engine for 4 stroke/ 2 stroke , Comparison between petrol and diesel engine,
Functions of carburettor, fuel injection pump, governor, Classification of boilers fire tube- water tube Sketch and description of modern boiler and mention various mountings used. Boiler accessories (sketch, description and functions of) Economiser, Super heater, Feed water heater, Air pre-heater.Gas Turbine, Impulse&Reaction turbines, Pelton wheel, Francis ,Kaplan,condensers.

4.   Pumps - Introduction

centrifugal, Single stage, , lubricants - examples and   their applications
Note :   1. This subject is to be taught by mechanical faculty
         2. Paper setting and paper evaluation is also to be done by Mechanical
            Faculty.

REFERENCE BOOKS

1. Strength of materials   by Ramamrutham
2. Strength of materials   by Zakaraia Baig
2. Strength of materials   by Surender Singh
3. Strength of materials   by S.B.Junarker
4. General Mechanical Engineering   by Lakshminarayana
5. General Mechanical Engineering   by GopalaKrishna
6. Hydraulic Machinery   by Jagadishalal
7. Strength of Materials   by R.S. Kurmi

A.C. MACHINES LABORATORY – I

Subject Title   :   **A.C. MACHINES LABORATORY – I**

Subject Code   :   **EE-407**
Periods/week   :   **03**
Periods/Semester   :   **45**

OBJECTIVES

On completion of the practical course the student should be able to

1.1   Identify the machines from the name plate details

2.0   Rules to draw the circuit diagram for the given experiment

3.1   Select the correct type and range of instruments for different tests

4.1   List the sequence of operation of the experimental work

5.1   Rules for start and control emf and speed of AC machines

6.0   Select correct voltages and adjust auxiliaries for tests on transformer

7.0   Represent the experimental data in tabular and graphical form

8.0   Use the principles and concepts to analyse the experimental tests and results

9.0   Practice safety precautions while operating electrical machines

10.0   Measure the power in single phase and 3 phase A.C circuits

11.0   Charge batteries

12.0   Testing of Transformer oil

LIST OF EXPERIMENTS

1. Conduct OC &SC tests on 1-phase transformer and find
   a) Equivalent circuit
   b) Regulation and efficiency at various power factors
   c) Load at which max. efficiency occurs

2. Obtain the efficiency & regulation at different loads & p.f.s., by conducting load tests on 1 – phase transformer

3. Obtain efficiency & Regulation of two similar transformer by conducting, Sumpener's test

4. Conduct Scott connection on transformers

5. Calculate the regulation of alternator by using synchronous impedance method

6. Synchronise the alternator with supply mains by using
   a) Lamp method
   b) Synchroscope

7. Charge the battery and draw performance curves using
   (a) Constant current method
   (b) Constant voltage method

8. To test the break down voltage of a Transformer oil using oil Testing kit and to test the acidity of transformer oil.

ELECTRICAL ENGINEERING DRAWING

Subject Title : **Electrical Engineering Drawing**
Subject code : **EE-408**
Periods/week : **06**
Periods/ Semester : **90**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of marks	Short Questions	Essay Questions
1.	Views of fuses, Knife Switches, Couplings and bearings	06	05	1	-
2.	D.C.Machines	22	15	1	½
3.	Transformers	15	20	-	1
4.	Induction motors	18	20	-	1
5.	D C and A C Windings	20	10	-	½
6.	Supporting Structures	06	05	1	-
7.	Sub stations & Earthing Systems	03	05	1	-
	Total	**90**	**60**	**04**	**03**

 Note : Question Paper should contains
Part-A & Part -B
Part-A: Four Questions : Each 5 marks Total : 4x5 =20 marks
Part-B: Three Questions, the student has to answer TWO only
with Each : 20 marks   Total : 20x2 = 40 marks

OBJECTIVES
On the completion of the course the student should be able to comprehend the following

1.0   Views of fuses, Knife Switches, Couplings and Bearings
1.1   Draw Sectional and end view of Rewirable fuse
1.2   Draw Sectional and end view of HRC fuse
1.3   Draw Plan and end view of Double pole double throw knife switch
1.4   Draw sectional elevation and end view of flange coupling
1.5   Draw sectional elevation and end views of End plate with bearing

2.0   DC machines
2.1   Draw views, including sectional views of yoke and pole assembly
2.2   Draw sectional view of armature of DC machine
2.3   Draw sectional views of commutator of a DC Machine
2.4   Draw Sectional elevation and end view of a DC Machine

3.0   Transformers
3.1   Draw different core sections of a Transformer.
3.2   Draw sectional views of a single-phase core type transformer from the given data
3.3   Draw sectional views of a 3 phase core type transformers from given data

4.0   Induction motors
4.1   Draw the sectional view of stator of an induction motor
4.2   Draw the sectional view of Squirrel cage Rotor
4. 3   Draw the sectional view of Slip ring rotor
4.4   Draw the sectional elevation and end view of assembled Squirrel cage induction
         motor.
4.5   Draw the sectional elevation and end view of assembled Slip ring induction motor

5.0   DC and AC Windings
5.1   Draw Developed winding diagram for single layer lap connected Armature of a DC
         machine with ring diagram and winding table
5.2   Draw Developed winding diagram for double layer lap connected Armature of a DC
         machine with ring diagram and winding table
5.3   Draw Developed winding diagram for single layer wave connected Armature of a
         DC   machine with ring diagram and winding table
5.4   Draw Developed winding diagram for double layer wave connected Armature of a
         DC   machine with ring diagram and winding table
5.5   Draw developed winding diagram for a 3-phase single layer lap winding.
5.6   Draw developed winding diagram for a 3-phase single layer wave winding.
5.7   Draw developed winding diagram for a 3-phase double layer lap winding
5.8   Draw developed winding diagram for a 3-phase double layer wave winding

6.0   Supporting Structures.
6.1   Draw the sketch of 33 KV Tower.
6.2   Draw the sketch of 132 kV double circuit tower
6.3   Draw the sketch of 400 kV double circuit tower
6.4   Draw the sketch of 11 KV/440V PSCC Pole
6.5   Draw the sketch of steel tubular Pole

7.0   Substations and earthing systems
7.1   Draw the single line Diagram of 220 KV/ 33 KV Substation
7.2   Draw the sketch of 11 KV/ 400V Plinth mounted substation.
7.3   Draw the dimensioned sketched of substation earthing

COURSE CONTENTS

1. Views of fuse, switches
Views of fuses, Rewirable fuse, HRC fuse, DPDT Knife switch, Flange coupling, End plate with bearings

2. DC machine parts: (Assembled views in section)
Stator yoke and pole assembly, Armature of a small DC machine, Commutator of DC machine,

3. Transformers
Core sections, sectional views of single-phase core type, three phase core type transformers.

4. Induction motors
Elevation and End Views of 3 phase Squirrel cage induction motors and3 phase slip ring induction motors

5. DC and AC winding
Single layer Lap and wave winding-Double layer lap and wave windings-Winding tables-Ring diagram-Brush location-Equalizer rings. AC 3 phase single layer and double lap and wave windings

6. Supporting Structures
Views of-line supports-Towers

7. Substations and earthing systems
Plinth mounted Substation Line diagram of 220 Kv/33Kv Substation. Substation earthing systems

REFERENCE BOOKS
1. Electrical Engineering Drawing   by G.B.Bharadwajan.
2. Electrical Engineering Drawing   by Dargon.
3. Electrical Engineering Drawing   by Narang.
4. Electrical Engineering Drawing   by Surjit singh.

DIGITAL ELECTRONICS LAB

Subject Title   :   **Digital Electronics Lab**
Subject Code   :   **EE-409**
Periods/Week   :   **03 (For EE-409 & EE-410)**
Periods/Semester   :   **45 (For EE-409 & EE-410)**

LIST OF EXPERIMENTS

OBJECTIVES
On completion of the course the student should be able to
   I.   Perform tests on different Digital Electronic circuits.

