GOVERNMENT OF ANDHRA PRADESH

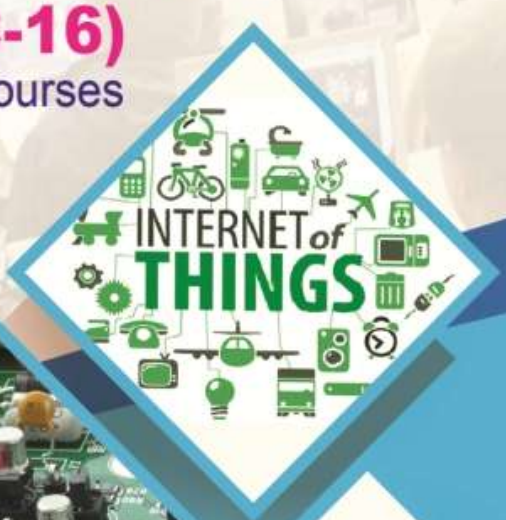
STATE BOARD OF TECHNICAL EDUCATION AND TRAINING

Andhra Pradesh :: Amaravathi

Globally Competetive

CURRICULUM (C-16)

For Polytechnic Diploma Courses
In Andhra Pradesh



DIPLOMA IN CIVIL ENGINEERING

Front Cover Page

Objective of the New Curriculum (C-16)

To make the students 'Globally Competetive & Employable' by learning industry relevant subjects & undergoing Industrial training

Suggestions from Industrialists have been incorporated in the Curriculum by organising **Industry Institute Interaction Meet.**

Highlights of the Curriculum (C-16)

- 6 months /1 year industrial training in all the Diploma Courses.
- 1 year industrial training in collaboration with BOAT (Board of Apprenticeship & Training (SR), Chennai).
- Virtual labs for ECE & Computer Branches & Strengthening of Skill Development Centers to provide industrial training to students.

Fundamentals of 'Internet of Things' (IoT) is included for all the Branches in the Subject "Industrial Management & Smart Technologies".

"Communication Skills" and "Life Skills" have been introduced as practical subjects for all the Branches.

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"Computer Fundamentals Laboratory" is introduced for all the Branches in First year. AutoCAD specific to the Branch has been given emphasis in the Curriculum.

C Language, Programmable Logic Controllers (PLC), Microcontrollers, Solar Energy are introduced in Electrical Engineering Branch.

Mobile Communications, Consumer Electronics are introduced in Electronics and Communication Branch

CAD/ CAM, CNC Machines, Power Plant Engineering are introduced in Mechanical Engineering Branch.

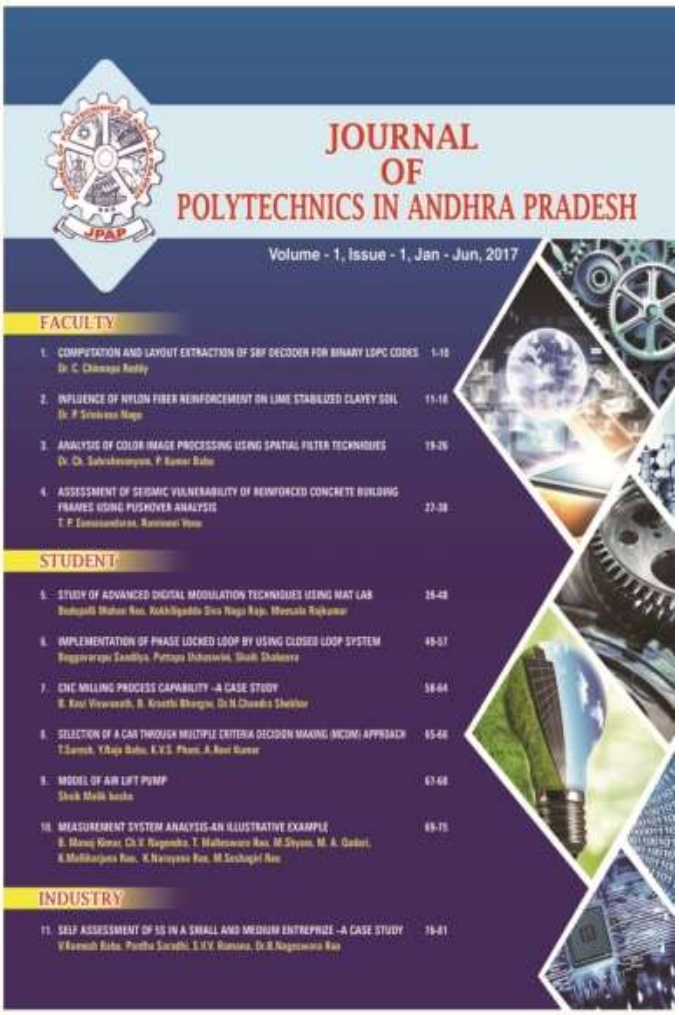
OOPS through JAVA, Web Designing, Computer Hardware & Networking are introduced in Computer Engineering Branch.

Automobile Chassis and Body Engineering, Recent Trends In Automobile Engineering, Motor Transport Organization etc are introduced in Automobile Engineering Branch.

Back Cover Page-Inside

Journal (JPAP)

The Department of Technical Education, A.P. has a bi- annual 'Journal of Polytechnics of Andhra Pradesh' JPAP



CISCO

CISCO ACADEMIES IN POLYTECHNICS

- 70 Government Polytechnics chosen to have Cisco Academies
- Course Content of CISCO has been incorporated into the ECE and Computer Diploma Courses
- CISCO to train Staff of Polytechnics in two phases to enable them to run the courses effectively
- Students to get 'Certificate from CISCO' along with Diploma Certificate.

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CURRICULUM-2016
(C-16)

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 needs of the industries and enhancing the employability skills of Polytechnic students, the Government of Andhra Pradesh constituted a committee vide G.O.Rt.No:95 of Higher Education (TE) Dept dated: 29-4-2016 and G.O.Rt.No:98 of Higher Education (TE) Dept dated: 4-5-2016 for updation of polytechnic curriculum under the chairmanship of Sri. S. Balasubrahmanyam, IAS (Retd.,). The committee submitted a report on 31-5-2016 making certain recommendations and suggesting new initiatives to be incorporated in the curriculum. An Industry Institute Interaction Meet was organized with Industry experts and subject experts on 26-12-2016 and the suggestions from Industrialists have also been incorporated in the curriculum. 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, besides reviewed by Expert Committee constituted with eminent academicians.

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

The revised New Curriculum i.e., Curriculum–2016 (C-16) is approved by BoG of SBTET for its implementation with effect from 2016-17.

Salient Features:

1. Duration of course is either 3 years / 3½ years duration of Regular Academic Instruction.
2. The Curriculum is prepared in Semester Pattern. However, First Year is maintained as Year-wise pattern.
3. 6 Months/ 1 year Industrial Training is introduced for all the Diploma courses.

4. Fundamentals of Internet of Things (IOT) is introduced for all the Diploma courses in the subject.
5. Modern subjects relevant to the industry are introduced in all the Diploma courses.
6. CISCO course content has been incorporated into the ECE and CME courses to get certification from CISCO along with Diploma.
7. The policy decisions taken at the State and Central level with regard to environmental science are implemented by including relevant topics in Chemistry. This is also in accordance with the Supreme Court guidelines issued in Sri Mehta's case.
8. 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, reading and writing skills in English. Further as emphasized in the meetings, Communication Skills lab and Life Skills lab are introduced for all the branches.
9. Modern topics relevant to the needs of the industry and global scenario suitable to be taught at Diploma level are also incorporated in the curriculum.
10. AutoCAD specific to the branch has been given more emphasis in the curriculum. Preparing drawings using CAD software has been given more importance.
11. Every student is exposed to the computer lab at the 1st year itself in order to familiarize himself with skills required for keyboard/mouse operation, internet usage and e-mailing.
12. Upon reviewing the existing C-14 curriculum, it is found that the theory content is found to have more weightage than the Practical content. In the revised C-16 curriculum, more emphasis is given to the practical content of Laboratories and Workshops, thus strengthening the practical skills.
13. With increased emphasis for the student to acquire Practical skills, the course content in all the subjects is thoroughly reviewed and structured as outcome based than the conventional procedure based.
14. Curricula of Laboratory and Workshops have been thoroughly revised based on the suggestions received from the industry and faculty, for better utilization of the equipment available at the Polytechnics. The experiments /exercises that are chosen for the practical sessions are identified to conform to the field requirements of industry.
15. The Members of the working group are grateful to Sri G.S. Panda Das, I.A.S., Special Commissioner of Technical Education & Chairman of SBTET, AP. and Sri. Adityanath Das, I.A.S., Principal Secretary of Higher Education for their guidance and valuable inputs in revising, modifying and updating the curriculum.
16. The Members acknowledge with thanks the cooperation and guidance provided by Sri. A.Nirmal Kumar Priya, Secretary, SBTET, Andhra Pradesh and other officials of Directorate of Technical Education and the State Board of Technical Education, Andhra Pradesh, experts from industry, academia from the universities and higher learning institutions and all teaching fraternity from the Polytechnics who are directly or indirectly involved in preparation of the curricula.

RULES AND REGULATIONS

1 DURATION AND PATTERN OF THE COURSES

All the Diploma programs run at various institutions are of AICTE approved 3 years or 3½ years duration 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. In respect of few courses like Diploma in BM course, the training will be in the seventh semester. Run-through system is adopted for all the Diploma Courses, subject to eligibility conditions.

2 PROCEDURE FOR ADMISSION INTO THE DIPLOMA COURSES:

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

a) Candidates who wish to seek admission in any of the Diploma courses will have to appear for Common Entrance Test for admissions into Polytechnics (POLYCET) conducted by the State Board of Technical Education and Training, Andhra Pradesh, Vijayawada.

Only the candidates satisfying the following requirements will be eligible to appear for the Common Entrance Test for admissions into Polytechnics (POLYCET).

b) The candidates seeking admission should have appeared for S.S.C examination, conducted by the Board of Secondary Education, Andhra Pradesh or equivalent examination thereto, at the time of making application to the Common Entrance Test for admissions into Polytechnics (POLYCET). In case of candidates whose results of their Qualifying Examinations is pending, their selection shall be subject to production of proof of their passing the qualifying examination in one attempt or compartmentally at the time of admission

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

d) For admission into the following Diploma Courses for which entry qualification is 10+2, candidates need not appear for POLYCET. 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 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 admitted candidate to maintain academic records.

5 NUMBER OF WORKING DAYS PER SEMESTER / YEAR:

a). The Academic year for all the Courses shall be in accordance with the Academic Calendar.

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 the syllabus.

6 ELIGIBILITY OF ATTENDANCE 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 upto 10% (65% and above and below 75%) in each semester or 1st year may be granted on medical grounds.

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

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

e). Students whose shortage of attendance is not condoned in any semester / 1st year and not paid the condonation fee in time 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.

7 READMISSION

Readmission shall be granted to eligible candidates by the respective Principal/ Regional Joint Director.

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

   b) For Industrial Training: before commencement of the Industrial training.

2. Within 30 days after commencement of class works in any year (including D. Pharmacy 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 beginning of the regular class work for that year / Semester, as officially announced by CTE/SBTET but not from the day on which he/she has actually reported to the class work, after readmission is granted.

8 SCHEME OF EXAMINATION

a) First Year

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.

b) III, IV, V, VI and VII Semesters:

THEORY EXAMINATION: Each subject carries usually 80 marks and 30 marks in respect of specified subjects of 3hours duration, along with 20 marks for internal evaluation (sessional marks) respectively.

PRACTICAL EXAMINATION: Each subject carry 60/30 marks of 3hours duration 40/20 sessional marks.

9 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. **Three unit tests will be conducted for I year students and two Unit Tests for semesters.** Average of marks obtained in all the prescribed tests will be considered for awarding the sessional marks.

b) Practical Subjects: Student's performance in Laboratories / Workshop shall be assessed during the year/ semester of study for 40% marks in each practical subject. Allotment of marks should be discrete taking into consideration of 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 work etc., during the course of study shall be done and sessional marks shall be awarded by the concerned 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 Section preferably choosing a qualified person from any local Industry/ nearby Government Polytechnic/ Local Government Organization. Internal examiner shall be the person concerned with internal assessment as in (c) above. The end examination shall be held along with all theory papers in respect of drawing.

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 Diploma courses *having* Industrial Training**, the training assessment shall be done and the marks are to be awarded in the following manner.

Industrial assessment	:	200 marks (in two spells of 100 marks each)
Maintenance of log book	:	30 marks
Record Work	:	30 marks
Seminar / viva-voce	:	40 marks

TOTAL	:	300 marks

The assessment at the institution level (Seminar/Viva-voce)shall be done by three members, viz., Internal Faculty member, External Examiner and Head of Section and be averaged.

10 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 end 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.

11. 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. However, the duration including Improvement examination shall not exceed FIVE years from the year of first admission.
4. No improvement is allowed in Practical / Lab subjects or Project work or Industrial Training assessment. However, improvement in drawing subject(s) is allowed.
5. If improvement is not achieved, the marks obtained in previous Examinations hold good.

6. Improvement is not allowed in respect of 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.

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

a) For Diploma Courses of 3 Years duration

i. 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.

ii. 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.

iii. 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 examination 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

<u>For IVC & ITI Lateral Entry Students:</u>

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

iv) A candidate shall be promoted to 5th semester 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 the 5th semester examination if he/she

i) Puts the required percentage of attendance in the 5th semester

ii) Should get eligibility to appear for 4th Semester examination.

For IVC& ITI Lateral Entry students:

i) Puts the required percentage of attendance in the 5th semester
ii) Should not have failed in more than Four backlog subjects of 3rd Semester

v) A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pay the examination fee. A candidate who could not pay the 5th 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 6th semester.

A candidate is eligible to appear for 6th semester Industrial Training assessment (Seminar/Viva-voce)

i) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training

ii) Should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance, ie., 90% in 6th semester Industrial Training.
ii) should get eligibility to appear for 5th Semester Examination.

Important Note:

Seminar/Viva-voce should not be conducted for Not-Eligible Candidates, till the candidate gets eligibility. The record of internal assessment for Industrial Training for 260 marks shall be maintained at Institution Level for all candidates and the data is to be uploaded only for eligible candidates. For not eligible candidates the data is to be uploaded as and when the candidate gets eligibility.

b) For Diploma Courses of 3 ½ Years duration (MET/ CH/ CHPP/ CHPC/ CHOT/ TT):

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 Four backlog subjects of 1st year.

For IVC & ITI Lateral Entry students:

(i) Puts the required percentage of attendance in the 4th semester

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.
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 ie.,90 % of attendance and attends for the VIVA-VOCE examination at the end of training.
6. A candidate shall be promoted to 7th semester provided he / she puts the required percentage of attendance in the 6th semester and pays the examination fee. A candidate, who could not pay the 6th 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 7th semester.
7. A candidate shall be promoted to 7th semester of the course provided he/she has successfully completed both the spells of Industrial Training.

A candidate is eligible to appear for 7th semester examination if he/she

i) Puts the required percentage of attendance in the 7th semester
ii) Should get eligibility to appear for 4th semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance in the 7th semester
ii) Should not have failed more than four backlog subjects of 3rd Semester

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.

c) For Diploma Courses of 3 ½ Years duration (BM):

The same rules which are applicable for conventional courses also apply for this course. The industrial training in respect of this course is restricted to one semester (6 months) after the 6th semester (3 years) of the course.

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 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 4th semester.

   A candidate is eligible to appear for the 4th semester examination 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

<u>For IVC & ITI Lateral Entry Students:</u>

A candidate is eligible to appear for the 4th semester examination if he/she puts the required percentage of attendance in the 4th semester

4. A candidate shall be promoted to 5th semester 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 the 5th semester exam if he/she

   i) Puts the required percentage of attendance in the 5 th semester

   ii) Should get eligibility to appear for 4th Semester examination.

For IVC & ITI Lateral Entry students:

iii) Puts the required percentage of attendance in the5th semester
iv) Should not have failed in more than Four backlog subjects of 3rd Semester

5. A candidate shall be promoted to 6th semester provided he/she puts in the required percentage of attendance in the 5th semester and pays the examination fee.

A candidate who could not pay the 5th 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 6th semester.

A candidate is eligible to appear for 6th semester examination

i) Puts the required percentage of attendance in 6th semester and

ii) should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance in 6th semester.
ii) should get eligibility to appear for 5th Semester Examination.

6. A candidate shall be promoted to 7th semester provided he/she puts the required percentage of attendance in 6th semester and pay the examination fee. A candidate, who could not pay the 6th semester examination fee, has to pay the promotion fee prescribed by SBTET from time to time before commencement of the 7th semester (Industrial Training).

A candidate is eligible to appear for 7th semester Industrial Training assessment

(Seminar/Viva-voce) if he/she

i) Puts the required percentage of attendance, ie., 90% in 7th semester Industrial Training
ii) Should get eligibility to appear for 4th Semester Examination.

For IVC & ITI Lateral Entry students:

i) Puts the required percentage of attendance, ie., 90% in 7th semester Industrial Training.
ii) Should get eligibility to appear for 5th Semester Examination.

Important Note:

Seminar/Viva-voce should not be conducted for Not-Eligible Candidates, till the candidate gets eligibility. However, the record of internal Assessment for Industrial Training for 260 marks shall be maintained at Institution Level for all candidates and the data is to be uploaded only for eligible candidates. For not eligible candidates the data is to be uploaded as and when the candidate gets eligibility.

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 Industrial training shall commence 10 days after the completion of the last theory examination of 6th Semester.

13. 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.

   In respect IVC & ITI Lateral Entry 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 of study shall be taken into consideration for determining the overall 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 3 years/ 3 ½ years and four subsequent examinations, from the year of first admission.

14. 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.

15. 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 hours duration.

a) 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.

c) 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% (of total marks for the subject)

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.

16. 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.

17. MAXIMUM PERIOD FOR COMPLETION OF DIPLOMA COURSES:

Maximum period for completion of the diploma courses 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.

18. 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.

For IVC & ITI Lateral Entry students:

i. He / She pursued a course of study for not less than 2 / 2 ½ academic years & not more than 4 / 5 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 4 / 5 academic years from the year of admission shall forfeit their seat in the course & their seat shall stand cancelled.

19. ISSUE OF PHOTO COPY OF VALUED ANSWER SCRIPT, RECOUNTING& REVERIFICATION:

A) FOR ISSUE OF PHOTO COPIES OF VALUED ANSWER SCRIPTS

1. A candidate desirous of applying for Photo copy of valued answer script/ scripts should apply within prescribed date from the date of the declaration of the result.
2. Photo copies of valued answer scripts will be issued to all theory subjects and Drawing subject(s).
3. The Photo copy of valued answer script will be dispatched to the concerned candidate's address as mentioned in the application form by post.
4. No application can be entertained from third parties.

B) FOR RE-COUNTING(RC) and RE-VERIFICATION(RV) OF THE VALUED ANSWER SCRIPT

1. A candidate desirous of applying for Re-verification of valued answer script should apply within prescribed date from the date of the declaration of the result.
2. Re-verification of valued answer script shall be done for all theory subjects and Drawing subject(s).
3. The Re-verification committee constituted by the Secretary, SBTETAP with subject experts shall re-verify the answer scripts.

I) RE-COUNTING

The Officer of SBTET will verify the marks posted and recount them in the already valued answer script. The variations if any will be recorded separately, without making any changes on the already valued answer script. The marks awarded in the original answer script are maintained (hidden).

2) RE-VERIFICATION

(i) The Committee has to verify the intactness and genuineness of the answer script(s) placed for Re-verification.

(ii) Initially single member shall carry out the re-verification.

(iii) On re-verification by single member, if the variation is less than 12% of maximum marks, and if there is no change in the STATUS in the result of the candidate, such cases will not be referred to the next level ie., for 2-Tier evaluation.

(iv) On re-verification by a single member, if the variation is more than 12% of maximum marks, it will be referred to 2-Tier evaluation.

(v) If the 2-Tier evaluation confirms variation in marks as more than 12% of maximum marks, the variation is considered as follows:

a) If the candidate has already passed and obtains more than 12% of the maximum marks on Re-verification, then the variation is considered.

b) If the candidate is failed and obtains more than 12% of the maximum marks on Re-verification and secured pass marks on re-verification, then the status of the candidate changes to PASS.

c) If a candidate is failed and obtains more than 12% of the maximum marks on Re-verification and if the marks secured on re-verification are still less than the minimum pass marks, the status of the candidate remain FAIL only.

(vii) After Re-verification of valued answer script the same or change if any therein on Re-verification, will be communicated to the candidate.

(viii) On Re-verification of Valued Answer Script if the candidate's marks are revised, the fee paid by the candidate will be refunded or else the candidate has to forfeit the fee amount.

4. No request for Photo copies/ Recounting /Re-verification of valued answer script would be entertained from a candidate who is reported to have resorted to Malpractice in that examination.

20. MAL PRACTICE CASES:

If any candidate resorts to Mal Practice during examinations, he / she shall be booked and the Punishment shall be awarded as per SBTETAP rules and regulations in vogue.

21. DISCREPANCIES/ PLEAS:

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

22. 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, A.P.

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.

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 Vijayawada.