I. Digital Electronics

1.   Construct and verify the truth tables of Basic gates - AND, OR, NOT gates

2.   Construct and verify the truth tables of Universal gates - NAND, NOR gates

3.   Construct and verify the truth tables of Exclusive OR & Half-adder using logic gates.

4.   Construct and verify the truth table of Full adder circuit using logic gates.

5.   Verification of truth tables for RS, RST   Flip-flops.

6.   Verification of truth tables for JK , D, T Flip-flops.

7.   Verify function of a 4-bit shift register

8.   Construct and test a decade counter.

MICROCONTROLLER LAB

Subject Title   :   **Microcontroller Lab**
Subject Code   :   **EE-410**
Periods/Week   :   **3 (For EE-409 & EE-410)**
Periods/Semester   :   **45 (For EE-409 & EE-410)**

LIST OF EXPERIMENTS

OBJECTIVES
On completion of the course the student should be able to
    II.   Execute the programs using 8051 Microcontroller

I. Assembly language programming on 8051

Execute the following programs using 8051 Microcontroller

1. Block transfer of data.

2. 8 – bit addition

3. Multi byte addition

4. Sum of given n numbers

5. Sum of first n natural numbers

6. 8 bit multiplication using MUL instruction

7. Biggest data in given data array

8. Hex to BCD conversion

V SEMESTER

EE - 501 INDUSTRIAL TRAINING   (Practical Training)

V - SEMESTER

S.NO	Subject	Duration	Items	Max Marks	Remarks
1	Practical Training in the Industry	6 Months	1.First Assessment (at the end of 2nd month)	100	
			2. Second Assessment (at the end of 4th month)	100	
			3. Log Book & Record	60	50 Marks Each
			4. Seminar	40	
TOTAL PER SEMESTER				**300**	

The industrial training shall carry 300 marks and pass marks is 50%.A candidate failing to secure the minimum marks should complete it at his own expances.No apprenticeship training stipend is payable in such case.
During Industrial training the candidate shall put in a minimum of 90%attendence.

DIPOLOMA IN ELECTRICAL & ELECTRONICS ENGINEERING (CURRICULUM C-09)

V SEMESTER

(INDUSTRIAL TRAINING)

Duration : 6 months

OBJECTIVES

On completion of a spell of practical training in a industry, the student will be able to

1.0 Know the organizational set up from top executive to workmen level
    1.1 Know the function of each department/section
    1.2 Know the inter relationship among various
        department/sections

2.0 Know the various raw materials used as feed stock and their source.
    2.1 Understand the various intermediates produced and their further processing and / or waste disposal.

    2.2 Know the final products, its composition and its commercial importance's, uses and applications.

3.0 Understand the various stages involved in processing, sequential

arrangement of different equipment.

    3.1 Draw the flow diagram, detail flow diagram of each process
    3.2 Understand the arrangement of various equipment and machinery in systematic manner in a less possible area of site.

4.0 Know the various analytical methods used in the quality control department
    4.1 Understand the experimental methods to find out the quality of the product
    4.2 Understand various tools, instruments used for quality checking.

5.0 Know the trouble shooting in process operation
    5.1 Know preventive precautions of each equipment in the plant.
    5.2 Startup and shut down procedures for the equipment and plant.

6.0 Know the importance of safety in industries
    6.1 Understand the safety about personnel protection, equipment protection
    6.2 Know the usage of various safety devices
    6.3 Precautionary measures to be taken.

7.0 Know the various pollutants emitted from the plant.

7.1 Understand effects of pollutants.
7.2 Understand treatment method and disposal.
7.3 Know the effective methods pollution control.

COURSE CONTENTS

1. Organizational set up

2. Raw materials, intermediates and end products

3. Process descriptions (Process flow diagrams and line tracing, detailed flow diagrams etc.)

4. Quality control of raw materials, intermediates and end products

5. Operational troubles and preventive measures

6. Safety aspects (personnel, equipment etc.)

7. Pollution control

INDUSTRIAL TRAINING SCHEME
V SEMESTER

1. A candidate shall be assessed twice in the spell of industrial training i.e. at the end of third month and finally before he/she completed the industrial training

2. The assessment shall be carried out by a committee comprising of

    (a) A representative of the Industry where the candidate is undergoing training

    (b) A staff member of the concerned section of the polytechnic.

3. The assessment at the end of the third month and the end of training shall each carry 100 marks (Total = 200 marks) for the progress made during the corresponding period of training.

4. The remaining 100 marks are allotted as follows:

    For maintenance of log book & record work 60 marks (for each 30 marks)

    For seminar 40 marks.

    These are to be evaluated at the institution at the end of training by a committee consisting following staff members (1) Head of Dept. concerned.(2) Staff member who assessed the student in the industry (3) Any other staff member of concerned department

5. The progress made during the end of assessment will be evaluated on the basis of the following parameters.

ASSESSMENT SCHEME

S. No.	Name of the Parameter	Max. Marks Allotted for each Parameter
1.	Attendance and punctuality	05
2.	Familiarity with Technical terms	06
3.	Familiarity with tools and material	10
4.	Attitude towards job	07
5.	Manual skills	04
6.	Application of knowledge	10
7.	Problem solving skills	10
8.	Comprehension and observation	04
9.	Safety and Environmental consciousness	03
10.	Human relations	04
11.	Ability to communicate	06
12.	Supervising ability	10
13.	General conduct during the period	06
14.	Maintenance of dairy	15
	Total:	**100**

VI SEMESTER

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ENGLISH – IV
(Common Subject)

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Subject title   : **English -IV**
Subject code   : **EE-601**
Periods per week   : **03**
Periods / Semester   : **45**

TIME SCHEDULE

S.No.	Major Topics	Periods	Weightage of Marks	Short Type	Essay Type

INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

(COMMON WITH ECE / AEI)

Subject Title   :   Industrial Management and Entrepreneurship
Subject Code   :   EE –602
Periods/Week   :   05
Periods per Semester :   75

S.No.	Major Topics	Periods	Weightage of Marks	Short Answer Questions	Essay Type Questions
1.	Principle of Management ,Organisation Structure and behaviour	15	29	03	2
2.	Production, Material and Marketing Managements	30	39	03	3
3	Introduction to ISO 9000 & TQM	15	16	02	1
4	Role of Entrepreneur and Entrepreneurial Development	15	26	02	2
	Total	75	110	10	08

OBJECTIVES
> **On completion of the course the student will be able to comprehend the following**

1.0   Understand the principles of management , Organizational structure and behaviour
    1.1   Define industry, commerce (Trade) and business.
    1.2   Know the need for management.
    1.3   Explain the principles of scientific management.
    1.4   Understand functions of Management.
    1.5   Differentiate between management and administration.
    1.6   Differentiate types of ownerships.
    1.7   Understand salient features of joint stock companies.
    1.8   Understand the philosophy and need of organisation structure of an industry.
    1.9   Understand the line, line & staff and Functional organisations.
    1.10   List the advantages and limitations of line, line & staff and functional organisations.
    1.11   List different departments in a large scale industry.
    1.12   Explain the factors of effective organisation.
    1.13   Understand organisational behaviour.
    1.14   Conduct job analysis.
    1.15   Assess the incurring applicants.
    1.16   Outline the selection process.
    1.17   Understand the sources of manpower.

1.18   State motivation theories.
1.19   List out different leadership models.

2.0   Understand the different aspects Production , Materials and Marketing managements
2.1   Differentiate and integrate production, planning and control.
2.2   Relate the production department with other departments.
2.3   State the need for planning and it's advantages.
2.4   Explain the stages of Production, planning and control.
2.5   Explain routing methods.
2.6   Explain scheduling methods.
2.7   Explain dispatching.
2.8   Draw PERT/CPM networks.
2.9   Identify the critical path.
2.10   Explain the role of the materials in Industry.
2.11   Derive expression for inventory control.
2.12   Explain ABC analysis.
2.13   Define safety stock.
2.14   Define reorder level.
2.15   Know about economic ordering quantity.
2.16   Explain stock layout.
2.17   List out stores records.
2.18   Explain the Bin card.
2.19   Describe Cardex method.
2.20   Explain purchasing procedures.
2.21   List out purchase records.
2.22   Explain marketing functions.
2.23   Explain Sales function.
2.24   List out market conditions.
2.25   Differentiate Sellers and Buyers' market.
2.26   Differentiate monopoly, oligarchy, and perfect competition.
2.27   Explain the concept of cost.
2.28   List out the elements of cost.
2.29   Explain the concept of contribution.
2.30   Explain break-even analysis.
2.31   Conduct market and demand surveys.
2.32   Differentiate product and production analysis.

3.0   Understand ISO 9000 & TQM.
3.1   Understand the concept of quality.
3.2   Know the quality systems and elements of quality systems.
3.3   Know the principles of quality Assurance.
3.4   Know the Indian Standards on quality systems.
3.5   Know the evolution of ISO standards.
3.6   Discuss ISO standards and ISO 9000 series of quality systems.
3.7   State the constituents of ISO 9000 series of standards for quality   systems.
3.8   State the outstanding features and drawbacks of ISO 9000 series of standards.
3.9   List the beneficiaries of ISO 9000..

4.0 **Understand the role of entrepreneur in economic development and in improving the quality of life.**
    4.1   Outline the concepts of Entrepreneurship.
    4.2   Define the word entrepreneur.
    4.3   Determine the role of Entrepreneurship.
    4.4   Describe the profile of an entrepreneur.
    4.5   Explain the requirements of an entrepreneur.
    4.6   Outline the expectations of Entrepreneurship.
    4.7   Determine the role of entrepreneurs in promoting Small Scale Industries.
    4.8   Describe the details of self-employment schemes.
    4.9   Explain the method of site selection.
    4.10   Outline the method of plant layout.
    4.11   List the financial assistance programmes.
    4.12   List out the organisations that help an entrepreneur.