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

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

FIRST YEAR

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theor	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-101	English-I	3	-	90	3	20	80	100
C-102	Engineering Mathematics – I	5	-	150	3	20	80	100
C-103	Engineering Physics	4	-	120	3	20	80	100
C-104	Engineering Chemistry and Environmental studies	4	-	120	3	20	80	100
C-105	Surveying – 1	5	-	150	3	20	80	100
C-106	Engineering Mechanics	5	-	150	3	20	80	100
PRACTICAL SUBJECTS								
C-107	Engineering Drawing	-	6	180	3	40	60	100
C-108	Surveying - I Practice & Plotting	-	4	120	3	40	60	100
C-109	Physics Laboratory	-	3	90	3	20	30	50
C-110	Chemistry Laboratory	-			3	20	30	50
C-111	Computer Fundamentals laboratory	-	3	90	3	40	60	100
	Total	**26**	**16**	**1260**	**-**	**280**	**720**	**1000**

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2016
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								
C-301	Engineering Mathematics –II	5	-	75	3	20	80	100
C-302	Strength of Materials & Theory of Structures	6	-	90	3	20	80	100
C-303	Hydraulics	6	-	90	3	20	80	100
C-304	Surveying-II	5	-	75	3	20	80	100
C-305	Construction Materials	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-306	Civil Engineering Drawing-I	-	6	90	3	40	60	100
C-307	Material Testing Laboratory	-	3	45	3	40	60	100
C-308	Surveying - II Practice & Plotting	-	4	60	3	40	60	100
C-309	Hydraulics Laboratory	-	3	45	3	40	60	100
	Total	**26**	**16**	**630**	**-**	**260**	**640**	**900**

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

IV 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								
C-401	Reinforced Concrete Structures	6	-	90	3	20	80	100
C-402	Irrigation Engineering	4	-	60	3	20	80	100
C-403	Quantity Surveying	6	-	90	3	20	80	100
C-404	Transportation Engineering	5	-	75	3	20	80	100
C-405	Construction Practice	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-406	Civil Engineering Drawing-II	-	4	60	3	40	60	100
C-407	CAD Practice - I	-	6	90	3	40	60	100
C-408	Communication skills	-	3	45	3	40	60	100
C-409	Building Construction Practices	-	4	60	3	40	60	100
	Total	**25**	**17**	**630**	**-**	**260**	**640**	**900**

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

V Semester

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods	Scheme Of Examinations			
		Theory	Practicals	Per Semester	Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-501	Steel Structures	5	-	75	3	20	80	100
C-502	Construction Technology and Project Management	5	-	75	3	20	80	100
C-503	Environmental Engineering	6	-	90	3	20	80	100
C-504	Geotechnical Engineering	4	-	60	3	20	80	100
C-505	Advanced Civil Engineering Technologies	6	-	90	3	20	80	100
PRACTICAL SUBJECTS								
C-506	Civil Engineering Drawing-III	-	4	60	3	40	60	100
C-507	CAD Practice - II	-	6	90	3	40	60	100
C-508	Life skills	-	3	45	3	40	60	100
C-509	Civil Engineering Work shop	-	3	45	3	40	60	100
	Total	**26**	**16**	**630**	**-**	**260**	**640**	**900**

C-601 INDUSTRIAL TRAINING
(Practical Training)

VI SEMESTER

Scheme of evaluation:

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 i) Log Book ii) Report	30 30	
			4. Seminar	40	
Total :				**300**	

The industrial training shall carry 300 marks and pass marks are 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%attendence.

FIRST YEAR

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

FIRST YEAR

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods Per Year	Scheme Of Examination			
		Theor	Practical		Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-101	English	3	-	90	3	20	80	100
C-102	Engineering Mathematics – I	5	-	150	3	20	80	100
C-103	Engineering Physics	4	-	120	3	20	80	100
C-104	Engineering Chemistry and Environmental studies	4	-	120	3	20	80	100
C-105	Surveying – 1	5	-	150	3	20	80	100
C-106	Engineering Mechanics	5	-	150	3	20	80	100
PRACTICAL SUBJECTS								
C-107	Engineering Drawing	-	6	180	3	40	60	100
C-108	Surveying - I Practice & Plotting	-	4	120	3	40	60	100
C-109	Physics Laboratory	-	3	90	3	20	30	50
C-110	Chemistry Laboratory	-			3	20	30	50
C-111	Computer Fundamentals laboratory	-	3	90	3	40	60	100
	Total	**26**	**16**	**1260**	**-**	**280**	**720**	**1000**

C-16-COMMON-101- ENGLISH-I
(Common to all Branches)

Subject Title : ENGLISH-I

Subject Code : Common - 101

Periods per Week : 3

Periods per Year : 90

Time Schedule& Weightage

Sl No	Major Topics	Titles of the Lessons	No. of Periods	Weightage of Marks	No of Short Answers	No of Long Answers
1	Vocabulary& Need for English	Lessons 1,2& Regular and essential vocabulary	5	13	1	1
2	Grammar	Lessons 11,12 & 19 to 26	30	31	7	1
3	Reading	Lessons 13 To 18	10	10	-	1
4	Writing	Lessons 27 To 40	30	40	-	4
5	English in Action	Lessons 3 To 10	15	16	2	1
		Total	90	110	10	08

Rationale and Scope

Globalization has ushered in an era of opportunities for those who have the necessary competencies. Effective communication is one among them. This shift demands strengthening of English in polytechnics. In C-16 Curriculum the focus is on the special needs of English for technicians.

. This course aims at integration of the four fold language abilities viz., listening, speaking, reading and writing. The use of English for learning technical subjects and for performing technical functions like, writing reports, giving instructions and interpreting graphics/data is of

great importance. Therefore the curriculum C-16 focuses on improving communicative abilities equipping the students to become industry- ready and employable.

On completion of this course the student will be able to:

1.0 Build vocabulary in the direction of future needs
2.0 Learn various grammatical structures
3.0 Read and comprehend English and understand the details and draw inferences
4.0 Learn to be competent in various forms of written communication (writing composition and data interpretation)
5.0 Practice spoken communication suited to various situations.

1.0 Extend their vocabulary in the direction of their future needs

1.1 Locate words, learn spellings, understand meanings
1.2 Pronounce words intelligibly
1.3 Find synonyms and antonyms
1.4 Use affixation
1.5 Comprehend meanings of words by understanding meanings of roots

2.0 Learn various grammatical structures

2.1 Identify and use nouns
2.2 Identify and use pronouns
2.3 Use the present tense
2.4 Use the past tense
2.5 Use the future tense
2.6 Identify and use adjectives
2.7 Identify and use adverbs
2.8 Use prepositions
2.9 Use linkers
2.10 State basic sentence structures
2.11 Construct different types of sentences
2.12 Frame questions to elicit information
2.13 Frame questions for confirmation
2.14 Use active voice
2.15 Use passive voice
2.16 Use direct speech
2.17 Use indirect speech
2.18 Identify and correct errors

3.0 Read and comprehend English

3.1 Identify the main ideas
3.2 Identify the specific details
3.3 Draw inferences
3.4 Give contextual meanings of the words
3.5 Perceive tone in a text

4.0 Learn to excel in various forms of written communication (writing composition and data interpretation)

4.1 Identify components of a good paragraph
4.2 Write types of paragraphs
4.3 Distinguish between formal and informal letters
4.4 Write personal letters
4.5 Write leave letters
4.6 Write official letters
4.7 Write letters of complaints
4.8 Prepare a resume
4.9 Write a cover letter
4.10 Write short messages

4.11 Report incidents
4.12 Report experiments
4.13 Report Industrial visits
4.14 Write work done statements
4.15 Write maintenance reports
4.16 Make notes using Cue method and Mapping method
4.17 Summarize Paragraphs
4.18 Present and Interpret Data from flow charts, tree diagrams, bar graphs, tables, pie charts

Practice spoken communication suited to various situations.

4.19 Use appropriate expressions to greet and take leave
4.20 Use proper expressions to make requests
4.21 Use apt expressions for asking and giving directions
4.22 Use suitable expressions to seek and offer suggestions
4.23 Use suitable expressions to state intentions
4.24 Use suitable expressions to state feelings
4.25 Use appropriate expressions to state agreement and disagreement
4.26 Use proper expressions to make complaints
4.27 Use suitable expressions to express obligations

Course Material

The textbook prepared by the faculty of English of Polytechnics in AP.

Reference Books

1. Essential English Grammar (Intermediate Level) Raymond Murphy
2. Learn English (A Fun Book of Functional Language, Grammar and Vocabulary) Santanu Sinha Chaudhuri
3. Grammar Builder (Entire Series) Oxford University Press
4. High School English Grammar (Revised Edition) Wren and Martin
5. Sentence skills with Readings (fourth Edition, Tata McGraw Hill) John Langan, Paul Langan
6. Word Power Made Easy Norman Lewis
7. Spoken English Shashi Kumar and Dhamija

: **Engineering Mathematics - I**

(Common to all Branches)

Subject Title : Engineering Mathematics - I

Subject Code : Common - 102

Periods per Week : 5

Periods per Year : 150

Time Schedule

S. No	Major Topic	No of Periods		Weightage of Marks	Short Type			Essay Type		
	Unit - I : Algebra	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
1	Logarithms	3	0	0	0	0	0	0	0	0
2	Partial Fractions	5	0	3	0	1	0	0	0	0
3	Matrices and Determinants	10	10	16	2	0	0	0	0	1
	Unit - II : Trigonometry									
4	Trigonometric Ratios	2	0	0	0	0	0	0	0	0
5	Compound Angles	3	2	3	1	0	0	0	0	0
6	Multiple and Submultiple angles	4	4	3	0	1	0	0	0	0
7	Transformations	4	4	5	0	0	0	1/2	0	0
8	Inverse Trigonometric Functions	3	2	5	0	0	0	0	1/2	0
9	Trigonometric Equations	3	2	5	0	0	0	1/2	0	0
10	Properties and solutions of triangles	4	4	5	0	0	0	0	0	1/2
11	Hyperbolic Functions	2	0	0	0	0	0	0	0	0
12	Complex Numbers	4	2	3	1	0	0	0	0	0
	Unit III : Co-ordinate Geometry									
13	Straight Lines	5	3	6	1	1	0	0	0	0

14	Circle	4	2	5	0	0	0	0	1/2	0
15	Conic Sections	4	3	5	0	0	0	0	1/2	0
	Unit – IV : Differential Calculus									
16	Limits and Continuity	4	2	3	0	1	0	0	0	0
17	Differentiation	18	10	23	1	0	0	1	1	0
S. No	**Major Topic**	**No of Periods**		**Weightage of Marks**	**Short Type**			**Essay Type**		
	Unit - V : Applications of Differentiation	**Theory**	**Practice**		**R**	**U**	**App**	**R**	**U**	**App**
18	Geometrical Applications	3	2	5	0	0	0	0	0	1/2
19	Physical Applications	2	2	5	0	0	0	0	0	1/2
20	Maxima and Minima	3	4	5	0	0	0	0	0	1/2
21	Errors and Approximations	2	0	5	0	0	0	0	0	1/2
	Total	92	58	110	6	4	0	2	2 1/2	3 1/2
				Marks	18	12	0	20	25	35

R: Remembering type 38 marks
U: Understanding type 37 marks
App: Application type 35 marks

ENGINEERING MATHEMATICS – I

COMMON TO ALL BRANCHES – 102

Objectives

Upon completion of the course the student shall be able to:

UNIT – I

Algebra

1.0 Use Logarithms in engineering calculations

1.1 Define logarithm and list its properties.

1.2 Distinguish natural logarithms and common logarithms.

1.3 Explain the meaning of e and exponential function.

1.4 State logarithm as a function and its graphical representation.

1.5 Use the logarithms in engineering calculations.

2.0 Resolve Rational Fraction into sum of Partial Fractions in engineering problems

2.1 Define the following fractions of polynomials:

1. Rational,
2. Proper and
3. Improper

2.2 Explain the procedure of resolving rational fractions of the type mentioned below into partial fractions

$i)\quad \dfrac{f(x)}{(x+a)(x+b)(x+c)}$ $\qquad ii)\quad \dfrac{f(x)}{(x+a)^2(x+b)(x+c)}$

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

3.0 Use Matrices for solving engineering problems

3.1 Define a matrix and order of a matrix.

3.2 State various types of matrices with examples (upto 3rd order square matrices).

3.3 Compute sum, scalar multiplication and product of matrices.

3.4 Illustrate the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.

3.5 Define the transpose of a matrix and write its properties.

3.6 Define symmetric and skew-symmetric matrices.

3.7 Resolve a square matrix into a sum of symmetric and skew- symmetric matrices with examples in all cases.

3.8 Define minor, co-factor of an element of 2X2 and 3x3 square matrices with examples.

3.9 Expand the determinant of a 3 x 3 matrix using Laplace expansion formula.

3.10 Distinguish singular and non-singular matrices.

3.11 State properties of determinants with simple examples.

3.12 Define multiplicative inverse of a matrix and list properties of adjoint and inverse.

3.13 Compute adjoint and multiplicative inverse of a square matrix.

3.14 Representation of system of linear equations (2 variables in 2 equations and 3 variables in 3 equations) in matrix form.

3.15 Solve system of linear equations using Cramer's rule.

3.16 Solve system of linear equations by matrix inversion method

3.17 State elementary row operations.

3.18 Solve a system of linear equations by Gauss- Jordan method

UNIT – II

Trigonometry :

4.0 Understand Trigonometric Ratios

4.1 Define trigonometric ratios of any angle.

4.2 List the values of trigonometric ratios at specified values.

4.3 Draw graphs of trigonometric functions

4.4 Explain periodicity of trigonometric functions.

5.0 Solve simple problems on Compound Angles

5.1 Define compound angles and state the formulae of sin(A±B), cos(A±B), tan(A±B) and cot(A±B)

5.2 Give simple examples on compound angles to derive the values of $\sin 15^0$, $\cos 15^0$, $\sin 75^0$, $\cos 75^0$, $\tan 15^0$, $\tan 75^0$ etc.

5.3 Derive identities like $\sin(A+B)\sin(A-B) = \sin^2 A - \sin^2 B$ etc.,

5.4 Solve simple problems on compound angles.

6.0 Solve problems using the formulae for Multiple and Sub- multiple Angles

6.1 Derive the formulae of multiple angles 2A, 3A etc and sub multiple angles A/2 in terms of angle A of trigonometric functions.

6.2 Derive useful allied formulas like $\sin A = (1 - \cos 2A)/2$ etc.,

6.3 Solve simple problems using the above formulae

7.0 Apply Transformations for solving the problems in Trigonometry

7.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa- examples on these formulae.

8.0 Use Inverse Trigonometric Functions for solving engineering problems

8.1 Explain the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.

8.2 Define inverses of six trigonometric functions along with their domains and ranges.

8.3 Derive relations between inverse trigonometric functions so that given A= $\sin^{-1}x$, express angle A in terms of other inverse trigonometric functions - with examples.

8.4 State various properties of inverse trigonometric functions and identities like $\sin^{-1}x+\cos^{-1}x = \frac{\pi}{2}$ etc.

8.5 Derive formulae like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right),\ where\ x \geq 0, y \geq 0, xy < 1$ etc., and solve simple problems.

9.0 Solve Trigonometric Equations in engineering applications

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

9.2 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.

10.0 Appreciate Properties of triangles and their solutions

10.1 State sine rule, cosine rule, tangent rule and projection rule.

10.2 Explain the formulae for sin A/2, cos A/2, tan A/2 and cot A/2 in terms of semi-perimeter and sides a, b, c .

10.3 List various formulae for the area of a triangle.

10.4 Solve problems using the above formulae.

10.5 Solve a triangle when (i) three sides, (ii) two sides and an included angle, (iii) two sides and an opposite angle-case of two solutions and (iv) one side and two angles are given.

11.0 Represent the Hyperbolic Functions in terms of logarithm functions

11.1 Define Sinh x, cosh x and tanh x and list the hyperbolic identities.

11.2 Represent inverse hyperbolic functions in terms of logarithms.

12.0 Represent Complex numbers in various forms

12.1 Define complex number, its modulus , conjugate and list their properties.

12.2 Define the operations on complex numbers with examples.

12.3 Define amplitude of a complex number

12.4 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples.

12.5 State DeMoivre's theorem and its applications to complex numbers e.g., finding the roots, powers, simplifications of a complex number with illustrative examples

UNIT - III

Coordinate Geometry

13.0 Solve the problems on Straight lines

13.1 Write the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form

13.2 Solve simple problems on the above forms

13.3 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

14.0 Solve the problems on Circles

14.1 Define locus of a point – circle and its equation.

14.2 Find the equation of a circle given

(i) Center and radius

(ii) Two ends of a diameter

(iii) Centre and a point on the circumference

(iv) Three non collinear points

14.3 Write the general equation of a circle and find the centre and radius.

15.0 Appreciate the properties of Conics in engineering applications

15.1 Define a conic section.

15.2 Explain the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.

15.3 Find the equation of a conic when focus, directrix and eccentricity are given

15.4 Describe the properties of Parabola, Ellipse and Hyperbola in standard form.

UNIT - IV

Differential Calculus

16.0 Use the concepts of Limit and Continuity for solving the problems

16.1 Explain the concept of limit and meaning of $\lim_{x \to a} f(x) = l$ and state the properties of limits.

16.2 Mention the Standard limits $\lim_{x \to a} \frac{x^n - a^n}{x - a}$, $\lim_{x \to 0} \frac{\sin x}{x}$, $\lim_{x \to 0} \frac{\tan x}{x}$, $\lim_{x \to 0} \frac{a^x - 1}{x}$, $\lim_{x \to 0} \frac{e^x - 1}{x}$, $\lim_{x \to 0} (1 + x)^{\frac{1}{x}}$, $\lim_{x \to \infty} \left(1 + \frac{1}{x}\right)^x$ (All without proof).

16.3 Solve the problems using the above standard limits

16.4 Evaluate the limits of the type $\lim_{x \to l} \frac{a x^2 + b x + c}{\alpha x^2 + \beta x + \gamma}$ and $\lim_{x \to \infty} \frac{f(x)}{g(x)}$

16.5 Explain the concept of continuity of a function at a point and on an interval with some examples whether a given function is continuous or not.

17.0 Appreciate Differentiation and its meaning in engineering situations

17.1 State the concept of derivative of a function y = f(x) – definition, first principle as $\lim_{h \to 0} \frac{f(x + h) - f(x)}{h}$ and also provide standard notations to denote the derivative of a function.

17.2 State the significance of derivative in scientific and engineering applications.

17.3 Find the derivatives of elementary functions like x^n , a^x, e^x, log x, sin x, cos x, tanx, Secx, Cosecx and Cot x using the first principles.

17.4 Find the derivatives of simple functions from the first principle .

17.5 State the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions with illustrative and simple examples.

17.6 Explain the method of differentiation of a function of a function (Chain rule) with illustrative examples such as

(i) $\sqrt{t^2 + \frac{2}{t}}$ **(ii)** $x^2 \sin 2x$ **(iii)** $\frac{x}{\sqrt{x^2 + 1}}$ **(iv)** $\log(\sin(\cos x))$.

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

17.8 Explain the method of differentiation of a function with respect to another function and also differentiation of parametric functions with examples.

17.9 Find the derivatives of hyperbolic functions.

17.10 Explain the procedures for finding the derivatives of implicit function with examples.

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

17.12 Explain the concept of finding the higher order derivatives of second and third order with examples.

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

17.14 Explain the definition of Homogenous function of degree n

17.15 Explain Euler's theorem for homogeneous functions with applications to simple problems.

UNIT - V

Applications of the Differentiation

18.0 Understand the Geometrical Applications of Derivatives

18.1 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.

18.2 Explain the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve y=f(x) at any point on it.

18.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve y=f(x).

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

19.0 Understand the Physical Applications of Derivatives

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

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

20.0 Use Derivatives to find extreme values of functions

20.1 Define the concept of increasing and decreasing functions.

20.2 Explain the conditions to find points where the given function is increasing or decreasing with illustrative examples.

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

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

21.0 Use Derivatives to find Errors and Approximations

21.1 Find the absolute error, approximate error, relative error and percentage error in functions of single variable.

COURSE CONTENT

Unit-I

Algebra

1. Logarithms :

   Definition of logarithm and its properties, natural and common logarithms; the meaning of e and exponential function, logarithm as a function and its graphical representation.

2. Partial Fractions :

   Rational, proper and improper fractions of polynomials. Resolving rational fractions in to their partial fractions covering the types mentioned below:

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

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

Matrices:

3. Definition of matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, scalar multiplication and product of matrices. Transpose of a matrix-Symmetric, skew symmetric matrices-Minor, cofactor of an element-Determinant of a square matrix-Laplace's expansion, properties of determinants. Singular and non singular matrices-Adjoint and multiplicative inverse of a square matrix- examples-System of linear equations in 2 or 3 variables-Solutions by Cramer's rule, Matrix inversion method-examples-Elementary row operations on matrices -Gauss-Jordan method to solve a system of equations.

Unit-II

Trigonometry :

4. Trigonometric ratios: definition of trigonometric ratios of any angle, values of trigonometric ratios at specified values, draw graphs of trigonometric functions, periodicity of trigonometric functions.
5. Compound angles: Formulas of sin(A±B), cos(A±B), tan(A±B),cot(A±B),and related identities with problems.
6. Multiple and sub multiple angles: trigonometric ratios of multiple angles 2A,3A and submultiple angle A/2 with problems.
7. Transformations of products into sums or differences and vice versa simple problems
8. Inverse trigonometric functions : definition, domains and ranges-basic properties- problems.

9. 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 usage of transformations-problems.

10. 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.
11. Hyperbolic functions: Definitions of hyperbolic functions, identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.
12. Complex Numbers: Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential form (Euler) form of a complex number- Problems. DeMoivre's Theorem and its applications in complex numbers- Simple problems.

UNIT-III

Coordinate geometry

13. Straight lines: various forms of straight lines, angle between lines, perpendicular distance from a point, distance between parallel lines-examples.
14. Circle: locus of a point, Circle definition-Circle equation given (i) center and radius, (ii) two ends of a diameter (iii) centre and a point on the circumference (iv) three non collinear points - general equation of a circle - finding center, radius.
15. Definition of a conic section, equation of a conic when focus directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola, standard forms.