COURSE CONTENTS

1. **Principles of management, Organizational structure and behaviour**

Definitions of Industry, Commerce and Business. Principles of Scientific Management, functions of management. Difference of administration and management.

Role of industry, Types of ownership – Sole proprietorship, Partnership, Private limited, Public limited company, Industrial Cooperatives, Philosophy, types of Organisations, Line and Staff and functional organisations. Advantages and limitations, departments in a large scale industry. Effective organisation. Job analysis, Assessing applicants, selection, motivation, Leadership models.

2. **Production , Materials and Marketing managements**

Production, planning and control, relation with other departments, need for planning and its advantages, Routing, scheduling, despatching, PERT and CPM, simple problems.

Materials in industry, inventory control model, ABC Analysis, Safety stock, re-order, level, Economic ordering quantity, Stores layout, stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex., Sellers and Buyers markets, Marketing, Sales, Market conditions, monopoly, oligarchy, perfect competition. Cost Elements of Cost, Contribution, Break even analysis, Market Survey, Product and production Analysis.

3. **Introduction to ISO 9000 and TQM.**

Concept of quality discussed by B. Crosby W. Edward, Deming, Joseph M. Jura Kooru Ishikawa, Genichi Taguchi, Shigco Shingo.

Quality systems – Definitions of the terms used in quality systems like, quality policy, quality management, quality systems, quality control and quality assurance.

Elements quality systems : Management responsibility, Quality system, contract review, design control, document control, purchasing, purchaser – supplied product, product identification and traceability, process control, Inspection and testing.

Principles of quality assurance – Definition of quality assurance.

Indian standards on quality systems – Main features of IS 13999 : 1990, IS 14000 : 1990, IS 14004 : 1990, IS 14001: 1990, IS 14002 : 1990, IS 14003: 1990.
Know the necessity of International standards – Evolution of ISO. Various standards under ISO – Outstanding features of ISO 9000 series of standards – ISO 9000 Phenomenon ISO 9000 series of quality systems – Constituents of ISO 9000 series of standards for quality systems.
Drawbacks of ISO 9000 series of standards, list the beneficiaries of ISO 9000 (Whom does ISO 9000 help).

4.   Role of Entrepreneur & Entrepreneurial Development.
Concept, definition, role, expectation, entrepreneurship Vs Management, promotion of S.S.I. Self – employment schemes. site selection, plant layout, profile and requirement, Institutional support needed, financial assistance programmes.

REFERENCE BOOKS

1.   Industrial Engineering and Management -by O.P Khanna

2.   Production Management- by Buffa.

3.   Engineering Economics and Management Science - by Banga & Sharma.

4.   S.S.I Hand Book by S.B.P. Publishers.

5.   Personnel Management by Flippo.

6.   Entrepreneurship – by NITTT&R, Chennai.

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A.C. MACHINES – II

Subject Title : **A.C. MACHINES –II**
Subject Code : **EE-603**
Periods/ Week : **05**
Periods /Semester : **75**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Synchronous motors.	20	29	03	02
2.	3- Phase Induction Motors	30	49	03	04
3.	1- Phase Induction Motors	15	19	03	01
4.	1- Phase Commutator Motors	10	13	01	01
	Total	75	110	10	08

OBJECTIVES
On the completion of the study of the subject the student should be able to study of the comprehend the following

1.0 Comprehend the working of synchronous motors.
   1.1 Principle of Production of Rotating Magnetic Field in 3-phase System.
   1.2 Explain the construction of synchronous motor and it's parts
   1.3 Explain the principles of working of synchronous motors.
   1.4 Explain the performance of synchronous motor on Load with phase diagrams.
   1.5 Explain the effects of varying excitation at constant load with phasor diagrams,
   1.6 Explain the significance and account for the shape of 'V' curves, Inverted V curve,
   1.7 Explain how a Synchronous motor can be used as a Synchronous condenser.
   1.8 Explain the phenomenon of HUNTING.
   1.9 State "How HUNTING is prevented"?
   1.10 Explain the starting methods of synchronous   motor by
           (a).Auxiliary motor and (b).   Damper winding
   1.11 List the applications of synchronous motor.

2.0 Comprehend the working of 3 phase Induction Motors,
   2.1 Explain the advantages of Induction Motors.
   2.2 Explain the construction of Induction motor- slip ring and squirrel cage
   2.3 State the principle of working of 3 phase induction motor.

2.4   Explain working of 3 phase induction motor on no load –on load
2.5   (a). Derive the equation relating TORQUE, POWER and SLIP.
          (b). Draw Torque – Slip curves,
2.6   Explain how an induction motor is treated as a generalized transformer.
2.7   Explain **:** (a) No-load test (b) Blocked rotor test and
                  (c) Draw circle diagram with the help of above tests.
2.8   Solve problems on the evaluation of the performance of induction motors
           With given data.
2.9   Explain methods of starting of induction motors.
2.10   Sketch the circuit diagram and explain the working of
          (a).D.O.L. starter.   (b).   Star/Delta Starter.
          (c). Auto – Transformer starter. (d).   Rotor resistance starter.
2.11   Explain construction features of double cage rotor motor.
2.12   Explain the speed control of inductor motors by
          (a). Frequency changing method,   (b). Pole changing method.
          (c). Injecting voltage in rotor circuit. (d). Cascading
2.13   State the applications of inductor motors
2.14   Compare synchronous motors with induction motors.

3.0   Comprehend the working of I phase induction motors.
3.1   State the types of I phase induction motors.
3.2   Explain the working of 1 – phase Induction motor.
3.3   Explain why a Single-phase Induction motor is not Self starting motor.
3.4   Explain the working of split phase motor, capacitor start motor and shaded
          pole motor.

4.0   Comprehend the working of single phase Commutator motors .
4.1   State the construction and working of different types of single
          phase Commutator motors-,A.C.Series motor, universal motor,
           stepper   motor, permanent magnet brushless motor.
 4.2   Explain applications of above motors.

COURSE CONTENTS

1.   Synchronous Motors
   Introduction - Rotating Magnetic field, synchronous speed, parts of synchronous
   Motor – Excitation of rotor working Principle – Back EMF – Resistance and
   synchronous Reactance – Effects of Load, Vector diagrams – Load Angle, power
   relation, Effects of change of Excitation at constant Load, Vector diagrams
   for:(a).Normal, (b). Under and c)Over excitation conditions, Effects of Excitation
   on Armature current and power factor, Relation between Back EMF applied voltage,
   Simple problems - V – Curves and inverted V – curves ,constant power lines –
   Hunting and its undesirable Effects – Methods of Countering hunting, starting
   Device necessity – Methods of starting , Applications of synchronous motor. When
   used as synchronous condenser, Calculation of Motor Ratings, problems.

2. **Three Phase Induction Motors**

Introduction – Constructional features and differences in respect of cage and wound rotor types. Principle of working & self starting features, actual rotor speed and synchronous speed, slip. Effect of loading on slip – frequency and magnitude of rotor EMF and reactance – Expression for rotor current on no load and on Load – problems. Induction motor as a generalized transformer. Losses and Power transfer stage by stage from stator to rotor – Relational between rotor copper losses – Rotor output and rotor input derivation and problems. Torque equation derivation – Starting torque, condition for maximum torque – Relation Between full load torque, starting Torque and maximum torque – Torque slip curves effects and variation rotor resistance and reactance on starting, full load and maximum torque. Effect of supply voltage on torque and speed, problems. Losses and efficiency – No load and blocked rotor tests, circle diagram from test data – Evaluation of torque – efficiency, problems on circle diagram. Starters for Induction motor – necessity, Direct Switching, D.O.L starter, Star / Delta starter, Auto Transformer starter and rotor resistance starters, simple problems. Double cage rotor motor – Improvement in performance features. Speed variation of induction motors ,Application of induction motors. Comparison of Synchronous and induction motors.

3. **Single phase Induction Motors**

Essential parts and constructional features of single phase motors – self starting - split phase, capacitors start, capacitor run and shaded pole types and Principles of working – Accessories like capacitors, centrifugal switch – function –reversal of rotation Applications and relative merits.

4. **Commutator Motors (Single phase)**

Essential parts and Constructional features of A.C series motor – principles of working – sparking, elimination methods, speed control, reversal of rotation and applications - Universal motor- parts, constructional features, principle of working, speed control and applications- Stepper motor – essential features , principle of working and Applications- permanent magnet brushless motor – principle of working and applications.

REFERENCE BOOKS

1.   Electrical Technology by B.L. Theraja

2.   Electrical Technology by J.B. Gupta

3.   Electrical Technology by H. Cotton

4.   Performance and design of A.C. Machines by M.G, Say

5.   Performance of A.C. Machines by Langsdorf

6.   Electrical motors applications and control by M.V. Deshpande

POWER ELECTRONICS

Subject Title : **Power Electronics**
Subject Code : **EE-604**
Periods/Week : **05**
Periods/Semester : **75**

TIME SCHEDULE

Sno	Major Topics	No. of periods	Weightage of marks	Short Answer Questions	Essay Questions
1	Power Electronic Devices	22	34	3	2 1/2
2	Converters & Choppers	13	26	2	2
3	Inverters and Cyclo converters	10	13	1	1
4	Speed control of AC / DC Motors	12	16	2	1
5	Application of Power Devices	18	21	2	1 ½
	Total	75	110	10	8

OBJECTIVES
On completion of the study of the subject the student should be able to comprehend the following

1.0 Understand the construction and working of Power Electronic Devices
    1.1 List different thyristor family devices.
    1.2 Sketch the ISI circuit symbols for each device.
    1.3 Describe constructional details of SCR.
    1.4 Draw & Explain the Volt – Ampere characteristics of SCR.
    1.5 Mention the ratings of SCR.
    1.6 Explain the construction of GTO SCR
    1.7 Compare the characteristics of GTO SCR and SCR.
    1.8 Give constructional details of Diac & Triac.
    1.9 Draw & Explain the Volt-ampere characteristics of Diac & Triac under forward / reverse bias.
    1.10 State the different modes of Triac triggering.
    1.11 Compare SCR with LASCR.
    1.12 Draw & Explain SCR circuit triggered by UJT.
    1.13 Explain power control circuits Diacs, Triacs & SCR's.
    1.14 Briefly explain the working of Power BJT, Insulated gate bipolar transistor (IGBT)
    1.15 Describe the mechanism in protecting power devices.
    1.16 Explain the necessity of commutation
    1.17 Briefly explain the different methods of commutation schemes

2.0   Understand the working of converters and Choppers.
2.1   Classify converters.
2.2   Explain the working of single-phase half wave fully controlled converter with Resistive and R-L loads.
2.3   Understand need of free wheeling diode.
2.4   Explain the working of single phase fully controlled converter with resistive Load.
2.5   Explain the working of three-phase half wave controlled   converter with Resistive load.
2.6   Explain the working principle of chopper.
2.7   Describe the control modes of chopper
2.8   Explain the operation of chopper in all four quadrants.

3.0   Understand the Inverters and Cyclo converters
3.1   Explain the working principle of inverter.
3.2   Explain the basic series inverter and parallel inverter
3.3   Explain the working of single-phase bridge inverter using MOSFET.
3.4   Explain the working of voltage source inverter.
3.5   Explain the working of PWM inverter.
3.6   Explain the basic principle of Cyclo converter.

4.0   Understand speed control of DC / AC Motors
4.1   Explain the principle of AC voltage control using Phase control with simple circuits and draw waveforms.
4.2   Mention factors affecting the speed of DC Motors.
4.3   Describe speed control for DC Shunt motor using converter.
4.4   Describe speed control for DC Shunt motor using chopper.
4.5   List the factors affecting speed of AC Motors.
4.6   Explain the speed control of induction motor by using converters and inverters (V/F control)

5.0   Understand Applications of power devices
5.1   List the types of disturbances in commercial power supply.
5.2   List the devices used to suppress spikes in supply voltages.
5.3   List the advantages of SMPS.
5.4   Explain SMPS with block diagram.
5.5   Classify UPS
5.6   Draw the block diagram of an off-line UPS
5.7   Draw the block diagram of on-line UPS
5.8   List the storage batteries used in UPS.
5.9   Draw and explain the light dimmer circuit using DIAC and TRIAC
5.10   Draw and explain the burglar alarm circuit using SCR.
5.11   Draw and explain the emergency lamp circuit using SCR.
5.12   Draw and explain the battery charger circuit using SCR.

COURSE CONTENTS

1.   Power Electronic Devices
Types of power semiconductor devices – SCR, Triac, Power BJT, IGBT, GTO,LASCR- Working principle of all devices, symbols. -Two transistor analogy for SCR – V-I characteristics, Forward break over voltage, latching current, holding current, turn on triggering time, turn off time - triggering of SCR using UJT – protection of power devices-Necessity of commutation-Methods of commutation.

2.   Converters & Choppers
Classification of converters, single phase half wave fully controlled converter, free wheeling diode, single phase fully controlled converter, three phase half wave, three phase full wave controlled converter, choppers- modes, operation.

3.   Inverters & Cyclo converters
Classification of invertors-basic series inverter- parallel inverter- single-phase bridge inverter using MOSFET- voltage source inverter- PWM inverter- single Pulse– Cyclo converter – basic principle of operation.

4.   Speed Control of DC /AC Motors
DC motor control- Introduction-Speed control of DC shunt motor by using converters and choppers- speed control of induction motor by using V/F control (Converters and invertors control).

5.   Application of Power Devices
Switched mode power supplies (SMPS) - Uninterrupted power supplies (UPS) – offline and online UPS – light dimmer, burglar alarm, emergency lamp and battery charger.

REFERENCE BOOKS

1.   Power Electronics by Jamil Asghar – PHI, New Delhi.
2.   Power Electronics – Devices, Circuits and applications   PHI,New Delhi
3.   Industrial Electronics   by Chute
4.   Industrial Electronics   by Mithal
5.   Industrial Electronics   by P.C.Sen.
6.   Industrial Electronics   by Berde
7.   Advanced Power Electronics   by P.C.Sen.
8.   Industrial & Power Electronics by Harish Rai
9.   Power Electronics   by PS Bhimbra

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ELECTRICAL UTILISATION AND AUTOMATION

Subject Title : **ELECTRICAL UTILISATION AND AUTOMATION**
Subject Code : **EE-605(A)**
Periods/Week : **05**
Periods/semester : **75**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Electric Lighting	**10**	**16**	**02**	**01**
2.	Electric heating	**10**	**16**	**02**	**01**
3.	Electrical Drives and Braking	**15**	**21**	**02**	**1 1/2**
4.	Electric Traction	**25**	**36**	**02**	**03**
5.	PLC Programming	**15**	**21**	**02**	**1 1/2**
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

On completion of the study of the subject the student will be able to comprehend the following.

1.0 **Understand the principles of lighting.**
1.1 Explain the nature of light and its propagation
1.2 Define
    a) Plane and solid angles   b) luminous flux
    c) Luminous intensity   d) Lumen
    e) candle power   f) Illumination
    g) Brightness   h) Polar curve
    i) MHCP   j) MSCP
    k) MHSCP

1.3 List the types of lamps used for illumination for different situations such as domestic, industrial, decoration, advertisement and street lighting schemes
1.4 Define glare
1.5 State the requirements of good lighting
1.6 Explain different types of lamp fittings.
1.7 State the uses and advantages of each type
1.8 State and explain the laws of illumination
1.9 Solve problems on laws of illumination.
1.10 Define the terms:
    a) Utilisation factor   b) Depreciation factor   c) Waste light factor
    d) Reflection factor   e) Reduction factor   f) Absorption factor
    g) Luminous efficiency   h) Specific energy consumption
    j) Space -height ratio

1.12 Design simple Indoor lighting schemes and solve problems on calculation of
number of lamps required.

2.0   Understand the principles of electric heating

2.1   State the advantages of electric heating
2.2   List the requirements of good heating material
2.3   State the materials employed for heating
2.4   Explain Resistance heating -   Direct and Indirect
2.6   List the Industrial applications of Resistance heating.
2.7   Explain different methods of temperature control of resistance heating with
diagrams.
2.8   Explain Arc Heating - direct and indirect
2.9   List the Industrial applications of Arc Heating.
2.10   Explain Induction Heating – (Core type and Core less type)
2.11   Explain the principle of dielectric heating
2.12   List the industrial applications of dielectric heating

3.0   **Know the types of Electrical Drives and Braking methods of electric motors.**

3.1   List the factors governing the selection of electric drive.
3.2   Classify and explain the drives.
3.3   State the advantages and disadvantages of different types of drives.
3.4   State the types of loads for which drives are needed
3.5   Load curves of different types of loads.
3.6   Problems on motor Ratings using load curves.
3.7   State the need of load equalization
3.8   State the use of fly wheels
3.9   State the different types of enclosures and bearings
3.10   State the methods employed for reduction of noise
3.11   Select the suitable motors for the following drives with reasoning
(a) Domestic (b)lathes (c)drilling machines (d) flour mills (e) cranes
(f) lifts &hoists (g) grinding machines (h) pump sets (i) punches & presses
(j) wood working machines (k) printing (l) belt conveyor (m) textile mills
(n) paper mills (o) rolling mills (p) ship propulsion (q) mines (r) cement works.
3.12   Draw the Electrical circuit diagram of a Refrigerator and explain the parts.
3.13   Draw the Electrical Circuit diagram of an Air Conditioner and explain the parts.
3.14   State the advantages of electric braking.
3.15   Explain different methods of electric braking
3.16   Explain plugging of D.C. shunt and Series motors and three phase Induction
Motor.
3.17   Problems on Plugging of D.C.Motors
3.18   Explain   Rheostatic Braking of D.C. Shunt and Series Motors(Theory only)
3.19   Explain   Regenerative braking of D.C. shunt and series motor and three-phase
induction motor(Theory only).