UNIT-IV

Differential Calculus

16. Concept of Limit- Definition- Properties of Limits and Standard Limits -Simple Problems-Continuity of a function at a point- Simple Examples only.
17. 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 functions, derivative of hyperbolic, implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

UNIT-V

Applications of Derivatives:

18. Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point. Lengths of tangent, normal, sub tangent and subnormal to the curve at any point. Angle between the curves - problems.
19. Physical applications of the derivative – velocity, acceleration, derivative as a rate Measure – Problems.
20. 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.
21. Applications of derivative in finding errors and approximations of functions and simple problems.

Reference Books :

1. A text book of matrices by Shanti Narayan,
2. Plane Trigonometry, by S.L Loney
3. Co-ordinate Geometry, by S.L Loney
4. Thomas Calculus, Pearson Addison-Wesley publishers
5. Calculus – I, by Shanti Narayan and Manicavachgam Pillai, S.V Publications

ENGINEERING PHYSICS

Subject Title : Engineering Physics
Subject Code : Common -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	12	13	1	1
3.	Kinematics	14	13	1	1
4.	Friction	08	10	-	1
5.	Work, Power and Energy	12	10	-	1
6.	Simple Harmonic Motion	12	13	1	1
7.	Heat & Thermodynamics	12	13	1	1
8.	Sound	12	13	1	1
9.	Properties of matter	10	06	2	-
10.	Electricity & magnetism	12	13	1	1
11.	Modern Physics	08	03	1	-
	Total:	**120**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the course the student shall be able to

1.0 Understand the concept of Units and dimensions

1.1 Explain the concept of Units
1.2 Define the terms
a) Physical quantity, b) Fundamental physical quantities and
c) 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 State Rules of writing S.I. units
1.8 State advantages of SI units
1.9 Define Dimensions
1.10 Write Dimensional formulae
1.11 Derive dimensional formulae of physical quantities
1.12 List dimensional constants and dimensionless quantities
1.13 State the principle of Homogeneity of Dimensions
1.14 State the applications of Dimensional analysis
1.15 State the limitations of dimensional analysis
1.16 Solve problems

2.0 Understand the concept of Elements of Vectors

2.1 Explain the concept of Vectors
2.2 Define Scalar and Vector quantities
2.3 Give examples for scalar and vector quantities
2.4 Represent vectors graphically
2.5 Classify the Vectors
2.6 Resolve the vectors
2.7 Determine the Resultant of a vector by component method

2.8 Represent a vector in space using unit vectors (I, j, k)
2.9 State triangle law of addition of vectors
2.10 State parallelogram law of addition of vectors
2.11 Illustrate parallelogram law of vectors in case of flying bird and sling.
2.12 Derive expression for magnitude and direction of resultant of two vectors
2.13 State polygon law of addition of vectors
2.14 Explain subtraction of vectors
2.15 Define Dot product of two vectors with examples (Work done, Power)
2.16 Mention the properties of Dot product
2.17 Define Cross products of two vectors with examples (Torque, Linear velocity)
2.18 Mention the properties of Cross product.
2.19 Solve the related numerical problems

3.0 Understand the concept of Kinematics

3.1 Write the equations of motion in a straight line
3.2 Explain the acceleration due to gravity
3.3 Derive expressions for vertical motion
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of flight
3.4 Derive height of a tower when a body projected vertically upwards from the top of a tower.
3.5 Explain projectile motion with examples
3.6 Explain Horizontal projection
3.7 Derive an expression for the path of a projectile in horizontal projection
3.8 Explain oblique projection
3.9 Derive an expression for the path of projectile in oblique projection
3.10 Derive formulae for projectile in oblique projection
a) Maximum Height, b) time of ascent, c) time of descent, and d) time of flight
e) Horizontal Range, f) Maximum range
3.11 Solve the related numerical problems

4.0 Understand the concept of Friction

4.1 Define friction
4.2 Classify the types of friction and define
4.3 Explain the concept of Normal reaction
4.4 State the laws of friction
4.5 Define coefficients of friction
4.6 Explain the Angle of friction
4.7 Derive an expression for acceleration of a body on a rough horizontal surface
4.8 Derive an expression for the displacement and time taken to come to rest over a rough horizontal surface
4.9 Define Angle of repose
4.10 Derive expressions for acceleration of a body on a smooth inclined plane (up and down)
4.11 Derive expressions for acceleration of a body on a rough inclined plane (up and down)
4.12 List the Advantages and Disadvantages of friction
4.13 Mention the methods of minimizing friction
4.14 Solve the related numerical problems

5.0 Understand the concepts of Work, Power, and Energy

5.1 Define the terms 1.Work, 2. Power and Energy
5.2 State SI units and dimensional formulae for 1.Work, 2. Power, and Energy
5.3 Define potential energy and state examples
5.4 Derive the expression for Potential energy
5.5 Define kinetic energy and state examples
5.6 Derive the expression for kinetic energy

5.7 State and derive Work- Energy theorem
5.8 Derive the relation between Kinetic energy and momentum
5.9 State the law of conservation of energy and mention examples
5.10 Verify the law of conservation of energy in the cases of a freely falling body and vertically projected body in the upward direction
5.11 Solve the related numerical problems

6.0 Understand the concept of Simple harmonic motion

6.1 Define Simple harmonic motion
6.2 Give examples for Simple harmonic motion
6.3 State the conditions of Simple harmonic motion
6.4 Explanation of SHM in terms of projection of circular motion on any one of the diameters of the circular path
6.5 Derive expression for displacement
6.6 Derive expression for velocity
6.7 Derive expression for acceleration
6.8 Derive expression for Time period and frequency of S H M
6.9 Define phase of S H M and explain from the expression of displacement
6.10 Define Ideal simple pendulum and derive expression for Time period of simple pendulum
6.11 State the laws of motion of simple pendulum and mention formulae
6.12 Solve the related numerical problems

7.0 Understand the concept of Heat and thermodynamics

7.1 Explain the concept of expansion of gases
7.2 State and explain Boyle's law and also express it in terms of density
7.3 Define absolute zero temperature
7.4 Explain absolute scale of temperature
7.5 State Charles laws in terms of absolute temperature and explain
7.6 Define ideal gas and distinguish from real gas
7.7 Derive Ideal gas equation
7.8 Define Specific gas constant and Universal gas constant
7.9 Explain why universal gas constant is same for all gases
7.10 State SI unit and dimensional formula of universal gas constant
7.11 Calculate the value of universal gas constant
7.12 State the gas equation in different forms (as a function of density and mass)
7.13 Distinguish between r and R
7.14 State and Explain Isothermal process
7.15 State and Explain adiabatic process
7.16 Distinguish between isothermal and adiabatic processes
7.17 State first and second laws of thermodynamics and state applications
7.18 Define specific heats & molar specific heats of a gas and differentiate them
7.19 Derive the relation $C_p - C_v = R$ (Mayer's Equation)
7.20 Solve the relavent numerical problems

8.0 Understand the concept of Sound

8.1 Define the term sound
8.2 Explain longitudinal and transverse wave motion and state differences
8.3 Distinguish between musical sound and noise
8.4 Explain noise pollution and state SI unit for intensity level of sound
8.5 Explain causes of noise pollution
8.6 Explain effects of noise pollution
8.7 Explain methods of minimizing noise pollution
8.8 Explain the phenomenon of beats
8.9 State the applications of beats
8.10 Define Doppler effect

8.11 List the Applications of Doppler effect
8.12 Define reverberation and reverberation time
8.13 Write Sabine's formula and name the parameters contained
8.14 Define and Explain echoes and also state its applications
8.15 State conditions of good auditorium
8.16 Solve the related numerical problems

9.0 Understand the properties of matter

9.1 Define the term Elasticity
9.2 Define the terms stress and strain and also define different types of stress and strain
9.3 State the units and dimensional formulae for stress and strain
9.4 State and explain Hooke's law
9.5 Define surface tension and state examples
9.6 Explain Surface tension with reference to molecular theory
9.7 Define angle of contact
9.8 Define capillarity
9.9 Write the formula for surface tension based on capillarity and name the parameters
9.10 Explain the concept of Viscosity
9.11 Mention examples of Viscosity
9.12 State Newton's formula for viscous force and explain
9.13 Define co-efficient of viscosity and write its units and dimensional formula
9.14 Explain the effect of temperature on viscosity of liquids and gases
9.15 State Poiseulle's equation for Co-efficient of viscosity and name the physical quantities involved
9.16 Solve the related numerical problems

10.0 Understand the concept of Electricity and Magnetism

10.1 Explain the concept of Electricity
10.2 State Ohm's law and write the formula
10.3 Explain Ohm's law
10.4 Define specific resistance, conductance and state their units
10.5 State Kichoff's laws
10.6 Explain Kichoff's laws
10.7 Describe Wheatstone's bridge with legible sketch
10.8 Derive an expression for balancing condition of Wheatstone's bridge
10.9 Describe Meter Bridge experiment for the determination of resistivity with a neat circuit diagram
10.10 Write the formula in Meter Bridge to determine specific resistance
10.11 Explain the concept of magnetism
10.12 State the Coulomb's inverse square law of magnetism
10.13 Define magnetic field and magnetic lines of force and write the properties of magnetic lines of force
10.14 State the Magnetic induction field strength and mention its units and dimensionsal formula
10.15 Derive an expression for the moment of couple on a bar magnet placed in a uniform magnetic field
10.16 Derive Magnetic induction field strength at a point on the axial line
10.17 Derive Magnetic induction field strength at a point on the equatorial line
10.18 Solve the related numerical problems

11.0 Understand the concept of Modern physics

11.1 State and Explain Photo-electric effect
11.2 Write Einstein's photoelectric equation and explain
11.3 State laws of photoelectric effect
11.4 Explain the Working of photoelectric cell

11.5 List the Applications of photoelectric effect
11.6 Recapitulate refraction of light and its laws
11.7 Define critical angle
11.8 Explain the 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 Define super conductor and superconductivity and mention examples for superconductors
11.13 State the properties of superconducting materials
11.14 List the applications of superconductors

COURSE CONTENT

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(Proper Vector, Null Vector, Unit Vector, Equal , Negative Vector, Like Vectors, Co-Initial Vectors, Co-planar Vectors and Position Vector).Addition of vectors- Representation of vectors- Resolution of vectors - Parallelogram, Triangle and Polygon laws of vectors–Subtraction 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 - 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- Law of Conservation of energy- 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- Laws of simple pendulum-seconds pendulum- Problems

7. Heat and Thermodynamics:
Expansion of Gases- Boyle's law- Absolute scale of temperature- Charles laws- Ideal gas equation- Universal gas constant- Differences between r and R- Isothermal and adiabatic processes- Laws of thermodynamics- Specific heats - molar specific heats of a gas –Derivation of Mayer's Equation- Problems

8. Sound:

Sound- Nature of sound- Types of wave motion -musical sound and noise- Noise pollution – Causes & effects- Methods of reducing noise pollution- Beats- Doppler effect- Echo- Reverberation-Reverberation time-Sabine 's formula-Conditions of good auditorium- Problems

9. **Properties of matter**

Definition of Elasticity –Definition of stress and strain -the units and dimensional formulae for stress and strain-The Hooke's law- Definition of surface tension- Explanation of Surface tension with reference to molecular theory - Definition of angle of contact - Definition of capillarity -The formula for surface tension based on capillarity - Explanation of concept of Viscosity - Examples for surface tension and Viscosity - Newton's formula for viscous force- Definition of co-efficient of viscosity- The effect of temperature on viscosity of liquids and gases - Poiseuille's equation for Co-efficient of viscosity- The related numerical 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 line –problems.

11. Modern Physics;

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

REFERENCE BOOKS

1. Intermediate physics Volume-I & 2 — Telugu Academy (English version)
2. Unified physics Volume 1,2,3 and 4 — Dr.S.L Guptha and Sanjeev Guptha
3. Text book of physics Volume I — Resnick & Holiday
4. Text book of applied physics — Dhanpath Roy
5. Fibre optics — D.A Hill
6. NCERT Text Books ---------- XI & XII Standard

Blue Print for setting question paper at different levels

S.No	Major Topics	No. of Periods	Weightage of Marks	Short answer type			Essay type		
				K	U	A	K	U	A
1.	Units and Dimensions	08	03	1	0	0	0	0	0
2.	Elements of Vectors	12	13	0	0	1	0	1	0
3.	Kinematics	14	13	0	1	0	1	0	0
4.	Friction	08	10	0	0	0	0	1	0
5.	Work, Power and Energy	12	10	0	0	0	0	1	0
6.	Simple Harmonic Motion	12	13	0	0	1	0	1	0
7.	Heat & Thermodynamics	12	13	0	1	0	1	0	0
8.	Sound	12	13	0	1	0	0	0	1
9.	Properties of Matter	10	06	1	1	0	0	0	0
10.	Electricity & magnetism	12	13	0	1	0	0	1	0
11.	Modern Physics	08	03	1	0	0	0	0	0
	Total:	**120**	**110**	**3**	**5**	**2**	**2**	**5**	**1**

C – 16, ENGINEERINGCHEMISTRY &ENVIRONMENTALSTUDIES
(Common to all Branches)

Subject Title	**:**	**Engineering Chemistry & Environmental Studies**
Subject Code	**:**	**Common-104**
Periods per week	**:**	**04**
Total periods per year	**:**	**120**

Scheme of instruction and examination Time Schedule

S.No	Major topic	No of Periods	Weightage of marks	Short type (3marks)			Essay type (10 marks)			remarks
				R	U	A	R	U	A	
A. ENGINEERING CHEMISTRY										
1	Fundamentals of Chemistry	18	16	1	0	1	0	1	0	
2	Solutions	10	8	1	0	0	0	0	1/2	5 mark
3	Acids and bases	10	8	0	0	1	0	1/2	0	5 mark
4	Principles of Metallurgy	10	10	0	0	0	1	0	0	
5	Electrochemistry	14	13	0	1	0	0	0	1	
6	Corrosion	8	10	0	0	0	0	1	0	
7	Water Technology	14	13	1	0	0	1	0	0	
8	Polymers	12	13	1	0	0	1	0	0	
9	Fuels	6	3	1	0	0	0	0	0	
B. ENVIRONMENTALSTUDIES		18	16	1	1	0	0	1	0	
total		120	110	6	2	2	3	3 1/2	1 1/2	
				18	6	6	30	35	15	

OBJECTIVES

Upon completion of the course the student shall be able to

A.ENGINEERINGCHEMISTRY

1.0 Understand the concept of Atomic structure

1.1 Explain the charge and mass of fundamental particles of an atom (electron, proton and neutron)

1.2 Explain the concept to f atomic number and mass number.

1.3 State the Postulates of Bohr's atomic theory and its limitations.

1.4 Explain the significance of four Quantum numbers.

1.5 Explain 1. Aufbau principle, 2 Pauli's exclusion principle 3 Hund's rule.

1.6 Define Orbital in an atom.

1.7 Draw the shapes of s,pandd - Orbitals .

1.8 Distinguish between Orbit and Orbital

1.9 Write the electronic configuration of elements up to atomic number 30

1.10 Explain the significance of chemical bonding

1.11 Explain the Postulates of Electronic theory of valency

1.12 Define the types of Chemical bonding viz., Ionic, Covalent bonds.

1.13 Explain the types of Chemical bonding viz., Ionic, Covalent bonds with examples.

1.14 Explain bond formation in NaCl and MgO.

1.15 List Properties of Ionic compounds

1.16 Explain bond formation in Hydrogen molecule, Oxygen molecule, and Nitrogen molecule using Lewis dot method.

1.17 List Properties of Covalent compounds

1.18 Distinguish between properties of ionic compounds and covalent compounds.

1.19 Structures of ionic solids-define a) Unit cell b) co-ordination number.

1.20 Structures of Unit cells of NaCl and CsCl.

1.21 Define the term. Oxidation number.

1.22 Calculate the Oxidation Number of underlined atoms in the following examples
a)K$\underline{Mn}O_4$ b) $K_2\underline{Cr}_2O_7$ c) H$\underline{N}O_3$ d) $H_2\underline{S}O_4$ e) $\underline{Cl}O_4^-$ f) $\underline{N}H_4^+$

1.23 Differentiate between Oxidation Number and Valency

2.0 Calculate Molarity and Normality of given Solution

2.1 Define the terms 1.Solution, 2.Soluteand 3.Solvent

2.2 Classify solutions based on physical state and solubility

2.3 Define mole

2.4 Problems on 'Mole concept'

2.5 Define the terms 1. Atomic weight, 2.Molecular weight and 3. Equivalent weight

2.6 Calculate Molecular weight and Equivalent weight of given Acids,($HCl, H_2SO_4 HNO_3$)Bases (NaOH, KOH, $Ca(OH)_2$) and Salts (NaCl, Na_2CO_3, $CaCO_3$)

2.7 Define 1.Molarity, 2.Normality of solutions

2.8 Solve Numerical problem son Molarity and Normality

a) calculate the Molarity or Normality if weight of solute and volume of solution are given

b) calculate the weight of solute if Molarity or normality with volume of solution are given

c) problems on dilution to convert high concentrated solutions to low concentrated solutions

3.0 Understand the concepts of Acids and bases

3.1 Explain Arrhenius theory of Acids and Bases

3.2 State the limitations of Arrhenius theory of Acids and Bases

3.3 Explain Bronsted – Lowry theory of acids bases

3.4 State the limitations of Bronsted – Lowry theory of acids bases

3.5 Explain Lewis theory of acids and bases

3.6 State the limitations of Lewis theory of acids and bases

3.7 Explain the Ionic product of water

3.8 Define pH and explain Sorens on scale

3.9 Solve the Numerical problems on pH(Strong Acids and Bases)
3.10 Define Buffer solution
3.11 Give atleast three examples for Buffer solutions
3.12 State the applications of Buffer solution

4.0 Understand the Principles of Metallurgy

4.1 List at least eight Characteristics of Metals
4.2 Distinguish between Metals and Non Metals
4.3 Define the terms 1.Mineral, 2.Ore, 3. Gangue, 4.Fluxand 5.Slag
4.4 Describe the methods of concentration of Ore; 1.Handpicking,2.Levigation, and 3. Froth Floatation
4.5 Describe the methods involved in extraction of crude metal- Roasting, Calcination and Smelting.
4.6 Explain the purification of Metals by Electrolytic Refining
4.7 Define an Alloy
4.8 Write the Composition of the following alloys:1.Brass, 2. Germansilver, 3 Nichrome
4.9 List the uses of the following Alloys: 1. Brass, 2.Germansilver, 3.Nichrome

5.0 Understand the concepts of Electrochemistry

5.1 Define the terms1. Conductor, 2. Insulator, 3.Electrolyte 4.Non–electrolyte
5.2 Distinguish between metallic conduction and Electrolytic conduction
5.3 Explain electrolysis by taking example fused NaCl
5.4 Explain Faraday's laws of electrolysis
5.5 Define 1. Chemical equivalent (E) 2. Electrochemicalequivalent (e) and their relation.
5.6 Solve the Numerical problems based on Faraday's laws of electrolysis
5.7 Define Galvanic cell
5.8 Explain the construction and working of Galvanic cell
5.9 Distinguish between electrolytic cell and galvanic cell
5.10 Explain the electrode potentials and standard electrode potentials
5.11 Explain the electro chemical series and its significance
5.12 Explain the emfofa cell.
5.13 Solve the numerical problems on emfof the cell based on standard electrode potentials.

6.0 Understand the concept of Corrosion

6.1 Define the term corrosion
6.2 state the Factors influencing the rate of corrosion
6.3 Describe the formation of a)composition cell, b)stress cell ,c) concentration cell during corrosion.
6.4 Define rusting of iron and Explain the mechanism of rusting of iron.
6.5 Explain the methods of prevention of corrosion:
a)Protective coatings (anodic and cathodic coaitings)
b) Cathodic protection(Sacrificial anode process and Impressed–voltage process)

7. 0 Understand the concept of Water Technology

7.1 State the various Sources of water like Surface water and sub-surface water.

7.2 Define the terms soft water and hard water with respect to soap consumption.

7.3 Define the term hardness of water

7.4 Types of hardness of water 1.Temporary hardness 2. Permanent hardness

7.5 List the salts that causing hardness of water(with Formulae)

7.6 State the disadvantages of using hard water in industries

7.7 Define Degree of hardness, units of hardness(mg/L) or ppm.

7.8 Explain the methods of softening of hard water:a) Ion-Exchange process, b)Permutit process or zeolite process

7.9 Concept of Osmosis and Reverse Osmosis with examples .

7.10 State the applications of Reverse Osmosis.

7.11 State essential qualities of drinking water.

8.0 Understand the concepts of Polymers

8.1 Explain the concept of polymerisation

8.2 Describe the methods of polymerization a) addition polymerization of Ethylene b)condensation polymerization of phenol and formaldehyde(Only flow chart i.e. without chemical equations)

8.3 Define the term plastic

8.4 Classify the plastics with examples

8.5 Distinguish between the rmo and thermo setting plastics

8.6 List the Characteristics of plastics

8.7 State the advantages of plastics over traditional materials

8.8 State the disadvantages of using plastics.

8.9 Explain the methods of preparation of the following plastics:
1.Polythene, 2. PVC, 3.Teflon, 4. Polystyrene and 5. Urea formaldehyde

8.10 Explain the uses of the following plastics:
1.Polythene, 2. PVC, 3.Teflon, 4.Polystyrene and 5. Urea formaldehyde

8.11 Define the term natural rubber

8.12 write the structural formula of Natural rubber

8.13 Explain the processing of Natural rubber from latex

8.14 List the Characteristics of natural rubber

8.15 Explain the process of Vulcanization

8.16 List the Characteristics of Vulcanized rubber

8.17 Define the term Elastomer

8.18 Describe the preparation of the following synthetic rubbers a) Buna-s and b)Neo prene rubber

8.19 List the uses of the following synthetic rubbers a) Buna-s and b)Neo prene rubber

9.0 Understand the concepts of Fuels

9.1 Define the term fuel

9.2 Classify the fuels based on physical state–solid, liquid and gaseous fuels,

9.3 Classify the fuels based on occurrence-primary and secondary fuels

9.4 List the characteristics of good fuel

9.5 State the composition and uses of gaseous fuels:
a)water gas, b)producer gas, c)natural gas, d)coal gas, e)Biogas and f) acetylene

B. ENVIRONMENTALSTUDIES

1.1 Define the term environment

1.2 Explain the scope and importance of environmental studies

1.3 Segments of environment 1).Lithosphere, 2).Hydrosphere, 3).Atmosphere, 4).Biosphere,

1.4 Define the following terms 1)Pollutant, 2).Pollution, 3).Contaminant, 4)receptor, 5)sink, 6) particulates, 7)dissolved oxygen, 8)Threshold limit value, 9).BOD, and 10).COD 11) eco system .

1.5 State the renewable and non renewable energy sources with examples.

1.6 Define the terms:
1).Producers, 2).Consumers and 3).Decomposers with examples.

1.7 Explain bio diversity and threatst obiodiversity

1.8 Define air pollution

1.9 Classify the air pollutants-based on origin and physical state of matter.

1.10 Explain the causes of Air pollution.

1.11 Explain the effects of air pollution on human beings, plants and animals.

1.12 State the uses of forest resources.

1.13 State the deforestation and its causes and effects.

1.14 Explain the 1.) Green house effect , 2) Ozone layer depletion and 3) Acidrain.

1.15 Explain the methods of control of Air pollution

1.16 Define Water pollution

1.17 Explain the causes of Water pollution

1.18 Explain the effects of Water pollution on living and Non-living things.

1.19 Explain the methods of control of Water pollution.

COURSE CONTENT

A. ENGINEERINGCHEMISTRY

1. Fundamentals of Chemistry

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

Chemical Bonding: Introduction – types of chemical bonds – Ionic and covalent bond with examples–Properties of Ionic and Covalent compounds- structures of ionic crystals NaCl, CsCl.

,**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– pH and related numerical problems–Buffer solutions–Applications.

4. Principles of Metallurgy

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

5. Electrochemistry

Conductors, insulators, electrolytes– electrolysis – Faraday's laws of electrolysis-numerical problems – Galvanic cell – standard electrode potential – electrochemical series–emf and numerical problems on emfofa cell

6. Water technology

Introduction–soft and hard water–causes of hardness–types of hardness
–dis advantages of hard water – degree of hardness (ppm) – softening methods – permut it process – ion exchange process– drinking water –Osmosis, Reverse Osmosis –Applications of Reverse osmosis

7. Introduction - factors influencing 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 – preparationandusesofthefollowingplastics:1.Polythene 2.PVC 3.Teflon 4.Polystyrene 5. Urea formal dehyde – Rubber – Natural rubber – processing from latex –Vulcanization – Elastomers, Buna-s, Neoprene rubber and their uses.

9. Fuels

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

B. ENVIRONMENTALSTUDIES

Introduction– environment –scope and importance of environmental studies important terms– renewable and non-renewable energy sources–Concept of ecosystem, producers, consumers and decomposers – Biodiversity, definition and threats to Bio diversity.

Air pollution – causes-Effects– forest resources: uses and over exploitation, deforestation, acid rain, greenhouse effect –ozone depletion – control of air pollution – Water pollution – causes – effects – control measures,

REFERENCEBOOKS

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 & Jain
5.	Engineering Chemistry	O.P. Agarwal, Hi-Tech.
6.	Engineering Chemistry	Sharma
7.	Engineering Chemistry	A.K. De

SURVEYING–I

Subject Title : Surveying–I
Subject Code : C-105
Periods/Week : 05
Periods/Year : 150

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay type
1.	Classification of surveying	10	08	01	1/2
2.	Chain Surveying	35	26	02	02
3.	Compass Surveying	35	26	02	02
4.	Levelling	60	42	04	03
5.	Minor Instruments	10	08	01	1/2
	Total	150	110	10	08

OBJECTIVES:

Upon completion of this course, student shall be able to

1.0 Knows basic concepts of Surveying

1.1 States the concept of surveying
1.2 States the purpose of surveying.
1.3 States the units of linear and angular measurements in Surveying
1.4 States the instruments used for taking linear and Angular measurements
1.5 States the classification of surveys.
1.6 States the fundamental principles of surveying.

2.0 Understands the principles of Chain Surveying

2.1 Explains the functions of different equipment used in Chain Surveying.
2.2 Explains methods of ranging and chaining a line.
2.3 Lists the operations involved in chaining on flat and sloping ground and when high ground intervenes.
2.4 Describes the method of setting out right angles with or without cross staff.
2.5 Explain the principles used in the chain triangulation
2.6 Explains the method of recording field observations.
2.7 Explain the errors in chain surveying
2.8 Determines the corrections for incorrect length of chain
2.9 Explains the methods of overcoming the different obstacles in chain surveying.
2.10 Calculates the areas using analytical methods only.

3.0 Understands the principles of Compass Surveying

3.1. States the purpose and principle of Compass Surveying.
3.2. Identifies the parts of Prismatic Compass and states their Functions.
3.3. Defines the terms:- Whole Circle Bearing, Quadrantal Bearing, True Meridian, Magnetic Meridian, True Bearing, Magnetic Bearing, Declination, Dip & Local attraction.

3.4. Converts Whole Circle Bearing into Quadrantal Bearing and vice versa.
3.5. Explains local attraction and its effect.
3.6. Determines corrected bearings for local attraction.
3.7. Computes the included angles and true bearings of lines in a Compass Closed traverse from data.
3.8. Explains the operations involved in field in compass Surveying
3.9. Explains method of recording field notes.
3.10. Explains the method of plotting Compass Survey and correcting for closing error by Bowditch method.
3.11. Explains Errors in Compass Surveying-Personal, Instrumental and Natural.

4.0 Understands the principles of levelling for different engineering purposes

4.1 Define levelling
4.2 List the types of levelling instruments
4.3 DefineDatum or Datum plane,Reduced level, Level surface, Horizontal surface,. Vertical Line . Station. Mean sea level, and. Bench Mark
4.4 List the component parts of a Dumpy level and their functions
4.5 List the temporary adjustments of a Dumpy level.
4.6 Explain the steps involved in performing Temporary adjustments of a dumpy level.
4.7 Define Back sight, Fore sight, Intermediate sight and Change Point
4.8 List types of levelling staves
4.9 Tabulate the levelling field data
4.10 State two methods of reducing levels
4.11 Compare height of instrument and Rise and fall methods
4.12 Compute reduced levels by height of instrument and Rise and fall methods, and apply check
4.13 List the errors in levelling
4.14 Explain 1. Natural and 2. Instrumental errors
4.15 List the Precautions to be taken to prevent errors in levelling
4.16 Explain the effect of Errors due to 1. Curvature and 2. Refraction
4.17 Compute the error due to 1. Curvature, 2. Refraction and 3. Combined error.
4.18 Apply correction for the above errors.
4.19 List the types of Levelling
4.20 Describe in detail 1. Profile levelling and 2. Reciprocal levelling
4.21 List the errors eliminated in Reciprocal levelling
4.22 Derive the formula for true difference in elevation and true error between two points in reciprocal levelling
4.23 Calculate true difference in elevation in reciprocal levelling
4.24 Calculate Collimation error in reciprocal levelling
4.25 List the fundamental lines of dumpy level
4.26 State the relationship among fundamental lines of dumpy level
4.27 Explain permanent adjustments of a dumpy level (one peg method only)
4.28 Define 1. Contour, 2. Contour interval and 3. Horizontal equivalent
4.29 List the Characteristics of contours
4.30 List the uses of contours
4.31 List the methods of contouring
4.32 Describe contouring by blocks
4.33 Describe contouring by Radial method
4.34 Explain the interpolation of contours
4.35 Explain the method of tracing contour gradient

5.0 Uses and working principles of Minor Instruments

5.1 Explain the construction, principle, uses and working of Pentagraph with sketch

5.2 Explain the construction, uses and working of electronic planimeter with sketch

5.3 Explain the construction, uses and working of abney level with sketch

COURSE CONTENT:

1.0 Classification and Principles of Surveying

1.1 Concept of Surveying
1.2 Purpose of Surveying
1.2 Units of Linear and angular measurements
1.3 Instruments used for taking Linear and angular measurements
1.4 Classification of Survey based on instruments and purpose of field work – Engineering Surveys
1.5 Fundamental principles of surveying.

2.0 Chain Surveying

2.1 Equipment used and their functions, Chains and arrows. Metallic tapes and Steel tapes, ranging rods, offset rods, pegs, plumb bob, Optical square, Line ranger
2.2 Different operations in Chain Surveying- Direct ranging and Indirect ranging
2.3 Chaining on Flat ground, Chainind on sloping ground and chaining when high ground intervenes.
2.4 Setting out right angles with or with out cross staff
2.5 Principles of Chain triangulation. Types of stations and types of chain lines
2.6 Recording field notes – field book-Conventional signs.
2.7 Errors in chain survey
2.8 Correction due to incorrect length of Chain - problems
2.9 Obstacles in chain survey -methods to overcome obstacles – problems.
2.10 Calculations of area – different methods –Average Ordinate, Trapezoidal and Simpson's rules - Problems

3.0 Compass Surveying

3.1 Purpose and principle of compass Survey
3.2 Parts of prismatic compass – identification and their function
3.3 Meridians - true meridian, magnetic meridian, arbitrary Meridian - Bearings- whole Circle bearing, Quadrantal bearing -. Dip, Declination and local attraction
3.4 conversion of whole circle bearing to Quadrantal bearing and vice versa
3.5 Local attraction- and its effects
3.6 Detection of local attraction and computation of corrected bearings – problems
3.7 Determination of included angles and true bearings of lines in a Compass Closed traverse from data – declination - Problems
3.8 Operations involved in field in Compass Survey – Types of compass surveys
3.9 Method of recording field notes
3.10 Plotting of Closed traverse-closing error and adjustments by Bowditch method.
3.11 Errors in Compass Surveying-Personal, Instrumental and Natural.

4.0 Levelling

4.1 Definition of levelling
4.2 Types of levelling instruments
4.3 Definitions :Datum or Datum plane,Reduced level, Level surface, Horizontal surface,. Vertical Line . Station. Mean sea level, and. Bench Mark
4.4 Component parts of a Dumpy level and their functions sketch of dumpy level
4.5 Temporary adjustments of a Dumpy level – setting , levelling and elimination of parallex
4.6 Steps involved in performing Temporary adjustments of a dumpy level.
4.7 Back sight, Fore sight, Intermediate sight and Change Point
4.8 Types of levelling staves
4.9 To 4.12 Tabulation of levelling field data, methods of reducing levels, height of instrument and Rise and fall methods, Comparision of height of instrument and Rise and fall methods, Computation of reduced levels by height of instrument and Rise and fall methods, and apply check
4.13 To 4.14 Errors in levelling -1. Natural and 2. Instrumental errors 3. Personal
4.15 Precautions to be taken to prevent errors in levelling
4.16 To 4.18 Errors due to 1. Curvature and 2. Refraction 3. Combined error - corrections
4.19 To 4.20 Types of Levelling - Describe in detail
4.21 Errors eliminated in Reciprocal levelling
4.22 Derivation of the formula for true difference in elevation and true error between two points in reciprocal levelling
4.23 To 4.24 Calculation of true difference in elevation and collimation error in reciprocal levelling
4.25 To 4.26Fundamental lines of dumpy level relationship among fundamental lines of dumpy level
4.27 Permanent adjustments of a dumpy level (one peg method only)
4.28 1. Contour, 2. Contour interval and 3. Horizontal equivalent
4.29 Characteristics of contours
4.30 Uses of contours
4.31 To 4.33 Methods of contouring – Description in detail contouring by blocks and contouring by Radial method
4.34 Interpolation of contours
4.35 Method of tracing contour gradient

5 Uses and working principles of minor instruments

5.1 Pentagraph
5.2 Electronic Planimeter
5.3 Abney level

REFERENCE

1. Surveying and levelling Vol–1 by KULKARNI and KANETKAR
2. Surveying and Levelling Vol–1 by B.C. PUNMIA.
3. Surveying – 1 by NAGARAJ AND HUSSAIN
4. Surveying – 1 by A.KAMALA
5. Surveying(McGrawhill) by N. N. BASAK.
6. Text Book of Surveying by C.Venkatramaiah (Universities Press)

ENGINEERING MECHANICS

Subject Title : Engineering Mechanics

Subject Code : C-106

Periods/Week : 05

Periods/Semester : 150

TIME SCHEDULE

S.No.	Major Topics	No. of Periods	Weightage of marks	Short Answer Type	Essay Type
1.	Forces & Moments	16	13	1	1
2.	Centroid	20	16	2	1
3.	Moment of Inertia	30	23	1	2
4.	Simple Stresses and Strains	42	29	3	2
5.	Shear force and Bending Moment	42	29	3	2
	Total	**150**	**110**	**10**	**8**

OBJECTIVES:

Upon completion of the course, the student shall be able to

1.0 Understand the concept Equilibrium of Co-Planar forces

1.1 Define the following terms

1. Force
2. Moment
3. Resultant
4. Equilibrium of forces
5. Equilibrant
6. Moment of a couple

1.2 Distinguish between

1.2.1 Scalar and Vector quantities

1.2.2 Co-planar and Non co-planar forces

1.2.3 Parallel and non-parallel forces

1.2.4 Like and unlike parallel forces

1.3 Compute the resultant of two co-planar forces acting at a point by

1.3.1 Law of parallelogram of forces

1.3.2 Triangle law of forces

1.4 Explain 'Lami's Theorem'.

1.4.1 Solve simple problems using Lami's Theorem

1.5 Solve problems on computation of the resultant of a system of coplanar concurrent forces by

1.5.1Law of polygon of forces

1.5.2Resolution of forces

1.6. Solve problems on computation of the resultant of a system of coplanar

parallelforces.

1.7. Explain the properties of a couple.

1.8. State the conditions of equilibrium of rigid body subjected to a number of co- planar forces.

1.8.1. Determine resultant of co-planar concurrent forces by analytical methods.

1.9 List various types of supports (like Simple support, fixed support, hinged support, roller support)

1.10 List various types of beams (like simply supported beams, cantilever, fixed beams, over hanging beams, continuous beams)

1.11 List various types of loading (like point load, uniformly distributed load, uniformly varying load

1.12 To determine support reactions for simply supported beams with point loads and uniformly distributed loads

2.0 **Understand the term Centroid**

2.1 Define Centroid and Centre of gravity

2.2 Distinguish between Centroid and Centre of gravity

2.3 State the need for finding the Centroid and Centre of gravity for various engineering applications

2.4 Calculate the positions of Centroid for simple plane figures from first principles

2.5 Explain the method of determining the Centroid by 'Method of moments'

2.6 Determine the position of Centroid of standard sections-T, L, I, Channel section, Z section, unsymmetrical I section

2.7 Determine the position of Centroid of built up sections consisting of RSJ'S, flange plates and Plane figures having hollow portions

3.0 Compute the Moment of Inertia and radius of gyration

3.1 Define Moment of Inertia (MI), Polar Moment of Inertia, Radius of gyration

3.2 State the necessity of finding Moment of Inertia for various engineering applications

3.3 State 1. Parallel axis theorem 2. Perpendicular axis theorem to determine MI

3.3 Determine Moment of Inertia and Radius of gyration for regular geometrical sections like T, L, I, Channel section, Z section, unsymmetrical I section

3.4 Determine MI of standard sections by applying Parallel axis theorem.

3.5 Determine MI of built-up sections by applying Parallel axis theorem.

3.6 Calculate radius of gyration of standard sections.

3.7 Determine the polar M.I for solid and hollow circular section applying Perpendicular axis theorem.

4.0 Calculate the simple Stresses and Strains in structural materials

4.1 Define the following terms

1. Stress
2. Strain
3. Modulus of Elasticity
4. Longitudinal Strain
5. Lateral Strain
6. Poisson's ratio
7. Modulus of rigidity
8. Bulk Modulus
9. Working stress
10. Factor of safety
11. Resilience
12. Strain Energy
13. Proof resilience and
14. Modulus of Resilience

4.2 Distinguish between different kinds of stresses and strains.

4.3 Draw the stress-strain curve for ductile materials (Mild steel) and hence explain the salient points in the curve.

4.4 State Hooke's law and limit of proportionality.

4.5 Solve problems on relationship between simple stress and simple strain under axial loading on uniform bars and stepped bars.

4.6 State the relationship among the elastic constants.

4.7 Solve problems on relationship between elastic constants.

4.8 Calculate stresses in simple and composite members under axial loading

4.9 Explain temperature stress, strain, temperature stresses in composite sections.

4.10 Calculate instantaneous stress and strain Energy due to dynamic loads and impact loading.

4.11 Explain the mechanical properties of materials

5.0 Determine Shear Force and Bending Moment of simple beams analytically

5.1 Define
- a) Cantilever beam
- b) Simply supported beam
- c) Fixed beam
- d) Continuous beam
- e) Overhanging beam

5.2 Define
- a) Point Load
- b) Uniformly Distributed Load

5.3 Describe
- a) Roller support
- b) Hinged support
- c) Fixed support

5.4 Calculate reactions at rollers/hinged and fixed supports for
1. Simply Supported beams,
2. Cantilever beams and
3. Overhanging beams.

5.5 Explain
- a) Shear Force
- b) Bending Moment

5.6 Explain sign conventions used for drawing
1. Shear Force

2. Bending Moment

5.7 Deduce the relationship among the rate of loading, shear force and bending moment

5.8 Determine Shear Force and Bending Moments on
1.Cantilever and
2.Simply Supported beams
for simple cases of loading (Point Load, Uniformly Distributed Load) analytically

5.9 Describe the procedures for sketching the Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD)

5.10 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for Cantilever and Simply Supported Beams

5.11 Define point of contra flexure

5.12 Determine the Shear Force, Bending Moment and point of contra flexure for overhanging beams

5.13 Sketch Shear Force Diagrams (SFD) and Bending Moment Diagrams (BMD) for overhanging beams

COURSE CONTENT

1. Forces & Moments

a) Definition of force - vectors and scalars - vector representation of a force - systems of forces - co-planar forces.

b) Resultant of forces at a point – Parallelogram Law and Triangle Law of forces – Lami's theorem – Polygon law of forces – Resolution of forces.

c) Parallel forces – like and unlike – moment of force -its units and sense-couple-moment of a couple – properties of a couple.

d) Conditions of equilibrium of a rigid body subjected to a number of co-planar forces.

e) Structural members supporting co - planar forces- Types of supports- Types of beams - Types of loading - Determination of support reactions for simply supported beams with point loads and uniformly distributed loads

2. Centroid

a) Definitions – Centroid, Centre of gravity

b) Position of Centroid of standard figures like rectangle, triangle, parallelogram circle, semi-circle and trapezium.

c) Determination of location of Centroid of standard sections- T, L, I, Channel section, Z section,built up sections consisting of RSJs & flange plates and plane figures having hollow portion.

3. Moment of Inertia

a) Definition of Moment of Inertia
b) Perpendicular and parallel axes theorems
c) Moment of Inertia of standard sections like rectangle, triangle, circle and hallow circular sections
d) Moment of Inertia of built up sections- T, L, I, Channel section, and Z sections using parallel axis theorem
e) Moment of Inertia and radius of gyration of built-up sections consisting of the combinations of RSJ's & flange plates, channels & flange plates etc.
f) Polar Moment of Inertia of solid and hollow circular sections using Perpendicular axis theorem

4. Simple Stresses and Strains

a) Stress and strain – type of stresses and strains
b) Stress strain curves for ductile materials- mild steel, Elastic limit, Limit of proportionality, Yield point, Ultimate stress, Breaking stress, Working stress and Factor of safety.
c) Hooke's law – Young's modulus – deformation under axial load.
d) Shear stress and Shear Strain – Modulus of rigidity.
e) Longitudinal and lateral strain - Poisson's ratio, Bulk Modulus – relationship between elastic constants (proof not required, only problems).
f) Composite sections – effect of axial loads
g) Temperature stresses and strains – hoop stress - Temperature stresses in composite sections
h) Resilience – strain energy-proof resilience and modulus of resilience – maximum instantaneous stress due to gradual, sudden and shock loading.
i) Mechanical properties of materials - elasticity, plasticity, ductility, brittleness, malleability, stiffness, hardness, toughness, creep, fatigue- examples of materials which exhibit the above properties.

5. Shear force and Bending Moment

a. Beams – Types of beams – Cantilevers – Simply supported – Overhanging – Fixed and Continuous.
b. Types of supports – Roller – Hinged – Fixed,
c. Explanation of S.F and B.M. at a section
d. Relation between rate of loading SF and BM
e. Calculation of S.F. and B.M values at different sections for cantilevers Simply supported beams, overhanging beams under point loads and uniformly distributed loads, position and significance of points of contra flexure.
f. Drawing S.F and B.M diagrams by analytical methods – location of points of contra flexure.