4.0 Electric Traction.

4.0   Introduction and advantages of Electric traction.
4.1   Give the classification of systems of track electrification.
4.2   List the types of services (main line, suburban and urban) Sketch the speed-time curves for the above services
4.3   State each stage of the speed-time curve with appropriate speeds used
4.4   Explain the Block diagram of Electric locomotive showing catenary, transformer, rectifier and Electric motor.
4.5   Define Maximum speed, average speed and scheduled speed
4.6   List the factors affecting the scheduled speed
4.7   Sketch the simplified speed-time curves
4.8   Explain the practical importance of the above curves
4.9   Derive the expression for maximum speed, acceleration and retardation for trapezoidal speed time curve.
4.10   Solve numerical examples on trapezoidal speed time curves.
4.11   Explain Tractive effort
4.12   Derive the expression for tractive effort.
4.13   Explain the mechanics of transfer of power from motor to driving wheel
4.14   Define `Coefficient of adhesion'
4.15   List the factors affecting the coefficient of adhesion
4.16   State the methods of improving the coefficient of adhesion
4.17   Solve problems on calculation of number of axles required.
4.18   Explain the term specific energy consumption
4.19   Derive the formulae for energy output of drive to
            (i).   Accelerate
            (ii).   To overcome friction
            (iii). To over come gradient

4.20   List the factors affecting specific energy consumption
4.21   Solve simple problems on specific energy calculation under given conditions
4.22   Explain the purpose and material used for
            a). Catenary
            b). droppers
            c). trolley wires
            d). bow collector
            e). pantograph collector
4.23   Need of Booster Transformer.

5.0 PLC Programming

5.1   Define Programmable Logic Controller (PLC).
5.2   State the advantages of PLC.
5.3   Explain the Block diagram of PLC – parts and their purpose.
5.4   State the applications of PLC.
5.5   Explain Ladder diagram.
5.6   Explain contacts and coils – Normally open, normally closed, energised output, latched output, branching
5.7   Draw ladder diagrams for AND, OR, NOT gates.
5.8   Draw ladder diagrams for combination circuits using NAND, NOR, AND, OR and NOT.
5.9   Explain Timers – T_{ON}, T_{OFF}
5.10   Explain Counters – CTU, CTD
5.11   Draw ladder diagrams using timers and counters.
5.12   Explain PLC Instruction set.
5.13   Draw ladder diagrams for DOL starter and STAR-DELTA starter.
5.14   Explain the meaning of SCADA and mention its applications.

COURSE CONTENTS

1. **Electric Lighting**
     Nature of light and its production, Terms and definitions plane and solid angle, luminous flux, Lumen, C.P. Illumination, brightness, polar curve, MHCP, MSCP, MHSCP, - types of lamps - Requirements of good lighting different types of lamp fittings- laws of illumination- Terms and factors used in design of lighting schemes for indoor - problems

2. Heating
     Advantages of electric heating - requirements of good heating material and materials generally employed, resistance heating - Principle and applications - Temperature control of resistance furnaces - Electric arc furnaces - direct and indirect types - applications - Induction heating- core type and coreless type - Applications - Dielectric heating - principle and applications.

3. Electric Drives and Braking
     Types of Drives – Individual and Group – advantages and disadvantages – types of loads – load curves – problems on load curves – load equalization – fly wheel – types of enclosures – bearings- noise and reduction methods of noise – motors for different applications – block diagrams of refrigerator and air conditioner – Electric braking- plugging of D.C.Motors and induction motor – problems – Rheostatic braking of D.C.Motors – Regenerative braking of D.C.motors and Induction motors.

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4. Electric Traction

Introduction – classification - speed time curves-Derivation for tyrapezoidal speed time curve- different types of train services, urban and sub-urban- factors affecting scheduled speed – problems on trapezoidal speed time curves – Mechanics of train movement - Tractive effort -Coefficient of adhesion - factors affecting the coefficient of adhesion - problemson calculation of number of axles- Specific energy consumption – calculations - –overhead equipment - Booster transformer

5. PLC Programming

PLC – Definition – advantages – block diagram – parts and their purpose – applications . Ladder diagrams for boolean circuits – timers – counters – instruction set – ladder diagrams for DOL and STAR DELTA starters – SCADA- meaning – applications – software.

REFERENCE BOOKS

1. Electrical power by S.L. Uppal
2. Electrical Utilisation by J.B.Gupta
3. Utilisation of Electric Power by Openshaw Taylor
4. Utilisation of Electric energy by G.C. Garg
5. Modern Electric Traction by H. Partab
6. Programmable logic controllers (principles and applications)
   By John W. Webb , PHI Publishers.
7. Introduction to PLC by Gary Dening, Delmar Publication.

ELECTRIC TRACTION & PLC

Subject Title : **ELECTRIC TRACTION & PLC**
Subject Code : **EE-605(B)**
Periods/Week : **05**
Periods/semester : **75**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Electric Traction	**45**	**68**	**06**	**05**
2.	Programmable logic controllers	**30**	**42**	**04**	**03**
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

On the completion of the study of the subject the student will be able to comprehend the following

1.0 **Electric Traction systems**
1.1 Introduction to Electric traction
1.2 State the advantages of Electric traction
1.3 Give the classification of Electric traction systems.
1.4 Explain each traction system briefly.
1.5 Exaplin the advantages of A.C to D.C traction over other traction systems.
1.6 List the types of services (main line, suburban and urban) Sketch the speed-time
1.7 curves for the above services
1.8 State each stage of the speed-time curve with appropriate speeds used
1.9 State the importance of speed-time curves
1.10 Define Maximum speed, average speed and scheduled speed
1.11 List the factors affecting the scheduled speed
1.12 Sketch the simplified speed-time curves
1.13 Explain the practical importance of the above curves
1.14 Derive the expression for maximum speed, acceleration and retardation of Trapezoidal speed time curve and quadrilateral speed time curves.
1.15 Solve numerical examples on the above speed time curves.
1.16 Explain tractive effort.
1.17 Derive the expression for tractive effort.
1.18 Solve problems on tractive effort.
1.19 Explain Mechanics of power transfer from motor to driving wheel
1.20 Define `Coefficient of adhesion'

1.21   List the factors affecting the coefficient of adhesion
1.22   State the typical values of coefficient of adhesion for steam, diesel and electric
        Drives.
1.23   State the methods of improving the coefficient of adhesion
1.24   Solve problems on Co-efficient of adhesion to calculate no of axles required for a
        locomotive.
1.25   Explain the term specific energy consumption
1.26   Derive the formula for specific energy consumption.
1.27   List the factors affecting specific energy consumption
1.28   Solve simple problems on specific energy consumption under given conditions
1.29   State the important requirements of traction motor
1.30   Explain the suitability of different motors (A.C& D.C) for traction
1.31   Explain with neat sketch the control of traction motor by autotransformer method in
        Single phase 25 KV system
1.32   Explain the purpose and material used for
             a). Catenary
             b). droppers
             c). trolley wires
             d). bow collector
             e). pantograph collector
1.33   Need of Booster Transformer.
1.34   Explain END-ON Generation and MID-ON Generation.
1.35   Draw the block diagram of an Electric locomotive and explain the parts.

2.0   **Programmable Logic Controllers**

2.1   Define Programmable Logic Controller (PLC).
2.2   State the advantages of PLC.
2.3   Explain the Block diagram of PLC – parts and their purpose.
2.4   Explain different memories used in PLC.
2.5   Explain PLC scan.
2.6   State different manufacturers of PLC
2.7   State the applications of PLC.
2.8   Explain Ladder diagram.
2.9   Explain contacts and coils – Normally open, normally closed, energised output,
        latched output, branching
2.10   Draw ladder diagrams for AND, OR, NOT gates.
2.11   Draw ladder diagrams for combination circuits using NAND, NOR, AND, OR and
        NOT.
2.12   Explain Timers – TON, TOFF and Retentive timer
2.13   Explain Counters – CTU, CTD
2.14   Draw ladder diagrams using timers and counters.
2.15   Explain PLC Instruction set.

COURSE CONTENTS

1.   Electric Traction

Introduction – advantages of electric traction-different systems of train electrification - speed time curves – Trapezoidal and quadrilateral –problems-different types of train services, urban and sub-urban- factors affecting scheduled speed - Tractive effort - problems – Mechanics of train movement - Coefficient of adhesion - factors affecting the coefficient of adhesion -problems -Specific energy consumption – calculations - Traction motors A.C & D.C – control of traction motor by auto trans former –overhead equipment - Current collecting gears - Booster transformer – END-ON and MID-ON generation – Block diagram of locomotive.