REFERENCE BOOKS

1. Engineering Mechanics – N. H.Dubey (Tata McGraw Hill)
2. Engineering Mechanics - R.S.Kurmi
3. Engineering Mechanics - P.K. Abdul Latheef
4. Engineering Mechanics & Statics - Dayaratnam
5. Engineering Mechanics - N. Srinivasulu,

ENGINEERING DRAWING

Subject Title : Engineering Drawing

Subject Code : 107 (Common to all Branches)

Periods/Week : 06

Periods Per Year : 180

Time Schedule

Sno	Major Topics	No. of Periods	Weightage of marks	Short Answer Questions	Essay type Questions
1	Importance of Engineering Drawing	01	-	-	-
2	Engineering Drawing Instruments	05	-	-	-
3	Free hand lettering & Numbering	06	5	1	-
4	Dimensioning Practice	09	5	1	-
5	Geometrical Constructions	21	15	1	1
6	Projection of points, Lines, Planes & Solids	21	10	-	1
7	Auxiliary views	06	5	1	-
8	Sectional views	27	10	-	1
9	Orthographic Projection	33	10	-	1
10	Pictorial drawing	30	10	-	1
11	Development of surfaces	21	10	-	1
	Total	**180**	**80**	**04**	**06**

The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

OBJECTIVES

Upon completion of the subject the student shall be able to

1) **Understand the basic concepts of Engineering Drawing**
   a) State the importance of drawing as an engineering communication medium
   b) State the necessity of B.I.S. Code of practice for Engineering Drawing
   c) Explain the linkages between Engineering drawing and other subjects of study in diploma course

2) Use of Engineering Drawing Instruments

a) Select the correct instruments and draw lines of different orientation
b) Select the correct instruments and draw small and large Circles
c) Select the correct instruments for measuring distances on the drawing
d) Use correct grade of pencil for different types of lines, thickness and given function
e) Select and use appropriate scales for a given application
f) Identify different drawing sheet sizes as per I.S. and Standard Layouts
g) Prepare Title block as per B.I.S. Specifications
h) Identify the steps to be taken to keep the drawing clean and tidy

3) Write Free Hand Lettering and Numbers

a) Write titles using slanting letters and numerals of 7mm, 10mm and 14mm height
b) Write titles using vertical letters and numerals of 7mm, 10mm and 14mm height
c) Select suitable sizes of lettering for different layouts and applications

4) Understand Dimensioning Practice

a) Define "Dimensioning"
b) State the need of dimensioning the drawing according to accepted standards
c) Identify notations of Dimensioning used in dimensioned drawing
d) Identify the system of placement of dimensions in the given dimensioned drawing
e) Dimension a given drawing using standard notations and desired system of dimensioning
f) Dimension standard features applying necessary rules
g) Arrange dimensions in a desired method for a given drawing
h) Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly

5) Apply Principles of Geometric Constructions

a) Divide a given line into desired number of equal parts internally
b) Draw tangent lines and arcs
c) Use General method to construct any polygon
d) Explain the importance of conics
e) Construct ellipse by concentric circles method
f) Construct parabola by rectangle method
g) Construct rectangular hyperbola from the given data
h) Construct involute from the given data
i) Construct cycloid and helix from the given data
j) State the applications of the above constructions in engineering practice

6) Apply Principles of Projection of points, lines, planes & solids

a) Visualize the objects
b) Explain the I-angle and III-angle projections
c) Practice the I-angle projections
d) Draw the projection of a point with respect to reference planes (HP&VP)
e) Draw the projections of straight lines with respect to two reference planes (cases of lines parallel to one plane and inclined to other plane only)
f) Draw the projections of planes (cases of planes perpendicular to one plane and inclined to other plane only)
g) Draw the projections of solids (cases of axis perpendicular to one plane and inclined to other plane only)

7) Understand the need of auxiliary views

a) State the need of Auxiliary views for a given engineering drawing
b) Draw the auxiliary views of a given engineering component

c) Differentiate between auxiliary view and apparent view

8) Appreciate the need of Sectional Views

a) Explain the need to draw sectional views
b) Select the section plane for a given component to reveal maximum information
c) Explain the positions of section plane with respect to reference planes
d) Differentiate between true shape and apparent shape of section
e) Draw sectional views and true sections of regular solids discussed in chapter-6 above
f) Apply principles of hatching

9) Apply principles of orthographic projection

a) Explain the principles of orthographic projection with simple sketches
b) Draw the orthographic view of an object from its pictorial drawing
c) Draw the minimum number of views needed to represent a given object fully

10) Prepare pictorial drawings

a) State the need of pictorial drawings
b) Differentiate between isometric scale and true scale
c) Prepare Isometric views for the given orthographic drawings

11) Interpret Development of surfaces of different solids

a) State the need for preparing development drawing
b) Prepare development of simple engineering objects (cubes, prisms, cylinders, cones, pyramids) using parallel line and radial line methods
c) Prepare development of surface of engineering components like trays, funnels, 90^0 elbows & rectangular ducts

COURSE CONTENT

NOTE

1) **B.I.S Specifications should invariably be followed in all the topics.**
2) **A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.**
3) **First Angle Projection is to be followed for all Orthographic projection exercises**

1) 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 B.I.S - Role of drawing in engineering education – Link between Engineering drawing and other subjects of study

2) Engineering drawing Instruments

Classification: Basic tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mention the names under each classification and their brief description -Scales: Recommended scales reduced & enlarged scales- 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

<u>Drawing Plate 1</u>: Consisting of two exercises on use of drawing instruments

3) **Free hand lettering & numbering**

Importance of lettering – Types of lettering -Guide Lines for Lettering- Practicing letters & numbers of given sizes (7mm, 10mm and 14mm) Advantages of single stroke or simple style of lettering

Drawing plate 2: Consisting of five to six exercises on freehand Lettering & Numbering

4) **Dimensioning practice**

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object - Dimensioning size, Location 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 dimensioning of narrow spaces

Drawing Plate 3: Consisting of 8 exercises on Dimensioning methods and rules

5) **Geometric Constructions**

Division of a line: to divide a straight line into given number of equal parts internally and it's examples in engineering applications. 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 Construction of polygon: Construction of any regular polygon of given side using general method. Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and loci of a moving point, Eccentricity of above curves – Their Engg. applications viz. Projectiles, reflectors, P-V Diagram of a Hyperbolic process - Construction of ellipse by concentric circles method - Construction of parabola by rectangle method - Construction of rectangular hyperbola - General Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering applications, viz, Gear tooth profile, screw threads, springs etc. - their construction.

Drawing Plate 4: Consisting of eight exercises on construction of polygons

Drawing Plate 5: Consisting of eight exercises on construction of conics

Drawing Plate 6: Consisting of eight exercises on involute, cycloid and helix

6) **Projection of points, lines, planes & solids**

Projecting a point on two planes of projection -Projecting a point on three planes of projection - Projection of straight line i) Parallel to both the planes ii) Perpendicular to one of the planes iii) Inclined to one plane and parallel to other plane - Projection of regular planes- i) Plane perpendicular to HP and parallel to VP and vice versa ii) Plane perpendicular to HP and inclined to VP and vice versa - Projection of regular solids with i) Axis perpendicular to one of the planes ii) Axis parallel to VP and inclined to HP and vice versa

Drawing Plate 7: Consisting of eight exercises on projection of points and Lines

Drawing Plate 8: Consisting of eight exercises on projection of planes

<u>Drawing Plate 9</u>: Consisting of eight exercises on projection of solids

7) **Auxiliary views**

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

<u>Drawing plate 10</u>: Consisting of four exercises on auxiliary views

8) **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) - Hatching – Section of regular solids inclined to one plane and parallel to other plane

<u>Drawing Plate 11</u>: Consisting of six exercises on sections of solids

9) **Orthographic Projections**

Meaning of orthographic projection -Using a viewing box model – Number of views obtained on the six faces of the box, - Legible sketches of only 3 views for describing object - Concept of front view, top view, and side view, sketching these views for number of engineering 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 mitre 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

<u>Drawing Plate 12</u>: Consisting of 12 exercises on orthographic projections of engineering objects

10) **Pictorial Drawings**

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - 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 view and Isometric projection - Isometric and Non-isometric lines - Isometric drawing of common features like rectangles, circular shapes, non-isometric lines - Use of box and offset methods

<u>Drawing plate 13</u>: Consisting of 12 exercises on Isometric views of engineering objects

11) **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) inclined to one principal plane and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramids -Types of development: Parallel line and radial line development -Procedure of drawing development - drawings of trays, funnels, 90^0 elbow pipes and rectangular ducts.

<u>Drawing plate 14</u>: Consisting of 5 exercises on development problems

REFERENCE BOOKS

Engineering Graphics by P I Varghese – (McGraw-hill)

Engineering Drawing by Basant Agarwal & C.M Agarwal - (McGraw-hill)

Engineering Drawing by N.D.Bhatt.

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

SP-46-1998 – Bureau of Indian Standards.

SURVEYING – I PRACTICE & PLOTTING

Subject Title : **Surveying – I Practice & Plotting**

Subject Code : **C-108**

Periods/Week : **04**

Periods/Year : **120**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Chain surveying	32
2.	Compass Surveying	24
3.	Levelling	40
4.	Plotting	24
	Total	120

OBJECTIVES:

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

1.0 Applies standard practices to perform chain survey in the field and plots from field data

1.1 Practice unfolding and folding a chain.
1.2 Perform direct ranging on level ground and measure the distance between two given stations and record the measurements in the field book..
1.3 Perform indirect ranging and measure the distance between two given stations when a high ground intervenes preventingintervisibility of ends of line.
1.4 Set out a right angle to a given chain line by using chain and cross staff and by using chain only.
1.5 Set and measure offsets for a given object from chain line by
1. Perpendicular offsets 2.Oblique offsets.

1.6 Perform triangulation survey of a given area with chain and cross staff and record all necessary nearby details.
1.7 Calculate the area bounded by the given points by chain triangulation.
1.8 Calculate the area bounded by the given points by chain and cross staff.
1.9 Carry out chain survey to overcome obstacles like pond, building etc and plot the Survey from field book measurements.
1.10 Carry out chain traversing to survey an area bounded by more than three stations and plot the Survey from field book measurements.

2.0 Performs compass survey and plots from field data

2.1 Identify the parts of a prismatic Compass
2.2 Set up the compass at a station and carry out temporary adjustments.
2.3 Take bearings of two points from instrument station and calculate the included angle.
2.4 Perform an open compass survey with Compass and Chain.
2.5 Perform a closed traverse with compass and chain.
2.6 Determine the area bounded by the given points by the method of Radiation.
2.7 Determine the distance between two accessible points involving single setting of the instrument.
2.8 Determine the distance between two inaccessible points involving setting of the instrument at two stations.

3.0 Performs different methods of levelling.

3.1 Identify the parts of Dumpty level and levelling staff
3.2 Performs temporary adjustments for taking observations
3.3 Takes levels for differential levelling.
3.4 Takes levels for check levelling and Reciprocal levelling
3.5 Reduces the levels from field data.
3.6 Takes L.S. and C.S for alignment of Road/Canal.
3.7 Conducting block levels of an area to prepare a contour map

4.0 Applies principles of mapping from the fieldwork and plotting the field work

4.1 Understand the importance & relation between field work & plotting.

COURSE CONTENT

Chain Surveying

a) Practice unfolding and folding of a chain.

b) Ranging and chaining of lines on level ground and recording in field book to measure the distance between two stations.

c) Chaining a line involving indirect ranging.
d) Setting and measuring the offsets-Perpendicular and Oblique offsets
e) Measurement of land areas –cross staff survey
f) Chain triangulation around the building covering a small area with other details taking offsets and recording.
g) Chain triangulation involving a road with other details taking offsets and recording.
h) Chain traversing to survey an area bounded by more than three stations.

Compass Surveying

a) Setting up the compass – observations of bearings
b) Calculation of included angles from the observed bearings
c) Traversing with prismatic compass and chain – open Traverse – Recording.
d) Traversing with prismatic compass and chain- closed traverse - recording.

e) Plotting the closed traverse from field data and adjust for closing error by Bowditch rule.

f) Determination of the area bounded by the given points by the method of Radiation

g) Determination of the distance between two accessible points involving single setting of the instrument

h) Determination of the distance between two inaccessible points involving setting of the instrument at two stations.

3.0 Levelling

3.1 Study of dumpy level, levelling staff and Temporary adjustments of level.

3.2 Taking levels of various points and booking the same in a level field book.

3.3 Differential or Fly levelling, reducing levels by Height of Collimation and Rise & Fall method.

3.4 Differential levelling involving inverted levels.

3.5 Reciprocal levelling.

3.6 Taking levels of Longitudinal Section and Cross Sections of a Road/ Canal

4.0 Plotting

4.1	Conventional signs in Surveying	1 Exercise
4.2	Plotting of land surveys – Chain and Cross Staff survey – Calculation of areas	1 Exercise
4.3	Plotting of chain triangulation, Surveying of small areas around Buildings.	1 Exercise
4.4	Plotting of closed traverse -Compass surveying location of details and adjusting error by Bow ditch's method.	1 Exercise
4.5	Plotting of L.S and C.S.	1 Exercise
4.6	Plotting of contours from block levelling.	1 Exercise
	Total	7 Exercises

PHYSICS LABORATORY

Subject Title : Physics Laboratory
Subject Code : Common -109
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Hands on practice on Vernier Calipers	03
2.	Hands on practice on Screw gauge	03
3.	Verification of Parallelogram law of forces and Triangle law of forces	03
4.	Simple pendulum	03
5.	Velocity of sound in air – (Resonance method)	03
6.	Focal length and Focal power of convex lens (Separate & Combination)	03
7.	Refractive index of solid using traveling microscope	03
8.	Surface tension of liquid using traveling microscope	03
9.	Coefficient of viscosity by capillary method	03
10.	Boyle's law verification	03
11.	Meter bridge	03
12.	Mapping of magnet lines of force	03
	Revision	06
	Test	03
	Total:	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practise with Vernier calipers to determine the volumes and areas of a cylinder and sphere and their comparison etc .
2.0 Practise with Screw gauge to determine thickness of a glass plate, cross sectional area of a wire and volumes of sphere and also their comparison etc
3.0 Verify the parallelogram law and Triangle law
4.0 Determine the value of acceleration due to gravity using Simple Pendulum
5.0 Determine the velocity of sound in air at room temperature and its value at zero degree centigrade
6.0 Calculate the Focal length and focal power of convex lenses using distant object method , U-V method , U-V graph and 1 / U – 1 / V graph methods and their comparison,
7.0 Determine the refractive index of a solid using travelling microscope
8.0 Determine the surface tension of a liquid using travelling microscope
9.0 Determine the viscosity of a liquid using capillary method
10.0 Verify the Boyle's law employing a Quill tube
11.0 Determine the specific resistance of material of a wirel using Meter Bridge
12.0 Drawing magnetic lines of force under N-S and N-N methods and locate null points

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	Competencies	Key competencies
1. Hands on practice on Vernier Calipers(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate the physical quantities of given object	• Read the scales • Calculate the requisite physical quantities of given objects
2. Hands on practice on Screw gauge(03)	• Find the Least count • Fix the specimen in posit • Read the scales • Calculate thickness of glass place and cross section of wire and other quantities	• Read the scales • Calculate thickness of given glass plate • Calculate cross section of wire and other quantities
3. Verification of Parallelogram law of forces and Triangle law of forces(03)	• Fix suitable weights • Note the positions of threads on drawing sheet • Find the angle at equilibrium point • Construct parallelogram • Compare the measured diagonal • Construct triangle • Find the length of sides • Compare the ratios	• Find the angle at equilibrium point • Constructing parallelogram • Construct triangle • Compare the ratios of force and length
4. Simple pendulum(03)	• Fix the simple pendulum to the stand • Adjust the length of pendulum • Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and $l\text{-}T^2$ graph	• Find the time for number of oscillations • Find the time period • Calculate the acceleration due to gravity • Draw l-T and $l\text{-}T^2$ graph

Name of the Experiment(Periods)	Competencies	Key competencies
5. Velocity of sound in air –Resonance method (03)	• Arrange the resonance apparatus • Adjust the reservoir level for booming sound • Find the first and second resonanting lengths • Calculate velocity of sound	• Adjust the reservoir level • Find the first and second resonanting lengths • Calculate velocity of sound at room temperature • Calculate velocity of sound at 0^0 C
6. Focal length and Focal power of convex lens (Separate & Combination) (03)	• Fix the object distance • Find the Image distance • Calculate the focal length and power of convex lens and combination of convex lenses • Draw u-v and 1/u – 1/v graphs	• Calculate the focal length and power of convex lens • Draw u-v and 1/u – 1/v graphs
7. Refractive index of solid using traveling microscope(03)	• Find the least count of vernier on microscope • Place the graph paper below microscope • Read the scale • Calculate the refractive index of glass slab	• Read the scale • Calculate the refractive index of glass slab
8. Surface tension of liquid using traveling microscope(03)	• Find the least count of vernier on microscope • Focus the microscope to the lower meniscus & bent pin • Read the scale • Calculate height of liquid rise • Calculate the surface tension of water	• Read the scale • Calculate height of liquid rise • Calculate the surface tension of water

Name of the Experiment	Competencies	Key competencies

9. Coefficient of viscosity by capillary method(03)	• Find the least count of vernier • Fix the capillary tube to aspiratory bottle • Find the mass of collected water • Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water using capillary method	• Find the pressure head • Calculate rate of volume of liquid collected • Find the radius of capillary tube • Calculate the viscosity of water
10. Boyle's law verification (03)	• Note the atmospheric pressure • Fix the quill tube to retort stand • Find the length of air column • Find the pressure of enclosed air • Find and compare the calculated value P x l	• Find the length of air column • Find the pressure of enclosed air • Find the value P x l
11. Meter bridge(03)	• Make the circuit connections • Find the balancing length • Calculate unknown resistance • Find the radius of wire • Calculate the specific resistance	• Find the balancing length • Calculate unknown resistance • Calculate the specific resistance
12. Mapping of magnet lines of force(03)	• Draw magnetic meridian • Placed the bar magnet in NN and NS directions • Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines	• Draw magnetic lines of force • Locate the neutral points along equatorial and axial lines

CHEMISTRY LABORATORY

Subject Title : Chemistry Laboratory
Subject Code : Common -110
Periods per week : 03
Total periods per year : 45

TIME SCHEDULE

S.No	Name of the Experiment	No. of Periods
1.	Familiarization of methods for Volumetric analysis	03
2.	Preparation of Std Na_2CO_3 and making solutions of different dilution	03
3.	Estimation of HCl solution using Std. Na_2CO_3 solution	03
4.	Estimation of NaOH using Std. HCl solution	03
5.	Estimation of H_2SO_4 using Std. NaOH solution	03
6.	Estimation of Mohr's Salt using Std. $KMnO_4$	03
7.	Determination of acidity of water sample	03
8.	Determination of alkalinity of water sample	03
9.	Determination of total hardness of water using Std. EDTA solution	03
10.	Estimation of Chlorides present in water sample	03
11.	Estimation of Dissolved Oxygen (D.O) in water sample	03
12.	Determination of pH using pH meter	03
13.	Determination of conductivity of water and adjusting ionic strength	03
14.	Determination of turbidity of water	03
15.	Estimation of total solids present in water sample	03
	Total:	**45**

Objectives:

Upon completion of the course the student shall be able to

1.0 Practice volumetric measurements (using pipettes, measuring jars, volumetric flask, burettes) and gravimetric measurements (using different types of balances), making dilutions, etc.

2.0 Practice making standard solutions with pre weighed salts and to make solutions of desired dilutions using appropriate techniques.

3.0 Conduct titrations adopting standard procedures and using Std. Na_2CO_3 solution for estimation of HCl

4.0 Conduct titrations adopting standard procedures and using Std. HCl solution for estimation of NaOH

5.0 Conduct titrations adopting standard procedures and using Std. NaOH solution for estimation of H_2SO_4

6.0 Conduct titrations adopting standard procedures and using Std. $KMnO_4$ solution for estimation of Mohr's Salt

7.0 Conduct titrations adopting standard procedures to determine the acidity of given samples of water (One ground water and one surface / tap water, and rain water if available)

8.0 Conduct titrations adopting standard procedures to determine the alkalinity of given

samples of water (One ground water and one surface / tap water)

9.0 Conduct titrations adopting standard procedures to determine the total hardness of given samples of water (One ground water and one surface / tap water) using Std. EDTA solution

10.0 Conduct titrations adopting standard procedures to determine the chlorides present in the given samples of water and wastewater (One ground water and one surface / tap water)

11.0 Conduct the test using titrometric / electrometric method to determine Dissolved Oxygen (D.O) in given water samples (One sample from closed container and one from open container / tap water)

12.0 Conduct the test on given samples of water / solutions (like soft drinks, sewage, etc.) to determine their pH using standard pH meter

13.0 Conduct the test on given samples of water / solutions
   a) To determine conductivity
   b) To adjust the ionic strength of the sample to the desired value

14.0 Conduct the test on given samples of solutions (coloured and non coloured) to determine their turbidity in NTU

15.0 Conduct titrations adopting standard procedures to determine the total solids present in given samples of water (One ground water and one surface / tap water)

Competencies and Key competencies to be achieved by the student

Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Familiarization of methods for Volumetric analysis (03)	--	--
Preparation of Std Na_2CO_3 and making solutions of different dilution (03)	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions	▪ Weighing the salt to the accuracy of .01 mg ▪ Measuring the water with volumetric flask, measuring jar, volumetric pipette and graduated pipette ▪ Making appropriate dilutions
Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Estimation of HCl solution using Std. Na_2CO_3 solution (03)	▪ Cleaning the glassware and rinsing with appropriate solutions ▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Filling the burette with titrant ▪ Fixing the burette to the stand	▪ Making standard solutions ▪ Measuring accurately the standard solutions and titrants ▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate
Estimation of NaOH using Std. HCl solution (03)		
Estimation of H_2SO_4 using Std. NaOH solution (03)		
Estimation of Mohr's Salt using Std. $KMnO_4$ (03)		

Determination of acidity of water sample (03) Determination of alkalinity of water sample (03) Determination of total hardness of water using Std. EDTA solution (03) Estimation of Chlorides present in water sample (03) Estimation of Dissolved Oxygen (D.O) in water sample (By titration method) (03)	▪ Effectively Controlling the flow of the titrant ▪ Identifying the end point ▪ Making accurate observations ▪ Calculating the results	observations
Estimation of Dissolved Oxygen (D.O) in water sample (By electrometric method) (03) Determination of pH using pH meter (03) Determination of conductivity of water and adjusting ionic strength to required level (03) Determination of turbidity of water (03)	▪ Familiarize with instrument ▪ Choose appropriate 'Mode' / 'Unit' ▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately ▪ Follow Safety precautions	▪ Prepare standard solutions / buffers, etc. ▪ Standardize the instrument with appropriate standard solutions ▪ Plot the standard curve ▪ Make measurements accurately
Name of the Experiment (No of Periods)	**Competencies**	**Key competencies**
Estimation of total solids present in water sample (03)	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate ▪ Drying the crucible in an oven	▪ Measuring the accurate volume and weight of sample ▪ Filtering and air drying without losing any filtrate ▪ Accurately weighing the filter paper, crucible and filtrate

COMPUTER FUNDEMENTALS LABORATORY
(Common to all Branches)

Subject Title : Computer Fundamentals Laboratory
Subject Code : C-111
Periods/Week : 03
Periods/Year : 90

Time Schedule

S. No.	Major Topics	No. of sessions each of 3 periods duration	No. of Periods
I.	Computer hardware Basics	02	06
II.	Windows Operating System	02	06
III.	MS Word	08	24
IV.	MS Excel	09	27
V.	MS PowerPoint	09	27
	Total	30	90

Rationale: The knowledge of Computer usage has become a must for everyone, due to wide spread computer usage and related applications in all fields. This laboratory is designed to give the students hands on practice of Windows Operating System and MS Office to enable the students to use these skills in future courses.