2.   Programmable logic controllers

PLC – definition –advantages – block diagram – memories – PLC scan – applications – Ladder diagrams for AND, OR, NOT, NAND, NOR – ladder diagrams for stair case lighting, DOL,   star delta starters , water level controller, lift , traffic light-temperature controller – I/O devices – proximity switch –reed switch – pneumatic switch – actuator – rotary encoders –communication standards – SCADA.

REFERENCE BOOKS

1. Electrical power by   S.L. Uppal
2. Electrical Utilisation   by Gupta
3. Utilisation of Electric Power   by Openshaw Taylor
4. Utilisation of Electric energy by R.K. Gang
5. Electric Traction by   H. Partab
6. Programmable Logic Controllers By John W.Webb

ELECTRIC TRACTION AND RENEWABLE ENERGY SOURCES

Subject Title : **ELECTRIC TRACTION AND RENEWABLE ENERGY SOURCES**
Subject Code : **EE-605 (C)**
Periods/Week : **05**
Periods/semester : **75**

TIME SCHEDULE

SI. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Electric Traction	40	52	04	04
2.	Introduction to Renewable energy sources	02	03	01	
3.	Solar and Wind Energy	16	29	03	02
4.	Bio and Tidal Energy	12	13	01	01
5.	Combined Cycle power Plants	05	13	01	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES

On the completion of the study of the subject the student will be able to comprehend the following

1.0 Electric Traction systems
1.1 Describe single-phase A.C. and composite systems
1.2 State the advantages and disadvantages of electric traction
1.2 List the types of services (main line, suburban and urban) Sketch the speed-time Curves for the above services
1.3 State each stage of the speed-time curve with appropriate speeds used
1.4 State the importance of speed-time curves
1.5 Define Maximum speed, average speed and scheduled speed
1.6 List the factors affecting the scheduled speed
1.7 Sketch the simplified speed-time curves
1.8 Explain the practical importance of the above curves
1.9 Derive the expression for maximum speed, acceleration and retardation (Trapezoidal & Quadrilateral speed time curves)
1.10 Solve numerical examples on speed time curves
1.11 Explain the tractive effort
1.12 Derive the expression for tractive effort for acceleration, to over come gravity pull and train resistance
1.13 Calculate the tractive effort under given conditions

1.14   Explain the mechanics of transfer of power from motor to driving wheel
1.15   Define `Coefficient of adhesion'
1.16   List the factors affecting the coefficient of adhesion
1.17   State the typical values of coefficient of adhesion for steam, diesel and electric Drives
1.18   State the methods of improving the coefficient of adhesion
1.19   Explain the term specific energy consumption
1.20   Derive the formulae for energy output of drive to
        i)   Accelerate
        ii) To overcome friction
        iii) To over come gradient
1.21   List the factors affecting specific energy consumption
1.22   Solve simple problems on specific energy calculation under given conditions
1.23   State the important requirements of traction motor
1.24   Explain the suitability of different motors (A.C& D.C) for traction
1.25   Explain with neat sketch the control of traction motor by autotransformer method in Single phase 25 kV system
1.26   Explain the purpose and material used for
        a) Catenary
        b) droppers
        c) trolley wires
        d) bow collector
        e) pantograph collector
1.27   Need of Booster Transformer.
1.28   Explain train lighting systems

2.0   Introduction to Renewable Energy Sources
2.1   To appreciate the need of renewable energy sources
2.2   State the different types of renewable energy sources

3.0   Solar and Wind Energy
3.1   State the amount of solar radiation reaching the earth's surface
3.2   Determine the solar constant
3.3   State the principle of conversion of solar radiation into heat.
3.4   Explain the function of flat plate collector
3.5   Explain the working principle of solar air heater with neat sketch and application
3.6   Identify different types of concentrating collectors
3.7   Explain the working principle of concentrating collector (focusing type, parabolic trough   collector)
3.8   State the different methods of storing solar energy
3.9   Explain the working principle of solar pond with a sketch
3.10   State the applications of solar pond
3.11   Explain with the help of sketches the construction details and working principle of different types of solar water heater, solar still, and solar cooker.
3.12   Understand the principle of photo –voltaic conversion and applications
3.13   Understand the solar photovoltaic arrays
3.14   State the working principle of solar cell
3.15   Explain the conversion energy and current voltage characteristics of solar cell.
3.16   Explain the solar water pumping system with a sketch

3.17   Understand the power available in the wind and force caused by it on the blades.
3.18   State the collection of wind data and estimate the energy
3.19   State the different considerations for sight selection for installing wind mill.
3.20   Identify the basic components of a wind mill
3.21   Explain the construction details on the working principle of the wind mill

4.0   Bio and Tidal Energy

4.1   Understand the meaning of bio-mass and bio-gas
4.2   State the principle of bio-gas generation and its applications
4.3   List out the different types of bio-gas plants
4.4   Explain the construction and working of fixed dome type and floating dome type bio-gas   Plants with sketches
4.5   Express bio-gas plant capacity
4.6   Identify the energy available in tides and its usefulness in conversion
4.7   State the working principle of tidal power plant
4.8   State the types of tidal power plants.
4.9   Understand single basin and double basin arrangements
4.10 State the site requirements for installation of tidal power plant
4.11   State the advantages and limitations of tidal power generation

5.0   Combined cycle power plants
5.1   Explain with block diagram the working of combined cycle power plants
5.2   State the advantages of combined cycle power plants over conventional coal fired Thermal Power plant.
5.3   State the applications of Combined cycle Power Plants.

COURSE CONTENTS

1.0   Electric Traction systems
Introduction - different systems of train electrification - speed time curves - different types of train services, urban and sub-urban- factors affecting scheduled speed - problems – Mechanics of train movement - Coefficient of adhesion - factors affecting the coefficient of adhesion - Tractive effort - problems -Specific energy consumption – calculations - Traction motors A.C & D.C – control of traction motor by auto trans former –overhead equipment - Current collecting gears - Booster transformer –Train Lighting Systems.

2.0   Introduction to renewable Energy Sources
Need of renewable energy sources-different types of renewable energy sources

3.0   Solar and Wind Energy
Solar radiation-Solar constant-principle of Conversion of solar radiation into heat-Function of flat plate collector-Working principle of Solar air heater-Different types of concentrating collectors and working of it-methods of storing solar energy-principle of solar pond-Applications-Construction details, Working of different types of solar water

heaters, Solar still & Solar cooker- Principle of photo voltaic conversion-Applications-Solar photo voltaic arrays-Working principle of solar cell-VI-Characteristics of Solar cell-Solar water pumping System-power available in wind-Wind data-energy estimation-Site selection for installing Wind mill-basic components ,constructional details and working principle of wind mill.

4.0 Bio and Tidal Energy
Introduction to bio – mass ,bio-mass conversion into energy bio-gas generation, Principle of bio gas generation & its applications-Different type of Bio gas plants-Construction and working of fixed dome type and floating dome type bio-gas plants - Bio –gas plant capacity-Energy available in tides and its usefulness in-working principle of tidal power plants –types of Tidal power plants-Single basin and double basin arrangements-Site requirements for installation of tidal power plants-Advantage and limitations of tidal power generation

5.0 Combined cycle power plants
Block diagram-Working of combined cycle power plants-Advantages and applications of combined cycle power plant

REFERENCE BOOKS

1. Electrical Technology Vol III by   B L Theraja
2. Electric Traction by H. Partab
3. Non conventional Energy source by G.D Rai.
4. Energy Technology by S. Rao & Dr. D.B. Palekr
     (Non conventional , Renewable and conventional)
5. Solar energy utilisation by G.D.Rai
6. Introduction to alternate sources of energy by TTTI, Madras
7. Solar energy by S.P. Sukhatme
8. Advances in bio-gas technology by O.P.Chawla.
9. Energy sources and conservation by Pakirappa

POWER SYSTEMS - II

Subject Title : **POWER SYSTEMS - II**
Subject Code : **EE-606**
Periods / week : **06**
Periods / Semester : **90**

TIME SCHEDULE

Sl. No.	Major Topics	Periods	Weightage of Marks	Short Questions	Essay Questions
1.	Transmission lines	20	31	02	2 ½
2.	HVDC transmission	05	03	01	--
3.	Line structures for transmission and Distribution	20	26	02	2
4.	Substations and Cables	10	11	02	½
5.	Distribution Systems	10	13	01	01
6.	Protection of transmission lines and Feeders	15	13	01	01
7.	Lightning arresters and Neutral grounding	10	13	01	01
	Total	**90**	**110**	**10**	**08**

OBJECTVES

On the completion of study of the subject the student should be able to comprehend the following

1.0 Comprehend the need for transmission and choice of supply systems
1.1 State the need of transmission lines and distribution lines
1.2 Explain the transmission supply systems
      a). D.C
      b). A.C
1.3 State the relative advantages of D.C and A.C. transmissions
1.4 State the supply systems based on the conductor material required for overhead lines and underground cables among
      a). AC - 1 ph 2 wire system
      b). AC - 3 ph 3 wire system
      c). DC – 2 wire system
1.5 Explain the effects of
      a). Supply frequency
      b). Supply voltage on transmission lines
1.6 Explain the effect of voltage on
    a)   Line efficiency
    b)   Voltage drop
    c)   Line loss
    d)   Volume of conductor material
    e)   Cost of transformers, insulators, and switchgear supports etc.
1.7 State the empirical formula for determining the system voltage

1.8   State the requirements of conductor material
1.9   State the type of transmission line conductors
       a) Solid   b) Stranded   c) Hollow   d) Bundled conductors
1.10   State the relative merits of different types of above conductors
1.11   Explain the current distortion effects
       a)   Skin effect
       b)   Proximity effect
       c)   Spirality effect
1.12   Use the conductor tables for the determination of resistance of   solid, ACSR and
       AAAC conductors(I.S.398)
1.13   Expression for inductance of
       a)   1 phase
       b)   3 phase symmetrical and asymmetrically spaced round conductors
             (No derivation)
1.14   State the need for transposition of overhead lines
1.15   Explain the effects of transposition
1.16   Define capacitance
1.17   Expressions for capacitance of
       a)   1 phase
       b)   3 phase symmetrically spaced, asymmetrically spaced and transposed lines
             round conductors (No- Derivation)
1.18 Use the conductors tables for determining the inductance and capacitance of
       overhead lines of different voltage
1.19   Define short, medium and long lines.
1.20   State the reasons for the constants lumped in short lines and medium transmission
        lines.
1.21   Define `regulation' and percentage regulation.
1.22   Derive the approximate formula for percentage regulation.
1.23   Computing for short line
       a)   Sending end voltage
       b)   Sending end P.F
       c)   percentage regulation
       d)   Efficiency for the given receiving end condition
1.24   Solve problems on short lines
1.25 Compute the percentage regulation, efficiency of medium transmission lines with
        given receiving end conditions and line parameters using
       a)   Nominal (pie) method
       b)   Nominal T- method
         (Solve problems on nominal Pie method only)
1.26   Draw the phasor diagram in the above methods
1.27   Explain the charging current in lines and power loss due to it
1.28   State `Ferranti' effect
1.29   Compute the rise in voltage at the receiving end
1.30   State the factors affecting corona
1.31   Explain corona in transmission lines
1.32   State the disruptive critical voltage and the formula for its calculation
1.33   State the empirical formula for power loss due to corona
1.34   State the effect of corona
1.35   Explain the methods of reducing corona

1.36   Explain the concept and applications of hot line technique

2.0 Understand HVDC transmission
2.1   Explain the importance of HVDC Transmission of power
2.2   Discuss basic concepts of HVDC transmission
2.3   Know the location of Projects in India and abroad
2.4   Discuss the advantages and disadvantages of HVDC transmission
2.5   Discuss the protective measures to be adopted for HVDC system

3.0   Line structures for transmission and Distribution
3.1   State the main components of overhead lines
3.2   State the requirements of line supports
3.3   List the factors influencing the selection of the line supports
3.4   a)   List the types of line supports
        b)   State the advantages and disadvantages of each as a line support
3.5   Describe a method of laying foundation to poles
3.6   a)   State the need for cross arms
        b)   Give the formula for economical spacing of conductors
3.7   State the necessity for pole guys
3.8   Describe the methods of fixing of guys
        i)   Bow
        ii)   Fly guys
3.9   State the factors on which the conductor spacing and ground clearance depend
3.10   List the common conductor spacing and ground clearances adopted for
        i)   66 KV
        ii)   33 KV
        iii)   II KV
        iv)   L.T. lines
3.11   Explain the procedure of Earthing L.T.11 KV and 33 KV lines with different supports
3.12   List the Maximum earth resistance value together with the size of pipe or plate used for Earthing
3.13   State the types of towers with sketches for 132 Kv,220 KV,400 KV and the common spans adopted in the country (both single and double circuit)
3.14   State the minimum ground clearances adopted for
        a)   132 KV
        b)   220 KV.
        c)   400 KV
3.15   Explain a method of laying foundation to towers
3.16   Define `sag'
3.17   State the factors affecting the sag
3.18   Derive an equation for the approximate method of calculating sag.
        a) when the supports are at the same level (a) in still air and
        b) with the effect of wind and ice
        c) when the supports are at different levels
3.19   solve the problems on above
3.20   State the disadvantages of loose spans (sag more than prescribed value)
3.21   State the importance of using stringing charts
3.22   State the purpose of insulators in transmission and distribution lines
3.23   State the requirements of insulators

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3.24 State applications of
    a)   Pin type
    b)   Strain type
    c)   Suspension type insulators
    d)   Shackle type
3.25 Tabulate the relative merits of pin and suspension type   insulators
3.26 Conclude that the voltage across a string does not distribute uniformly across the individuals discs
3.27 Define the terms
    a) Flashover
    b) Puncture
    c) String-efficiency
3.28 Solve problems on distribution of voltage across string
3.29 State the methods of improving string efficiency
    a) By eliminating ground capacitance
    b) By grading of the units
    c) Static shielding(guard ring)
3.30 Solve problems in equalisation of potential across a string
3.31 State the need for arcing horns and guard rings
3.32 List causes of failure of insulators in transmission and distribution lines

4.0 Substations and Underground Cables
4.1 Explain the need for substations
4.2 State the relative merits of indoor and outdoor substation
4.3 Name the equipment used in substation
    a) Bus bars   b)   Insulators
    c) Transformers   d)   Switch gear
    e) Indicating and metering equipment
    f) Protective relays   g)   Lightning arrestors
    h) Cables   i)   Fire fighting equipment
4.4 Substation auxiliary supply
4.5 Sketch typical scheme of bus bar arrangements
4.6 Sketch the typical layouts of
      33/11 KV substation
      132/11 KV substation
4.7 Define cables
4.8 Compare overhead lines with underground cables
4.9 State the classification of cables according to
    a)   Number of conductors
    b)   Voltage
    c)   Insulation and lead sheathing
    d)   The methods of improving the dielectric stresses
4.10 Derive an equation for the insulation resistance of a cables & solve problems on insulation resistance

5.0 Understand the Different Distribution Systems
5.1 Distinguish between primary distribution and secondary distribution
5.2 Explain Feeder, distribution and service mains
5.3 Classify the type of distribution systems according to

<table>
<tr><td>a)</td><td>Type of current</td><td>b)</td><td>Construction</td></tr>
<tr><td>c)</td><td>Service</td><td>d)</td><td>Number of wire</td></tr>
<tr><td>e)</td><td>Scheme of connections</td><td></td><td></td></tr>
</table>

5.4 List the type of distribution systems
    a) radial and
    b) ring systems
5.5 State the advantages and disadvantages of radial and ring systems
5.6 List the steps involved in the voltage drop calculations in A.C. distributors
5.7 Solve problems on voltage drop calculations in A.C. distributors.

6.0 Protection of Transmission Lines and Feeders
6.1 Understand transmission line and feeder protection.
6.2 Explain pilot wires and their effects.
6.3 Explain the protection of transmission lines using distance and impedance relays.
6.4 Explain the combined protection by using definite distance and time distance relays.
6.5 Explain protection of radial feeders using time graded fuses.
6.6 Explain protection of parallel feeders using directional relays.
6.7 Explain protection of ring main feeder using directional relays. Mention the relation between number of sections and minimum relay time.
6.8 Explain differential protection for parallel feeders of transmission lines.
6.9 Explain the different schemes of protection for single and duplicate bus bars.

7.0 Lighting Arrestors and Neutral Grounding.
7.1 Define surge, its types, and causes for production.
7.2 Explain the scheme of surge protection with diagram.
7.3 Explain the types of lightning arrestors or surge diverters.
7.4 Explain the construction, working and applications of Valve type lighting arrestor
7.5 Explain the construction, working and applications of Thyrite type lighting arrestor
7.6 Explain necessity of neutral grounding and give its merits and demerits.
7.7 Describe types of grounding the neutral and compare them.