I. Computer Hardware Basics (Not for end examination)

1. a) To familiarize with a Computer System and its hardware connections.
   b) To start and Shutdown a Computer correctly.
   c) To check the software details of the computer
   d) To practice Internal and External DOS commands
2. To check the hardware present in your computer.

II. Windows's operating system (Not for end examination)

3. To explore Windows Desktop
4. Working with Files and Folders
5. Windows Accessories: Calculator – Notepad – WordPad – MS Paint

III. Practice with MS-WORD

6. To familiarize with Ribbon layout of MS Word
   Home - Insert - Page layout – References – Review - View
7. To practice Word Processing Basics
8. To practice Formatting techniques
9. To insert a table of required number of rows and columns
10. To insert Objects, Clipart and Hyperlinks
11. To use Mail Merge feature of MS Word
12. To use Equations and symbols features

IV. Practice with MS-EXCEL

13. To familiarize with MS-EXCEL layout
14. To access and Enter data in the cells
15. To edit a spread sheet- Copy, Cut, Paste, and selecting Cells
16. To use built in functions and Formatting Data
17. To create Excel Functions, Filling Cells
18. To enter a Formula for automatic calculations
19. To practice Excel Graphs and Charts
20. To format a Worksheet in Excel, Page Setup and Print

V. Practice with MS-POWERPOINT

21. To familiarize with Ribbon layout features of PowerPoint 2007.
22. To create a simple PowerPoint Presentation
23. To set up a Master Slide in PowerPoint
24. To insert Text and Objects
25. To insert a Flow Charts
26. To insert a Table
27. To insert a Charts/Graphs
28. To insert video and audio
29. To practice Animating text and objects
30. To Review presentation

Competencies and Key Competencies to be achieved by the students

Exp No.	Name of the Experiment	Competencies	Key Competencies
1 (a).	To familiarize with Computer system and hardware connections	a. Identify the Parts of a Computer system a). CPU b) Monitor c) CD/DVD Drive d) Power Switch e) Start Button f) Reset Button b. Identify and connect various peripherals c. Identify and connect the cables used with computer system d. Identify various ports on CPU and connect Keyboard & Mouse	Connect cables to external hardware and operate the computer
1 (b).	To Start and Shut down Computer correctly	a. Log in using the password b. Start and shut down the computer c. Use Mouse and Keyboard	a. Login and logout as per the standard procedure b. Operate mouse & Keyboard
1 (c).	To explore Windows Desktop	a. Familiarize with Start Menu, Taskbar, Icons and Shortcuts b. Access application programs using Start menu, Task manager c. Use Help support	a. Access application programs using Start menu b. Use taskbar and Task manager
1(d).	To practice Internal and External DOS commands	a. Practice Internal commands b. Practice External commands	Familiarize with MS-DOS Commands
2.	To check the software details of the computer	c. Find the details of Operating System being used d. Find the details of Service Pack installed	Access the properties of computer and find the details
3.	To check the hardware present in your computer	a. Find the CPU name and clock speed b. Find the details of RAM and Hard disk present c. Access Device manager using Control Panel and check the status of devices like mouse and key board d. Use My Computer to check the details of Hard Disk Drives and partitions e. Use the Taskbar	a. Access device manager and find the details b. Type /Navigate the correct path and Select icon related to the details required
4.	Working with Files and Folders	a. Create folders and organizing files in different folders b. Use copy / paste or move commands to organize files and folders	a. Create files and folders rename , arrange and search for the required folder/file

Exp No.	Name of the Experiment	Competencies	Key Competencies
	Working with Files and Folders Continued....	c. Arrange icons – name wise, size, type, Modified d. Search a file or folder and find its path e. Create shortcut for files and folders (in other folders) on Desktop f. Familiarize with the use of My Documents g. Familiarize with the use of Recycle Bin	b. Restore deleted files from Recycle bin
5.	To use Windows Accessories: Calculator – Notepad – WordPad – MS Paint	a. Familiarize with the use of Calculator b. Access Calculator using Run command c. Create Text Files using Notepad and WordPad and observe the difference in file size d. Use MS paint and create .jpeg, .bmp files using MS Paint	a. Use windows accessories and select correct text editor based on the situation. b. Use MS Paint to create /Edit pictures and save in the required format.
6.	To familiarize with Ribbon layout of MS Word. – Home – Insert- Page Layout- References- Review-View	a. Create/Open a document b. Use Save and Save as features c. Work on two documents simultaneously d. Choose correct Paper size and Printing options	a. Create a Document and name appropriately and save b. Set paper size and print options
7.	To practice Word Processing Basics	a. Typing text b. Keyboard usage c. Use mouse (Left click / Right click / Scroll) d. Use Keyboard shortcuts e. Use Find and Replace features in MS- word f. Use Undo and Redo Features g. Use spell check to correct Spellings and Grammar	a. Use keyboard and mouse to enter/edit text in the document. b. Use shortcuts c. Use spell check/ Grammar features for auto corrections.
8.	To practice Formatting techniques	a. Formatting Text b. Formatting Paragraphs c. Setting Tabs d. Formatting Pages e. The Styles of Word f. Insert bullets and numbers g. Themes and Templates h. Insert page numbers, header and footer	a. Format Text and paragraphs and use various text styles. b. Use bullets and numbers to create lists c. Use Templates /Themes d. Insert page numbers date, headers and footers

Exp No.	Name of the Experiment	Competencies	Key Competencies
9.	To insert a table of required number of rows and columns	a. Edit the table by adding the fields – Deleting rows and columns –inserting sub table – marking borders. Merging and splitting of cells in a Table b. Changing the background colour of the table c. Use table design tools d. Use auto fit – fixed row/ column height/length – Even distribution of rows / columns features e. Convert Text to table and Table to Text f. Use Sort feature of the Table to arrange data in ascending/descending order	a. Insert table in the word document and edit b. Use sort option for arranging data.
10.	To Insert objects, clipart and Hyperlinks	a. Create a 2-page document. &Insert hyperlinks and Bookmarks. b. Create an organization chart c. Practice examples like preparing an Examination schedule notice with a hyperlink to Exam schedule table.	a. Insert hyperlinks &Bookmarks b. Create organization charts/flow charts
11.	To Use Mail merge feature of MS Word	a. Use mail merge to prepare individually addressed letters b. Use mail merge to print envelopes.	Use Mail merge feature
12.	To use Equations and symbols features.	a. Explore various symbols available in MS Word b. Insert a symbol in the text c. Insert mathematical equations in the document	Enter Mathematical symbols and Equations in the word document
13.	To Practice with MS-EXCEL	a. Open /create an MS Excel spreadsheet and familiarize with MS Excel 2007 layout like MS office Button- b. Use Quick Access Toolbar- Title Bar- Ribbon-Worksheets-Formula Bar-Status Bar	a. Familiarize with excel layout and use b. Use various features available in toolbar
14.	To access and Enter data in the cells	a. Move around a Worksheet-Quick access -Select Cells b. Enter Data-Edit a Cell-Wrap Text-Delete a Cell Entry-Save a File-Close Excel	a. Access and select the required cells by various addressing methods b. Enter data and edit

Exp No.	Name of the Experiment	Competencies	Key Competencies
15.	To edit spread sheet Copy, Cut, Paste, and selecting cells	a. Insert and Delete Columns and Rows-Create Borders-Merge and Center b. Add Background Color-Change the Font, Font Size, and Font Color c. Format text with Bold, Italicize, and Underline-Work with Long Text-Change a Column's Width	Format the excel sheet
16.	To use built in functions and Formatting Data	a. Sort and filter data in a worksheet b. Perform Mathematical Calculations verify -AutoSum c. Perform Automatic Calculations-Align Cell Entries	Use built in functions in Excel
17.	To enter a Formula for automatic calculations	a. Enter formula b. Use Cell References in Formulae c. Use Automatic updating function of Excel Formulae d. Use Mathematical Operators in Formulae e. Use Excel Error Message and Help	Enter formula for automatic calculations
18.	To Create Excel Functions, Filling Cells	a. Use Reference Operators b. Work with sum, Sum if , Count and Count If Functions c. Fill Cells Automatically	a. Create Excel sheets involving cross references and equations b. Use the advanced functions for conditional calculations
19.	To Practice Excel Graphs and Charts	a. Produce an Excel Pie Chart b. Produce an Excel Column Chart c. Practice creating any Chart	a. Use data in Excel sheet to Create technical charts and graphs Produce Excel Line Graph b. Produce a Pictograph in Excel
20.	To format a Worksheet in Excel, page setup and print	a. Shade alternate rows of data b. Add currency and percent symbols c. Change height of a row and width of a column d. Change data alignment e. Insert Headers and Footers f. Set Print Options and Print	a. Format Excel sheet b. Insert headers &footers and print
21.	To familiarize with Ribbon layout &features of PowerPoint 2007.	Use various options in Home, insert, design, animation , slideshow, Review &View in the PowerPoint	Access required options in the tool bar

Exp No.	Name of the Experiment	Competencies	Key Competencies
22.	To create a simple PowerPoint Presentation	a. Insert a New Slide into PowerPoint b. Change the Title of a PowerPoint Slide c. PowerPoint Bullets d. Add an Image to a PowerPoint Slide e. Add a Textbox to a PowerPoint slide	a. Create simple PowerPoint presentation with photographs/ClipArt and text boxes b. Use bullets option
23.	To Set up a Master Slide in PowerPoint and add notes	a. Create a PowerPoint Design Template b. Modify themes c. Switch between Slide master view and Normal view d. Format a Design Template Master Slide e. Add a Title Slide to a Design Template f. The Slide Show Footer in PowerPoint f. Add Notes to a PowerPoint Presentation	a. Setup Masterslide and format b. Add notes
24.	To Insert Text and Objects	a. Insert Text and objects b. Set Indents and line spacing c. Insert pictures/ clipart d. Format pictures e. Insert shapes and WordArt f. Use 3d features g. Arrange objects	Inset Text and Objects Use 3d features
25.	To insert a Flow Chart / Organizational Charts	a. Create a Flow Chart in PowerPoint b. Group and Ungroup Shapes c. Use smart art	Create organizational charts and flow charts using smart art
26.	To insert a Table	a. PowerPoint Tables b. Format the Table Data c. Change Table Background d. Format Series Legend	Insert tables and format
27.	To insert a Charts/Graphs	a. Create 3D Bar Graphs in PowerPoint b. Work with the PowerPoint Datasheet c. Format a PowerPoint Chart Axis d. Format the Bars of a Chart e. Create PowerPoint Pie Charts f. Use Pie Chart Segments g. Create 2D Bar Charts in PowerPoint h. Format the 2D Chart e. Format a Chart Background	Create charts and Bar graphs, Pie Charts and format.

Exp No.	Name of the Experiment	Competencies	Key Competencies
28.	To Insert audio &video, Hyperlinks in a slide Add narration to the slide	a. Insert sounds in the slide and hide the audio symbol b. Adjust the volume in the settings c. Insert video file in the format supported by PowerPoint in a slide d. Use automatic and on click options e. Add narration to the slide f. Insert Hyperlinks	a. Insert Sounds and Video in appropriate format. b. Add narration to the slide c. Use hyperlinks to switch to different slides and files
29.	To Practice Animation effects	a. Apply transitions to slides b. To explore and practice special animation effects like *Entrance, Emphasis, Motion Paths &Exit*	Add animation effects
30.	Reviewing presentation	a. Checking spelling and grammar b. Previewing presentation c. Set up slide show d. Set up resolution e. Exercise with Rehearse Timings feature in PowerPoint f. Use PowerPoint Pen Tool during slide show g. Saving h. Printing presentation (a) Slides (b) Handout	a. Use Spell check and Grammar feature b. Setup slide show c. Add timing to the slides d. Setup automatic slide show

III SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION
CURRICULUM-2016
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								
C-301	Engineering Mathematics –II	5	-	75	3	20	80	100
C-302	Strength of Materials & Theory of Structures	6	-	90	3	20	80	100
C-303	Hydraulics	6	-	90	3	20	80	100
C-304	Surveying-II	5	-	75	3	20	80	100
C-305	Construction Materials	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-306	Civil Engineering Drawing-I	-	6	90	3	40	60	100
C-307	Material Testing laboratory	-	3	45	3	40	60	100
C-308	Surveying - II Practice & Plotting	-	4	60	3	40	60	100
C-309	Hydraulics Laboratory	-	3	45	3	40	60	100
	Total	**26**	**16**	**630**	**-**	**260**	**640**	**900**

ENGINEERING MATHEMATICS – II
(Common to all Branches)

Subject Title : Engineering Mathematics-II
Subject Code : C-301
Periods per week : 05
Periods per Semester : 75

Blue print

S. No	Major Topic	No of Periods	Weightage of Marks	Short Type			Essay Type		
	Unit - I			R	U	App	R	U	App
1	**Indefinite Integration**	15	21	1	1	0	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
	Unit - II								
2	**Definite Integration and its applications**	35	60	1	1	3	1	1	$2\frac{1}{2}$
	Unit - III								
3	**Differential Equations**	25	29	2	1	0	1	1	0
	Total	75	110	4	3	3	$2\frac{1}{2}$	$2\frac{1}{2}$	30
			Marks:	12	9	9	25	25	30

R: Remembering type 37 marks
U: Understanding type 34 marks
App: Application type 39 marks

OBJECTIVES

Upon completion of the subject the student shall be able to

Unit-I

1.0 Indefinite Integration

1.1 Explain the concept of Indefinite integral as an anti-derivative.

1.2 State the indefinite integral of standard functions and properties of Integrals $\int (u + v)\,dx$ and $\int ku\,dx$ where k is constant and u, v are functions of x.

1.3 Solve integration problems involving standard functions using the above rules.

1.4 Evaluate integrals involving simple functions of the following type by the method of 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) $\int f\{g(x)\}\,g'(x)\,dx$

1.5 Find the Integrals of *tan x, cot x, sec x* and *cosec x* using the above.

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

1.7 Evaluate integrals of powers of *tan x* and *sec x*.

1.8 Evaluate the Standard Integrals of the functions of the type

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

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

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

1.9 Evaluate the integrals of the type

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

1.10 Evaluate integrals using decomposition method.

1.11 Evaluate integrals using integration by parts with examples.

1.12 State the Bernoulli's rule for evaluating the integrals of the form $\int u.vdx$.

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

Unit-II

(a) Understand definite integral and its properties

2.1 State the fundamental theorem of integral calculus

2.2 Explain the concept of definite integral.

2.3 Calculate the definite integral over an interval.

2.4 State various properties of definite integrals.

2.5 Evaluate simple problems on definite integrals using the above properties.

(b) Real life applications of definite integrals

2.6 Explain definite integral as a limit of sum by considering an area.

2.7 Find the areas under plane curves and area enclosed between two curves using integration.

2.8 Obtain the volumes of solids of revolution.

2.9 Obtain the mean value and root mean square value of the functions in any given interval.

2.10 Explain the Trapezoidal rule, Simpson's 1/3 rules for approximation of integrals and provide some examples.

(c) Certain special integrals: Laplace Transforms

2.11 Write the definition of Laplace Transform and explain sufficient conditions for its existence.

2.12 Provide formulae for Laplace transforms of standard functions.

2.13 State Linear property, First shifting property, Change of Scale property for Laplace transforms. Solve simple problems using these properties.

2.14 Write formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^{(n)}(t)$, $\int_0^t f(u)\,du$ in terms of Laplace transform of $f(t)$. Provide simple examples on these functions.

2.15 Define unit step function and write the Laplace Transform of unit step function.

State second shifting property.

2.16 Define inverse Laplace Transform and write inverse Laplace Transform of standard functions. Solve simple problems.

2.17 Write first shifting property of inverse Laplace Transform with examples

2.18 Define convolution of two functions and state convolution theorem with few examples for understanding only.

(d) Understand the Fourier series expansion of functions

2.19 Define Fourier series of a function on the interval $(c, c+2l)$ and state sufficient conditions for its existence. Write the Euler's formulae for determining the Fourier coefficients.

2.20 Find Fourier series of simple functions in the range$(0,2l), (0,2\pi), (-l,l)\ and\ (-\pi,\pi)$.

2.21 Find Fourier coefficients for even and odd functions in the interval $(-l,l)\ and\ (-\pi,\pi)$ in simple examples.

2.22 Define half range Fourier sine and cosine series of a function over the interval $(0,\ l)$ with examples.

3.0 Introduction to Differential Equations

3.1 Define a Differential equation, its order, degree

3.2 Form a differential equation by eliminating arbitrary constants.

3.3 Solve the first order first degree differential equations by the following methods:

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.
iv. Bernoulli's Equation (Reducible to linear form.)

3.4 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ when the roots of the auxiliary equation are real and different, real and repeated, Complex conjugates.

3.5 Solve the higher order homogeneous differential equations with constant coefficients.

3.6 Explain the concept of complementary function, particular Integral and general solution of a differential equation.

3.7 Solve n^{th} 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 $k, e^{ax}, Sinax, Cosax, x^n$.

3.8 Solve simple problems leading to engineering applications

COURSE CONTENT

Unit-I
Indefinite Integration:

1. Integration regarded as anti-derivative – Indefinite integral of standard functions. Properties of indefinite integral. 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.

Evaluation of integrals which are reducible to the following forms :

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

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

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

Integration by decomposition of the integrand into simple rational, algebraic functions. Integration by parts, Bernoulli's rule.

Unit-II
Definite Integral and its applications:

2. Definite integral-fundamental theorem of integral calculus, 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 and RMS values of a function on a given interval. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a define integral.

. Definition, sufficient conditions for existence of Laplace Transform (LT), LT of elementary functions, linearity property, scale change property, first shifting property, multiplication by t^n, division by t, LT of derivatives and integrals, unit step function, LT of unit step function, second shifting theorem, inverse Laplace transforms- shifting

theorems and change of scale property, multiplication by s^n and division by s – examples of inverse LT using partial fractions – convolution theorem (no proof).

Representation of a function in Fourier series over the interval $(c, c + 2l)$, Give sufficient conditions for existence of Fourier series. Euler's formulae for Fourier coefficients, Finding Fourier coefficients for simple functions, elementary even and odd functions. Define half range Fourier serie

Unit -III

Differential Equations:

Definition of a differential equation-order and degree of a differential equation-formation of differential equations-solution of differential equation of first order, first degree: variable-separable, homogeneous, exact, linear differential equation, Bernoulli's equation.

Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

Non-homogenous linear differential equations with constant coefficients of the form f(D)y = X, where X is in the form k, e^{ax}, sin ax, cos ax, x^n, (n= 1,2) – complimentary function, particular integral and general solution.

Reference Books:

1. Integral Calculus Vol.I, by M.Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers
3. A Text book of Engg. Mathematics by B.S.Grawel
4. A Text book of Engg. Mathematics by B.V.Ramana- T.Mc Graw Hill Publishers

STRENGTH OF MATERIALS & THEORY OF STRUCTURES

Subject Title : Strength of Materials & Theory of Structures

Subject Code : C-302

Periods/Week : 06

Periods/Semester : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Theory of simple bending	20	26	02	02
2.	Deflection of beams	20	26	02	02
3	Principal stresses, planes & Mohr's circle	05	03	01	-
4	Torsion & Springs	04	03	01	-
5	Thin cylinders	03	03	01	-
6	Columns	15	23	01	02
7	Dams and Retaining walls	13	13	01	01
8	Stresses in Frames	10	13	01	01
	Total	**90**	**110**	**10**	**08**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understands the Effect of Loading on Beams

1.1 Explains terms: Neutral axis, Modulus of section, Moment of resistance
1.2 States the assumptions made in the theory of simple bending.
1.3 Derives the formula for simple bending – Explain bending stress distribution.
1.4 Solves problems on theory of simple bending.
1.5 Explains shear distribution across rectangular, solid circular and I sections.