COURSE CONTENTS

1.Transmission Lines-Need for transmission lines-Transmission supply systems, Relative advantages of AC & DC Transmission, Choice of frequency, Choice of voltage, Effect of voltage, Empirical formula for determining the system voltage, Requirements of conductor material - Types of conductor-Solid-Stranded-Hollow- Bundled conductors -Relative merits of different types of conductors -Transmission parameters: Resistance, Inductance capacitance-skin effect, proximity effect, spirality effect-Determination of resistance of solid, ACSR and AAAC conductors using conductor tables-Determination of inductance of Round and Parallel Conductors ,Transposition of O.H. lines-Effect of transposition on Inductance calculations in transposed lines, Calculation of capacitance in round and parallel conductors -Use of conductor tables of determination of inductance and capacitance of transmission lines-Regulation and % Regulation-Approximate formula for Regulation-Short line calculation of-Efficiency-Regulation-Sending end voltage-sending end p.f. for the given receiving end conditions -Regulation-Sending end voltage-sending end p.f. for the given receiving end conditions in medium transmission lines using Nominal pie method-Nominal T method -Vector diagrams in the above methods-Charging current in

lines-Ferranti's effect-Carona in transmission lines-Power loss due to corona-Effects of corona-Methods of reducing corona - Hot line technique - concept and application

2. High voltage DC Transmission: HVDC projects in India and abroad- Advantages and disadvantages of HVDC transmission. Basics of protection of HVDC systems

3. Line structure for Transmission and Distribution: Requirements of line supports, Factors influencing the selection of line support-Types of lines supports-Foundation for poles Descriptive treatment- Cross arms for L.T and H.T lines upto 33 KV- Pole guys-Conductors spacing and ground clearance-Methods of earthing- L.T., 11 KV and 33 KV lines-Max.earth resistance-Types of towers used for 132 KV and 220 KV /400kv lines spaces-Approximate ground clearance-Foundation to towers Earthing of towers Sag, Factors affecting sag, calculating sag. Disadvantages of loose span, stringing charts, Insulators, Requirements of insulators , Materials used , Types of Insulators, Voltage distribution across string of suspension Insulators, string efficiency, Flashover, Puncture, string efficiency, improving string efficiency, eliminating the ground capacitance, grading, static shielding , Arcing horns and guard rings, Causes for failure of insulators

4. Substations and Cables
Definition and classification of sub-stations, Relative merits of indoor and outdoor sub-stations
Equipment in sub-stations Bus-bars, Insulators, Switch gear, Transformer, Protective relays, Meters, Lightning arrestors, Cables, Fire fighting equipment, Bus bar arrangements - Typical sketches Typical layouts and sketches of 33/11KV SS, 132/11 KV, Earthing adopted in 132/11KV, 33/11 KV
Cables, Comparison between O.H. Lines and underground cables, Classification of cables, Insulation resistance of cables, Specifications of cables

5. Distribution Systems
Primary and secondary distribution, Feeders, distribution and service mains, Classification of Distribution systems, Radial and Ring system of Distribution, A.C. Distribution - single phase, Steps in voltage drop calculation.

6. Protection of transmission lines and Feeders

        Protection of Transmission Lines and Feeders, Transmission line and feeder protection Pilot wires, protection of transmission lines using distance and impedance relays. Combined protection using definite distance and time distance relays – Protection of redial feeders, parallel feeders, ring main feeders using time graded fuses directional relays. Types of lighting arrestors – Working and applications of rod gap, sphere gap, horn gap, valve type, thyrite type and lead oxide.

7. Lighting Arrestors and Neutral grounding

        Surge Protection- Need for Surge Protection Surge types and causes of surges – Scheme of surge protection with diagram. Various types of LA's – Value type, Thyrite type -Necessity of neutral grounding, its merits and de-merits- Methods of Grounding the neutral.

Reference Books

1. Principle of Power systems   - V.K. Mehta
2. Electrical power - S.L. Uppal
3. Text book of Elect. Power   - sony,Gupta Bhatnagar
4. Electrical Power - JB Gupta
5. Electrical power Systems - CL Wadhwa
6. HVDC Power Transmission system Technology - KR Padiyar

A.C. MACHINES LABORATORY- II

Subject Title	:	**A.C.MACHINES LABORATORY-II**
Subject code	:	**EE – 607**
Periods/Week	:	**06**
Periods/Semester	:	**90**

List of Experiment :

1.   Brake test on 3-phase squirrel cage induction motor.
2.   Brake test on 3-phase slip ring induction motor.
3.   Conduct suitable tests and draw circle diagram of squirrel cage induction motor.
4.   Conduct suitable tests and draw circle diagram of slip ring induction motor.
5.   Conduct load test on synchronous motor and draw V and inverted V curves.
6.   Conduct load test on split phase induction motor.
7.   Conduct load test on capacitor type induction motor.
8.   Conduct load test on single-phase Universal motor.
9.   Identify the faults and rectify the faults of a D.C. shunt motor.
10.   Identify the faults and rectify the faults of D.C. compound motor.
11.   Identify and rectify the faults in D.C 3 point starter, D.O.L Starter and Rotor resistance starter.
12   Identify and rectify the faults in manual and automatic star/Delta starter

13.   Overhauling of a D.C. machine.
14.   Overhauling of a table fan and ceiling fan.
15.   Identify and rectify the faults in a single-phase motor.
16.   Repair domestic appliances such as:
    a) Automatic Electric Iron,
    b) Wet grinder,
    c) Mixer,
    d) Water Heater.
17.   Overhauling of 3-phase induction motor.
18.   Rewinding of single-phase induction motor.
19.   Rewinding of 3-phase induction motor .
20.   Testing of over current relay.
21.   Testing of a Miniature circuit breaker.

POWER ELECTRONICS LAB

Subject Title	:	**POWER ELECTRONICS LAB**
Subject code	:	**EE – 608**
Periods/Week	:	**03**
Periods/Semester	:	**45**

POWER ELECTRONICS LAB

LIST OF EXPERIMENTS

1. Characteristics of SCR

2. Characteristics of IGBT

3. Characteristics of DIAC

4. Characteristics of TRIAC.

5. Characteristics of GTO

6. Study of Single – Phase Half and Fully controlled Bridge

7. Study of Single phase invertors using SCR's

8. D.C Motor speed control using Single phase Half converter

9. D.C Motor speed control using Single phase Full converter SCR Bridge.

10. Control the speed of a given single phase motor using SCR

11. Speed control of DC Motor using Chopper

12. Study of DIAC & TRIAC Lamp control.

13. Battery charger circuit using SCR

Electrical CAD LAB

Subject Title	:	**Electrical CAD LAB**
Subject code	:	**EE – 609**
Periods/Week	:	**03 (for EE-608 and EE-609)**
Periods/Semester	:	**45 (for EE-608 and EE-609)**

CAD   LAB

LIST OF EXPERIMENTS

Using AutoCAD :

1. Study the AutoCAD screen, various toolbars and menus.

2. Exercise on usage of Draw and modify tool bar.

3. Exercise on mirror, rotate, Array and Move commands.

4. Exercise on Dimensioning

5. Exercise on Hatching

Using Electrical CAD :

6. Draw Electrical Symbols.

7. Draw Poles and Towers

8. Draw Pipe and Plate Earthing.

9. Draw Guarding systems.

10. Draw different types of Stays.

INDUSTRIAL AUTOMATION LAB

SUBJECT TITLE	**:**	**INDUSTRIAL AUTOMATION LAB**
SUBJECT CODE	**:**	**EE-610**
PERIODS / WEEK	**:**	**3 (for EE-609 and EE-610)**
PERIODS/SEMESTER	**:**	**45 (for EE-609 and EE-610)**

INDUSTRIAL AUTOMATION LAB

LIST OF EXPERIMENTS:

1. Demonstration of PLC and Ladder diagram – Preparation, downloading, running.

    Execution of ladder diagrams :

2. Ladder diagrams for AND, OR, NOT gates.

3. Ladder diagrams for the combination circuits using AND,OR, NAND
    and NOR gates.

4. Ladder diagrams using Timers.

5. Ladder diagrams using Counters

    Execution of ladder diagrams with model applications :

6   Ladder diagram for stair case lighting and running the model
    application.

7. Ladder diagram for Traffic light and running the model application.

8. Ladder diagram for Water Level Controller and running the model
    application.

9. Ladder diagram for Temperature controller and running the model
    application

10. Demo of DOL Starter, Star-Delta Starter, Conveyor and Lift application
    models.

PROJECT WORK

Subject Title   :   **PROJECT WORK**
Subject code   :   **EE – 611**
Periods/Week   :   **02**
Periods/Semester   :   **30**

The project proposed includes Entrepreneurship project and assembling of small Electrical and Electronics gadgets etc.,. The members of faculty have to identify the need base new projects suitable for rural Technology and rural electrification Systems (Like Solar Cooker, solar water heater, solar lamps, small wind mill power Generation, model Traction, Model Power Houses, PLC based and Microprocessor based projects, maintenance of Machines,Dynamic models of Electric machines, motor winding, Transformer winding, Lighting systems in Industries, Energy management Techniques, Advanced Lighting systems, Electric traction technologies, LED lamp applications, Inverters, UPS, Speed Control techniques using thyristors, automatic Power factor correction, Advanced Energy Meters, E- Byke technology, solar operated vehicles, automatic street light controls, remote control operated electrical devices , Battery designs and its maintenance, Sealed maintenance free batteries, design of Illumination techniques using advanced luminaries,etc.,)