2.0 Understands Deflection of Beams under Loading

2.1 Derives the equation of the elastic curve and Relation between curvature, slope and deflection.
2.2 Distinguishes between strength and stiffness of a beam.
2.3 Computes the slope &deflection by Double integration method, Macaulay's method.
2.4 Defines Mohr's theorem(Moment area method)
2.5 Computes the slope &deflection by Mohr's theorem.
2.6 Determines the section of a beam from consideration of strength and stiffness.
2.7 Differentiates statically indeterminate structures from statically determinates structures

2.8 Determines the prop reaction of propped cantilever beams for various types of loadings (point & u.d.l) and draw the S.F.D and B.M.D.

2.9 Draws the deflected shapes of Fixed & Continuous beams under loading and identifies the sagging & hogging moments.

3.0 Understands Principal stresses, Planes & Mohr's Circle.

3.1 Defines the principal stress, principal planes and state the importance of Mohr's circle

4.0 Understands the effects of pure Torsion on Solid and Hollow Circular Shafts - Springs

4.1 Knows the formula for pure torsion of a circular shaft and power transmitted by a shaft.

4.2 Solves the simple problems on torsion applying torsion formula.

4.3 Calculates the deflection of a closely coiled helical spring under a given axial loading.

5.0 Understands the effects of internal pressure on unrivetted thin Cylinders

5.1 Calculates the longitudinal and Hoop stresses in the cylinder under internal pressure, given the dimensions of the thin cylinder.

5.2 Calculates the thickness of a thin cylindrical shell .

6.0 Understands the behaviour of columns under vertical loads

6.1 States the effective lengths of columns for different end conditions.

6.2 Distinguishes between Long and short columns.

6.3 Calculates Slenderness ratio of a column.

6.4 Calculates the load carrying capacity of a column using Euler's and Rankin's formula.

7.0 Understands the Stability of Retaining walls and dams under the action of lateral pressures

7.1 Explains different forces acting on the Gravity Dam.

7.2 Computes the intensity of base pressures acting on the Gravity Dam.

7.3 Explains the stability conditions of Gravity Dams.

7.4 Calculates the base width of the dam based on Stability conditions.

7.5 Explains the Earth pressures acting on the retaining walls.

7.6 Explains different forces acting on the Retaining wall.

7.7 Computes the intensity of base pressures acting on the Retaining Wall without surcharge.

7.8 Explains the stability conditions of Retaining wall.

7.9 Calculates the base width of the Retaining wall based on Stability conditions.

8.0 Understands effect of Dead and Live loads on statically determinate frames

8.1 Differentiates between statically determinate and indeterminate frames.

8.2 Calculates forces in members of a simple truss under dead loads and live loads by method of joints and method of sections.

COURSE CONTENT:

1.0 Stresses in Beams.

1.1 Theory of simple bending-Neutral axis-Modulus of section, Moment of resistance
1.2 Assumptions made in the theory of simple Bending.
1.3 Formula for Theory of simple bending – Bending stress distribution.
1.4 Theory of simple bending-problems
1.5 Shear stresses in Beams -Shear stress distribution across rectangular, solid circular and I sections. (Derivation of formula not required.)

2. 0 Deflection of Beams

2.1 Equation of the elastic curve - Relation between curvature, slope and deflection
2.2 Strength and stiffness of a beam.
2.3 Slope &deflection by Double integration method, Mecaulay's method for simply supported and Cantilever beams subjected to Point loads and uniformly distributed loads
2.4 Mohr's theorem-I & II for slope &deflection.
2.5 Slope & deflection by Mohr's theorem for simply supported and Cantilever beams subjected to Point loads and uniformly distributed loads
2.6 Section of a beam from consideration of strength and stiffness.
2.7 Difference between statically determinate and statically indeterminate structures.
2.8 Prop reaction of propped cantilever beams - various types of loadings (point & u.d.l) - S.F.D and B.M.D.
2.9 Fixed and Continuous beams – degree of static indeterminacy – deflected shapes under loading (no necessity to solve problems on the topic)

3.0 Principal stresses, Planes & Mohr's Circle

3.1 Definition of principal stress, principal planes and importance of Mohr's circle.

4.0 Torsion & Springs

4.1 Theory of pure torsion-Torsion formula-solid and hollow circular shafts subjected to pure torsion-simple problems-shear stress distribution in shafts – power transmitted by a shaft – simple problems
4.2 Calculates the deflection of a closely coiled helical spring under a given axial loading.

5.0 Thin Cylinders

5.1 Longitudinal and Hoop stresses in Unrivetted thin cylinders subjected to internal fluid pressure - calculation of thickness in thin cylinders under internal pressures-problems.

6.0 Columns

6.1 Columns - Effective lengths for different end conditions.
6.2 Columns - Long and short columns – Comparison.
6.3 Slenderness ratio of a column – Rectangular, I, circular, Hollow Circular, Built-up Sections.
6.4 Load carrying capacity by Euler's and Rankin's formula – problems - Limitations.

7.0 Dams and retaining walls

7.1 Forces acting on the Gravity Dam – Eccentricity, middle third rule.

7.2 Intensity of base pressures acting on the Gravity dam for different water storage levels.
7.3 Stability conditions of Gravity Dams.
7.4 Base width of the dam based on Stability conditions – problems.
7.5 Active and passive Earth pressures without surcharge–Angle of internal friction
7.6 Forces acting on the Retaining wall - Eccentricity, middle third rule.
7.7 Intensity of base pressures acting on the Retaining wall.
7.8 Stability conditions of Retaining wall.
7.9 Base width calculation - based on Stability conditions.

8.0 Stresses in frames

8.1 Forces in the members of statically determinate pin jointed frames-method of Joints and method of sections.

REFERENCE BOOKS

1.	Strength of Materials	by	Ramamurtham.
2.	S.M and T.S	by	B.C. punmia.
3.	S.M and T.S	by	Srinivasulu.
4.	Strength of Materials	by	R.S. Khurmi.
5.	Introduction to strength of materials	by	D.S . Prakash rao.
6.	Strength of Materials Vol-I (A practical approach)	by	D.S . Prakash rao.
7.	Introduction to Strength of materials	by	D.S. Prakash rao (Universities Press)

HYDRAULICS

Subject Title : Hydraulics

Subject Code : C-303

Periods/Week : 06

Periods/Year : 90

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Properties of liquids	05	03	1	-
2	Liquid pressure and its measurement	11	13	1	1
3	Flow of liquids	11	13	1	1
4	Flow through orifices and mouth pieces	11	13	1	1
5	Flow over notches and weirs	12	16	2	1
6	Flow through pipes	15	23	1	2
7	Flow though open channels	11	13	1	1
8	Pumps & Water turbines	11	13	1	1
9	Hydro electric power plants	03	03	1	-
	TOTAL	**90**	**110**	**10**	**8**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Know the properties of liquids

1.1 Scope and importance of hydraulics in civil engineering.

1.2 Define Mass density, Specific weight, Specific gravity, Adhesion, Cohesion, Surface tension, Capillarity, Compressibility, Dynamic viscosity, Kinematic viscosity, Vapour pressure and Cavitation.- States the values of Specific weight, Mass density, Specific gravity for pure water and mercury

1.3 Formulae of Dynamic viscosity, Capillarity, Surface tension and Kinematic Viscosity.

2.0 Understands Liquid pressure and its Measurement

2.1 Distinguishes among atmospheric pressure, gauge pressure and absolute pressure.

2.2 Describes pressure measuring instruments.

2.3 Computes the pressure of a flowing liquid given the readings on a piezometer, simple, differential and inverted differential manometers.

2.4 Computes the total pressure and centre of pressure on a horizontal and vertical surfaces immersed in a liquid.(No derivation of formulae, problems only)

3.0 Understands the General Principles of flow of the Liquids

3.1 Distinguishes the different types of flow of liquids.

3.2 States the equation of continuity and energies of liquid in motion.

3.3 Explains Bernoulli's theorem of total energy of a liquid in motion and its limitations (no proof). Solves problems on application of Bernoulli's theorem.

3.4 Explains the working and use of pitot tube, orifice meter, Venturimeter and Solves problems on pitot tube and horizonjtal Venturimeter (No derivation of formula)

4.0 Understands the function of Orifices and mouth pieces

4.1 Defines orifice and vena-contracta and explains the types of orifices.
4.2 Defines co-efficient of contraction, velocity and discharge.
4.3 States the relationship between Hydraulic Coefficients - Cc, Cv, and Cd. and Solves problems on hydraulic co-efficients.
4.4 State the formula for discharge through large rectangular orifice and states the equations for discharge through Submerged and partially submerged orifices.
4.5 Solves problems on discharge through a large rectangular orifice, Submerged orifices.
4.6 Computes the time of emptying of a prismatic tank by an orifice
4.7 Defines Mouthpiece and Differentiates between orifices and mouth pieces.
4.8 States the different types of mouth pieces with their C_d values and calculates the discharge through a mouth piece from the given details.

5.0 Comprehends the flow over different types of notches and weirs

5.1 Defines a notch and state types of notches.
5.2 States the advantages of triangular notch over rectangular notch.
5.3 States the formulae for the discharge over rectangular, triangular and trapezoidal notches.
5.4 Calculates the discharge over the above notches from the given parameters.
5.5 Defines a weir and Distinguishes sharp crested and broad crested weirs.
5.6 States the formulae for discharge over sharp crested and broad crested weirs.
5.7 Explains the above formulae with modifications for end contractions and velocity of approach.
5.8 Determines the discharge over sharp crested and broad crested weirs under given conditions.

6 Understands the flow through pipes

6.1 Explains the major and minor losses of head of water flowing through pipes stating relevant formulae.
6.2 States Chezy's and Darcy's formulae for friction loss in pipe flow.
6.3 Solves problems on a pipe flow under friction.
6.4 Sketches the Hydraulic gradient and total energy line under different conditions.
6.5 Computes the discharge through parallel pipes and compound pipes connected to a reservoir.
6.6 Differentiates between laminar and turbulent flows.
6.7 State Reynolds's number and critical velocity in pipes.

7 Understands the principles of flow through open channels

7.1 Defines open channel flow and differentiates with pipe flow.
7.2 Defines terms Wetted perimeter and Hydraulic mean depth
7.3 States Chezy's formula for uniform flow through open channels.
7.4 Calculates value of Chezy's constant given Kutter's formula, Manning's formula and Bazin's formula.
7.5 Computes the velocity and discharge in a channel.
7.6 State the conditions for most economical section of rectangular and trapezoidal channels.
7.7 Solves problems on flow through rectangular and trapezoidal channels for the given conditions.

8.0 Understands types and working of pumps and turbines

8.1 Defines pump and States different types of pumps
8.2 Describes the different parts of centrifugal pumps.
8.3 State the use of foot valve and strainer in a centrifugal pump.
8.4 Explain the working of different types of Reciprocating pumps.
8.5 Know the use of jet, air lift and deep well pumps.
8.6 Differences between Centrifugal & Reciprocating pumps.
8.7 Definition of turbine States different types of turbines.
8.8. Explains impulse & reaction turbines and their types.
8.9 Briefly explains with sketches the principle of working of Pelton wheel and Francis turbine.
8.10 Differentiate between impulse and reaction turbines.
8.11 Explain the purpose and types of Draft tubes.

9.0 Knows the general lay-out of Hydro-Electric Power Plants

9.1 Sketches a typical layout of hydro-electric power plants and shows the components.
9.2 Explains the function of surge tank, water hammer effect in pen stocks.

COURSE CONTENT:

1.0 Properties of Liquids

1.1 Scope and importance of hydraulics in Civil Engineering.
1.2 Definition and properties of liquids-as mentioned in specific objectives
1.3 Formulae of Dynamic viscosity, Capillarity, Surface tension, Kinematic Viscosity (problems not required)

2.0 Liquid Pressure and its Measurement

2.1 Atmospheric pressure, gauge pressure and absolute pressure.
2.2 Types of Pressure measuring instruments – Simple and Differential Manometers.
2.3 Determination of the pressure of a flowing liquid given the readings on a piezometer, simple, differential and inverted differential manometers.
2.4 Determination of Total and Centre of Pressure on Plane surface on horizontal and vertical immersed Plane surfaces..(No derivation of formulae, problems only)

3.0 Flow of Liquids

3.1 Types of flow-uniform flow, non-uniform flow, stream-line flow, turbulent flow, steady flow and unsteady flow.
3.2 Energies of liquid in motion-Datum head- pressure head and velocity head-principle of continuity.-problems
3.3 Total energy of liquid in motion-Bernoulli's theorem (without proof) - limitations of Bernoulli's theorem.-problems.
3.4 Practical applications of Bernoulli's theorem- pitot tube, orificemeter and venturimeter -problems on pitot tube and horizontal Venturimeter . (No derivation of formula.)

4.0 Flow through orifices and mouthpieces

4.1 Definition of orifice and vena-contracta –types of orifices. Determination of discharge through small orifice
4.2 Defines co-efficient of contraction, velocity and discharge.
4.3 State the relation between Hydraulic Coefficients - Cc, Cv, and Cd. and solves problems on hydraulic co-efficients.
4.4 Large rectangular orifice-derivation of formula for discharge and states the equations for discharge through Submerged and partially submerged orifices.

4.5 Problems on discharge through a large rectangular orifice, Submerged orifices.
4.6 Problems on determination of time of emptying of a prismatic tank by an orifice.
4.7 Definition of Mouthpiece and Difference between orifices and mouthpieces
4.8 Different types of mouth pieces with their C_d values and determination of discharge through a mouth piece from the given details.

5.0 Flow over Notches & Weirs

5.1 Definition of notch, types of notches-rectangular, triangular and trapezoidal.
5.2 Formulae for Determination of Discharge for the above notches
5.3 State the advantages of triangular notch over rectangular notch.
5.4 Problems on Determination of Discharge for the Notches
5.5 Definition of Weir-types of weirs, sharp-crested and broad crested weirs.
5.6 Formulae for determination of Discharge over a sharp crested weir and broad crested weir.(Mathematical formula)
5.7 Equations for Discharges for above Wiers with velocity of approach and end contractions.
5.8 Determines the discharge over sharp crested and broad crested weirs under given conditions.

6.0 Flow thorough pipes

6.1 Major loss (loss of head due to friction) and minor losses (Loss of head at entrance, loss of head due to sudden enlargement, loss of head due to sudden contraction, loss of head at exit of the pipe) - simple problems.
6.2 Frictional loss in pipes - Chezy's formula and Darcy's formula (without Proof)– problems.
6.3 Solves problems on a pipe flow under friction.
6.4 Hydraulic gradient and total energy line.
6.5 Discharge through parallel and compound pipes connected to a reservoir.
6.6 Laminar and turbulent flow in pipes.
6.7 Reynolds's number and critical velocity.

7.0 Flow through open Channels

7.1 Definition of open channel flow and differences between open channel flow and pipe flow.
7.2 Wetted perimeter and hydraulic mean depth.
7.3 Chezy's formula for discharge for uniform flow (Derivation not necessary).
7.4 Value of 'C' for different surfaces.
  7.4.1 Kutter's formula.
  7.4.2 Manning's fourmula
  7.4.3 Bazin's formula
7.5 Determination of values of the velocity and discharge in a channel
7.6 Conditions for Most economical section of a channel-rectangular and trapezoidal.
7.7 Design of rectangular and trapezoidal channel cross sections – problems.

8.0 Pumps and Turbines

8.1 Definition of pump and different types of pumps
8.2 Different parts of centrifugal pumps.
8.3 Uses of foot valve and strainer in a centrifugal pump.
8.4 Types of reciprocating pumps.
8.5 Uses of jet, air lift and deep well pumps.
8.6 Differences between centrifugal & reciprocating pumps.
8.7 Definition of turbine and different types of turbine.
8.8 Impulse & reaction turbines and their types.

8.9 Brief explanation of principle of working of Pelton wheel and Francis turbine.
8.10 Differences between impulse and reaction turbines.
8.11 Draft tube – Purpose and types.

9.0 Hydro-electric Power Plants

9.1 Sketch of a typical layout of hydro-electric power plants and its components.
9.2 The function of surge tank – water hammer effect in pen stocks.

REFERENCE BOOKS

1. Hydraulics by R.S. Khurmi.
2. Hydraulics & Hydraulic Machines by Modi & sethi.
3. Hydraulics by Jagdishlal.
4. Hydraulics by Reye & Rao
5. Hydraulics by R. K. Bansal.
6. Hydraulics by NITTTR,Chennai

SURVEYING – II

Subject Title : Surveying – II
Subject Code : C-304
Periods/Week : 05
Periods/Semester : 75

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Theodolite survey	20	29	03	02
2.	Trigonometric levelling	13	16	02	01
3.	Tacheometry	16	26	02	02
4.	Curves	16	26	02	02
5.	Total Station	10	13	01	01
	Total	75	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the principles of theodolite surveying for preparation of plans and alignment

1.1 Identifies the parts and functions of a Theodolite
1.2 Lists the fundamental lines of a Theodolite and their relationships.
1.3 List the steps involved in carrying out temporary adjustments for taking observations.
1.4 Explains measuring of horizontal and vertical Angles.
1.5 Steps involved in setting out angles using theodolite.
1.6 Explains the method of conducting traverse survey
1.7 Computes the latitudes, departure of lines and error of closure.
1.8 Types of Errors in theodolite surveying.

2.0 Understands the principles of Trigonometric Levelling

2.1 Calculates the height of an object when the base of the object is accessible.
2.2 Calculates the elevations of the object when the base of the object is inaccessible and instrument stations are
a) in the same vertical plane
b) not in the same vertical plane.

3.0 Understands the principles of Tacheometry to find the elevations and distances of stations

3.1 Explains the types and advantages of Tacheometry.
3.2 Explains the principle of Stadia Tacheometry.

3.3 Finds vertical and horizontal distance of stations by Stadia observations- Problems
3.4 Determination of Tacheometric constants.

4.0 Understands the method of setting out simple curves

4.1 States the definition and notation of a simple curve.
4.2 Computes the elements of simple curve
4.3 Explains the procedure for setting out a simple curve by linear methods using Chain and Tape.
4.4 Explains the procedure for setting out a simple curve by Angular Methods- Single and Double Theodolite.
4.5 Solves problems on setting out a simple curve by linear and angular methods for the given data.

5.0 Understand the principles of total station

5.1 List the parts of total station and their functions
5.2 Explain the setting up total station for taking observations
5.3 List the uses of total station
5.4 Explain the procedure for measurement of distances and angles
5.5 Explain procedure of taking multiple number of observations on a single station
5.6 Explain the procedure for measurement of area with single station setup
5.7 Explain the procedure of traversing using total station
5.8 Explain the orientation of total station by resection method
5.9 Explain establishing TBM by station elevation method
5.10 Explain Staking out a point, line and an arc
5.11 List the steps involved in marking the centre line for a typical residential building
5.12 Explain the procedure for LS and CS for proposed road / canal/ pipe line

COURSE CONTENT

1. Theodolite

1.1 Component parts, technical Terms, detailed study of a transit.
1.2 Fundamental lines and their relationship.
1.3 Temporary adjustments.
1.4 Measurement of horizontal angles by repetition and reiteration method.
1.5 Measurement of vertical angles.
1.6 Determination of magnetic bearings- deflection angles- direct angles- Prolonging a straight line.
1.7 Traversing with theodolite by included angle method, deflection angle method, bearing method.
1.8 Checks for closed and open traverse
1.9 Traverse computations, Latitude, departure, Errors in theodolite work.

2. Trigonometric levelling

2.1 Principle and necessity of Trigonometric levelling
2.2 Elevations and Distance of objects whose base is accessible and base is inaccessible with instruments station in same vertical plane and different vertical plane.

3. Tacheometry

3.1 Types and advantages of tacheometry-Stadia Tacheometry with staff held vertical and line of collimation horizontal or inclined – finding elevations and distances of staff stations – problems – determination of Tacheometric constants

4. Curves

4.1 Simple circular curve- definition and notations used - elements of simple curve

4.2 Preparation of curve table and setting out curves by chain and tape - single and double Theodolite methods – problems.

5. Total Station

5.1.Parts and functions – setting up total station for taking observations - Use of Total Station - Measurement of distances and angles - multiple number of observations on a single station - measurement of area with single station setup – Traversing using a total station - orientation of total station by resection method – establishing TBM by station elevation method – staking out a point, line and an arc – marking the centre line for a typical residential building - LS and CS for proposed road / canal / pipe line

REFERENCE BOOKS

1	Surveying I & II	by	B.C.Punmia
2	Surveying	by	S.K. Husain
3	Surveying and levelling I & II	by	T .P Kanetkar
4	Surveying - I & II –	by	A. V.R.J. Sharma and Kamala
5	Text book of surveying	by	C.venkatRamaiah
6	Surveying(McGrawhill)	by	N.N. Basak
7	Higher Surveying	by	A.M.Chandra (New Age Int.)

CONSTRUCTION MATERIALS

Subject Title : Construction Materials

Subject Code : C-305

Periods/Week : 04

Periods/Semester : 60

TIME SCHEDULEs

S.No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Stones	07	13	01	01
2.	Bricks	07	13	01	01
3.	Clay products & Sand	08	16	02	01
4.	Cement	07	13	01	01
5.	Mortars & Concrete	15	26	02	02
6.	Surface protective materials	04	06	02	00
7.	Timber, Plastics, Glass & Asbestos	12	23	01	02
	Total	60	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the selection of stones and their acceptability for construction work

1.1 Classify rocks (Physical classification only)
1.2 List the characteristics of good building stones.
1.3 List the common varieties of stones (like Granite, marble, Kadapa slabs, Shahabad stones)
1.4 Explain the purpose of dressing stones.

2.0 Understands the acceptability of bricks for construction work

2.0 State common sizes of bricks – IS specifications.
2.1 List the steps involved in the manufacture of bricks.
2.2 Explain the method of burning of clay bricks in a continuous kiln.
2.3 List the characteristics of good bricks.
2.4 List the standard tests on bricks
2.5 Explain the following tests conducted on bricks
1. Water absorption and 2. Compressive strength
2.6 Explain the uses of the following types of bricks for construction purposes - 1.Refractory bricks,
2. Fly ash bricks.

3.0 Understands the suitability of tiles, pipes and building sand for Construction

3.0 State the common varieties of tiles used for different purposes.
3.1 List the characteristics of good tiles.
3.2 List the uses of porcelain and glazed tiles.
3.3 State the uses of stone ware pipes.
3.4 List the characteristics of good sand.
3.5 State the functions of building sand.
3.6 State the percentage of bulkage allowance for construction work.
3.7 State the need for the quarry dust & robo sand as a substitute to sand.

4.0 Check the quality of cement for construction work

4.0 State the chemical composition of cement.
4.1 State rough and ready methods of examining cement
4.2 Explain the method of manufacture of cement by dry process only.
4.3 Types of cements
4.4 List the uses of various cements
4.5 State the standard tests for cement.
4.6 Explain the following tests on cement
1. Fineness,
2. Consistency,
3. Setting times.
4. Soundness
4.7 State grades of cement and their compressive strengths.
4.8 State the importance and application of blended cement with fly ash and blast furnace slag.

5.0 Understand the principles of preparation of mortars and Concrete

5.0 Explain 1.Fine aggregate and 2.Coarse aggregate.
5.1 Explain the purpose of water absorption and sieve analysis tests conducted on fine and coarse aggregates.(Procedure of tests not necessary).
5.2 Classify mortars.
5.3 List the different proportion of mortars for various works.
5.4 Explain the method of preparation of cement mortar .
5.5 List the ingredients of 1.Plain concrete and 2.Reinforced concrete.
5.6 State the usual proportions of plain and reinforced concrete for different items of work.
5.7 Define
1. Hydration of cement
2. Water cement ratio
3. Workability
4. Curing.
5.8 Explain the importance of 1.Hydration of cement and 2.water cement ratio.
5.9 States the types and uses of admixtures in concrete.
5.10 Explain the method of preparing concrete.
5.11 List the steps involved in the procedure of mixing, conveyance, placing, and compaction and curing of concrete.
5.12 List different curing compounds
5.13 List the methods of curing suitable for different surfaces.
5.14 Explain about ready mix concrete.

5.15 List the advantages and disadvantages of ready mix concrete.
5.16 List the uses of the following materials for improved durability and better resistance to adverse exposure conditions for concrete works
1. Fly ash,
2. Quarry dust

6.0 Understand the selections and applications of Surface Protective Materials

6.0 Give the composition of
1. Paints,
2. Enamels and
3. Varnishes.

6.1 List the types of the following surface protective materials:
1. Paints,
2. Enamels,
3. Varnishes,
4. Distempers,
5. Emulsion,
6. French polish and
7. Wax Polish.

6.2 List the uses of surface protective materials

7.0 Understand the selections and applications of Wood, Plastics, Glass and Asbestos for construction work

7.0 List the characteristics of good timber.
7.1 Define seasoning.
7.2 Explain the importance of seasoning of timber
7.3 Name the common varieties of timber used in A.P for various Civil Engineering works.
7.4 State various types of wood products used in construction work.
7.5 List the uses of wood products used in construction work.
7.6 List the uses of fibre reinforced plastic.
7.7 List merits and demerits of plastics.
7.8 List the merits and demerits of asbestos.
7.9 Explain suitability of different types of glasses as a building material.
7.10 List the uses of glass.

7.11 List the types of false ceiling materials
7.12 Understands the types and applications of Gypsum
7.13 State the Materials used for green buildings
7.14 State the applications of pre-painted G.I.sheets

COURSE CONTENT

1) Stones

a) Classification of rocks, physical classification.
b) Characteristics of good building stones.
c) Common varieties of stones-granite, marble, Kadapa slab, Shahabad stones.
d) Dressing of stones – purpose.

2) Bricks

a) ISI specification for bricks IS-1077-1971
b) Method of manufacture of bricks – continuous kiln process
c) Characteristics of good bricks.
d) Testing of bricks as per IS-3495-1966 – tests on water absorption and compressive strength of bricks.
e) Refractory bricks, Fly ash bricks and their uses.

3) Clay products & Sand

a) Tiles –Types of tiles- roofing tiles (Mangalore tiles), floor tiles, Ceramic tiles, Vitrified tiles, Morbonite.
b) Characteristics of good tiles.
c) Porcelain – glazed tiles (uses only).
d) Stone ware pipes – uses.
e) Characteristics of good sand, Functions of sand.
f) Bulking of sand – percentage of bulking – bulkage allowance to be permitted.
g) Quarry dust & robo sand as substitute of sand.

4) Cement

a) Chemical composition of cement.
b) Rough and ready method of testing cement.
c) Methods of manufacture of cement – Dry process.
d) Types of cement – Ordinary Portland cement, Portland Pozzolona Cement, Slag cement, quick setting cement, white cement –Rapid hardening cement – uses of different types of cement.
e) Tests for cement as per ISI – fineness, consistency, setting time, soundness tests – grads of cement and their compressive strengths.
f) Importance and application of blended cement with fly ash and blast furnace slag.

5) Mortars & Concrete

a) Fine aggregate and coarse aggregate – Purpose of Water absorption and sieve analysis tests conducted on fine and coarse aggregates.
b) Mortar – Classification of mortar – Lime mortar, cement mortar, Surkhi mortar, Blended mortar.
c) Different proportions of mortars for various works.
d) Method of Preparation of cement mortar.
e) Ingredients of plain concrete and reinforced concrete.
f) Proportioning – usual proportions of plain concrete and reinforced concrete for different items of work,
Foundation, Footings, Columns, Slabs & Beams for ordinary buildings.
g) Define - Hydration of cement, Water cement ratio, Workability, Curing - importance of Hydration of cement and water cement ratio .
h) Admixtures – types – Plasticizers, Super plasticizers, Air entraining agents Aceelartors, retarders – uses.
i) Method of preparation of concrete – Hand and machine mixing.
j) Procedure of mixing, conveyance, placing compaction, and curing of concrete.

k) Curing –different curing compounds - methods – suitability.
l) Introduction to ready mix concrete – Advantages and disadvantages.
m) List the uses of Fly ash and quarry dust for improved durability and better resistance to adverse exposure conditions for concrete works.

6) Surface Protective Materials

a) Composition of Paints, enamels, varnishes.
b) Types and uses of surface protective materials like Paints, Enamels, Varnishes, Distempers, Emulsion, French polish and Wax Polish.

7) Timber, Plastics, Glass and Asbestos

a) Characteristics of good timber.
b) Seasoning of timber – Importance.
c) Common varieties of timber used for different items of work – Doors and windows, form work, centering with particular references of A.P.
d) Wood products-veneer – Ply wood, particle board, laminated board, straw board – Eco board and their uses.
e) Types of plastics - merits and demerits of plastic – fibre reinforced plastics for plastic doors ,windows and water tanks.
f) Use of asbestos
g) Types of glasses and uses.
h) False ceiling materials- Types
i) Gypsum- Types –plaster of paris or stucco, gypsum plaster boards and partition walls (dry walls) – uses.
j) Materials used in construction of Green buildings
k) Pre-painted G.I.sheets- Applications.

REFERENCE BOOKS

1.	Building materials & components	By	C B R I
2.	Building materials	By	Kulakarni
3.	Construction materials	By	N.Sreenivasulu
4.	Building Materials	By	Duggal S. K
5.	Building Material & Construction	By	S.P. Arora & S. P. Bindra

CIVIL ENGINEERING DRAWING-I

Subject Title	**:**	**Civil Engineering Drawing - I**
Subject Code	**:**	**C-306**
Periods/Week	**:**	**06**
Periods/Semester	**:**	**90**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Introduction	09	08	02	-
2.	Residential Buildings	42	29	01	01
3.	Public and Industrial Buildings	24	15	-	01
4.	Working drawings	15	08	02	-
	Total	**90**	**60**	**05**	**02**

Note: All questions are to be answered. Part-A 5x4=20marks & Part-B 25 + 15=40marks

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Applies standard practices in drawing different components of building

1.1 Sketches the conventional signs of various Civil Engineering materials, Plumbing and Electrical fixtures.
1.2 Draws the cross section of load bearing wall and Name all components below and above ground level.
1.3 Draws the plan of one Brick wall meeting at corner showing alternative courses of headers and stretchers in English Bond.
1.4 Draws the elevation and sectional plan of fully panelled door and labels the parts.
1.5 Draws the elevation and sectional plan of fully panelled window, glazed window and labels the parts.
1.6 Draws the elevation of king post and Queen post trusses and labels the parts with the given data(details of joints not required)

2.0 Understands the requirements of setbacks and orientation principles for planning residential buildings as per local bye laws and NBC (National Building Code)

2.1 Draws the site plan of a residential building as per local bye-laws.
2.2 Draws the plan, section and elevations of single storied load bearing residential buildings from the given line diagram and set of specifications. A) One room with veranda B) one bedroom house C) two bedroom house
2.3 Draws the plan, section and elevations of single storied framed structure residential buildings from the given line diagram and set of specifications. A) One bedroom house B) two bedroom house

2.4 Draws plan and section of a dog legged stair with given specifications.

2.5 Draws the plan of first and second floors, section and elevation of two-storied residential building (framed structure) from the given line diagram and set of specifications.

2.6 Prepares the drawings in the standard format for obtaining sanction from a local body for a residential building (two storied, two bedroom building) including a rainwater harvesting structure.

3.0 Draws the line diagram (to a scale) of public and Industrial Buildings

3.1 Rural hospital of 10 beds capacity

3.2 Hostel for 50 students

3.3 Primary school of 250 to 300 students

3.4 Apartments - plan of one floor with 6 to 10 units @ 90 –150 Sq.m/unit

4.0 Working drawings:

4.1 Prepares a working drawing for the purpose of marking the width of foundation for the given plan of a building.

4.2 Prepares the working drawings for electrical layout, for a given residential building (2 bedroom buildings – ground floor only)

4.3 Draws the plan and cross section of a lift shaft for a multi storied building.

4.4 Draw the typical layout of a active solar water heating system.

COURSE CONTENT:

1.0 Introduction

1.1 Conventional signs for materials like bricks, stone, concrete, wood, glass, earth, steel and electrical fixtures like ceiling fan, bulb, main switch, refrigerator, bell push, buzzer, A.C motor, and water supply and sanitary fixtures like tap, wash basin, sink, W.C pan (Indian and European type), shower, flush tank.

1.2 Cross section of a load bearing wall, showing all the components, below and above the ground level.

1.3 Plan of one brick wall meeting at a corner, showing Odd and even courses in English bond.

1.4 Elevation & sectional plan of a Fully panelled door ,showing the component parts.

1.5 Elevation & sectional plan of a Fully panelled window, glazed window, showing the component parts.

1.6 Elevation of King post and Queen post trusses with the given data, showing the component parts. (details of joints not required)

2.0 Residential Buildings:

2.1 Set backs and orientation principles for planning residential buildings as per local bye laws and NBC

2.2 Single storied two bedroom load bearing residential building

2.3 Single storied framed structure two bedroom residential building

2.4 Dog legged stair

2.5 Two-storied residential building (framed structure type)

2.6 The standard format for obtaining sanction from local body for a residential building (two storied, two bedroom building) including a rainwater harvesting structure.

3.0 Public and industrial buildings

Draw line diagrams only showing the functional requirements of

3.1 Rural hospital for 10 beds capacity
3.2 Hostel for 50 students
3.3 Primary school for 250 to 300 students
3.4 Apartments - Plan of one floor with 6 to 10 units @90 – 150 Sq.m/unit

4.0 Working drawings:

4.1 Working drawing for the purpose of marking the width of foundation for the given plan
4.2 The working drawings for electrical layout for a given residential building (two bedroom building – Ground floor only)
4.3 Lift shaft for multi storied building.
4.4 Active Solar water heating system.

REFERENCE BOOKS:

Civil Engineering Drawing - 1 By N. Srinivasulu

Civil Engineering Drawing - 1 By Chakraborthy

Civil Engineering Drawing - 1 By S. Mahaboob Basha

MATERIAL TESTING LABORATORY

Subject Title : **MATERIAL TESTING LABORATORY**
Subject Code : **C-307**
Periods/Week : **03**
Periods/Semester : **45**

TIME SCHEDULE

S. No.	Major Topics	No. Of Periods
1	Tests on Bricks	6
2	Tests on Cement	9
3	Tests on Aggregates	9
4	Tests on Metals	6
5	Tests on Concrete	6
6.	Tests on soils	9
Total		45

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the standard tests on Engineering Materials to find their suitability in construction

1.1 States the significance of tests on materials in the field.
1.2 States the apparatus/equipment required for the tests on materials.
1.3 Explains the procedure for conducting the test.
1.4 Performs the test on materials to assess the characteristics of the materials/ mechanical properties quantitatively.
1.5 Draws inferences from the test results on the suitability of these materials in Civil Engineering works.

2.0 Determine suitability of sample of cement for given conditions of workability and strength

2.1 States the significant of workability and Compression tests in field.
2.2 States the method of preparing sample and the number of samples required for given work.
2.3 States the apparatus required for the test.
2.4 Explains the procedure for conducting the test.
2.5 Performs test.
2.6 Record observations of test.
2.7 Draws inference from test results on workability/strength of concrete.

COURSE CONTENT:

1.0 Tests on Bricks

a)Water absorption, b) Crushing strength c) Efflorescence.

2.0 Tests on Cement

a) Fineness test
b) Normal consistency test
c) Initial and final setting times of cement.
d) Compressive strength of cement.

3.0 Tests on Aggregates

a) Water absorption of Sand

b) Bulking of Sand : i) Laboratory test & ii) Field test

c) Percentage of voids in Coarse and fine aggregates

d) Sieve analysis of coarse and fine aggregates

e) Field method to determine fine silt in fine aggregate

f) Aggregate impact value for coarse aggregate

g) Specific gravity of fine and coarse aggregates

h) Bulk density of coarse aggregate and fine aggregates.

4.0 Tests on Metals

a) Tension test on steel rod
b) Deflection Test on beam (Steel beam or wooden beam)

5.0 Tests on Concrete

a) Slump cone test.
b) Compressive strength –cube test.

6.0 Tests on soils

a) Liquid limit & plastic limit
b) Standard Proctor test for OMC & MDD
c) Field density by sand replacement and core cutter method.

SURVEYING – II PRACTICE & PLOTTING

Subject Title : Surveying – II Practice & Plotting
Subject Code : C-308
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Theodolite Surveying	12
2.	Trigonometric levelling	08
3.	Tacheometry	08
4.	Curves	06
5.	Total Station	26
	Total	**60**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Performs Theodolite Surveying

1.1 Performs temporary adjustment.
1.2 Measures horizontal angles and vertical angles
1.3 Records the observations in the field book.
1.4 Determines of inaccessible horizontal distance involving two Instrument stations.

2.0 Performs Trigonometric levelling

2.1 Determines horizontal and vertical distances of accessible and inaccessible objects by using a Theodolite.

3.0 Performs Tacheometric Surveying

3.1 Takes Tacheometric observations.
3.2 Determines constants of a given Tachometer in the field
3.3 Computes heights and distances from field observations.

4.0 Sets out Simple Curves is the Field

4.1 Computes the elements of curve.
4.2 Sets out simple curve by chain and tape.

5.0 Field Exercises using Total Station

5.1 Study of component parts, accessories and functions Total Station.
5.2 Initialization of Total Station over ground station and measure the distance between two given points.
5.3 Measure area of given field.

5.4 Conduct traversing survey (closed Traverse).
5.5 To find Height and width of an elevated object.
5.6 To determine the elevation of Instrument point by making observation to point with known elevation.
5.7 To measure multiple sets (rounds) of observations.
5.8 To perform a station setup on a known point by making observations to one or more back sight points.
5.9 To establish the position of an occupied point relative to a base line or a boundary line.
5.10 To mark or establish points, Lines and Arcs on the ground.
5.11 To mark Centre line of a building on the ground.
5.12 L.S and C.S of proposed road/canal/pipe line on the ground.
5.13 Understand post processing.
5.14 To plot contour map of an area using surfer software.

COURSE CONTENT:

1.0 Theodolite surveying

1.1 Study of transit Theodolite- Temporary adjustments of Theodolite.
1.2 Measurement of horizontal angles by reiteration and repetition method.
1.3 Measurement of vertical angles.
1.4 Determination of inaccessible horizontal distance involving two Instrument stations.

2.0 Trigonometric levelling

2.1 Determination of height and reduced level of the top and bottom of accessible object.

3.0 Tacheometry

3.1 Determination of constants of Tacheometry.
3.2 Determination of horizontal distance and elevation by Stadia Tacheometry.

4.0 Curves

4.1 Setting out a simple curve by chain and tape method.

5.0 Field Exercises using Total Station.

5.1 Study of the Total Station equipment.
5.2 Station setup and measuring distance.
5.3 Measurement of area.
5.4 Traversing with total station.
5.5 Height and width of the elevated object.
5.6 Orientation of Total Station by resection method.
5.7 Establishing T.B.M by Station Elevation Method.
5.8 Measure rounds (multiple sets of observations on a single station).
5.9 Establish the position of an occupied point relative to a base line or a boundary

line.

5.10 Staking out a point, line and an arc.

5.11 Marking of the centre line for proposed residential building.

5.12L.S and C.S of a proposed road/Canal/pipeline.

5.13 Post processing.

5.14 Contouring.

HYDRAULICS LABORATORY

Subject Title : Hydraulics Laboratory
Subject Code : C-309
Periods/Week : 03
Periods/Semester : 45

TIME SCHEDULE

S.No	Major Topics	No. of Periods
1.	Verification of Hydraulic Principles/ Laws	36
2.	Study of Hydraulic machines	09
	Total	**45**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Verifies Hydraulic Principles

1.1 States the principle / law
1.2 States the apparatus / equipment required for testing the principle.
1.3 Performs test and records observations.
1.4 Draws inferences on the relationship between parameters.

2.0 Study of Hydraulic machines.

2.0 Understands the principles of Hydraulic machines.
2.1 Studies the functioning of Pumps and Turbines.

COURSE CONTENT:

LIST OF EXPERIMENTS:

1.0 Verifies Hydraulic Principles:

1 Determination of coefficient of discharge of a small orifice by constant head method and variable Head Method
2 Determination of Cc of an orifice by finding C_v and C_d.
3 Determination of coefficient of discharge of a mouthpiece by constant head method.
4 Determination of coefficient of discharge of triangular, rectangular and trapezoidal notches.
5 Verification of Bernoulli's theorem.
6 Determination of coefficient of a discharge of a venturimeter.
7 Determination of the coefficients of friction of pipe flow.
8 Determination of Chezy's constant from flow through open channel.

2.0 Study of Hydraulic Machines

9 Study of reciprocating pump and centrifugal pump.
10 Study of turbines – Pelton wheel, Francis and Kaplan turbines.

IV SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

IV 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								
C-401	Reinforced Concrete Structures	6	-	90	3	20	80	100
C-402	Irrigation Engineering	4	-	60	3	20	80	100
C-403	Quantity Surveying	6	-	90	3	20	80	100
C-404	Transportation Engineering	5	-	75	3	20	80	100
C-405	Construction Practice	4	-	60	3	20	80	100
PRACTICAL SUBJECTS								
C-406	Civil Engineering Drawing-II	-	4	60	3	40	60	100
C-407	CAD Practice - I	-	6	90	3	40	60	100
C-408	Communication skills	-	3	45	3	40	60	100
C-409	Building Construction Practices	-	4	60	3	40	60	100
	Total	**25**	**17**	**630**	**-**	**260**	**640**	**900**

REINFORCED CONCRETE STRUCTURES

Subject Title : REINFORCED CONCRETE STRUCTURES
Subject Code : C- 401
Periods/Week : 06
Periods/Semester : 90

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weight age of Marks	Short Type	Essay Type
1	Introduction to R.C.C and Principles of Working Stress Method	10	13	1	1
2	Philosophy of Limit State Design	04	03	1	-
3	Analysis and Design of Rectangular Beams	20	26	2	2
4	Design of Slabs	14	16	2	1
5	Analysis of T-beams	11	13	1	1
6	Design of continuous slabs and beams	12	16	2	1
7	Design of columns	11	13	1	1
8	Design of footings	08	10	-	1
	Total	**90**	**110**	**10**	**8**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the Properties of materials used in R.C.C, Loads to be considered and principles of working stress design

1.1 Introduction to Concrete and R.C.C
1.2 State the following properties of concrete: Compressive strength, Tensile strength, Modulus of elasticity, Poisson's ratio, Shrinkage, Creep, Workability and Unit weight.
1.3 Explains and differentiate between 'Nominal Mix Concrete' and 'Design Mix Concrete'
1.4 State the reasons for using steel as reinforcement.
1.5 Explain the functions of reinforcing steel in R.C.C members. State the types of steel used in R.C.C construction.
1.6 Define modulus of elasticity of steel and unit weight of steel.
1.7 Loads to be adopted in R.C.C design – dead load, live load, wind load (as per IS 875-1987), earth quake loads (as per IS-1893), snow load etc.,
1.8 Introduction to I.S Codes and state the different methods of designing R.C elements.
1.9 Explain the basic concept of working stress design, assumptions in the design, and permissible stresses in the materials.
1.10 Define Modular ratio, Effective depth, Neutral axis, Lever arm and Moment of resistance
1.11 Balance, under reinforced, over reinforced sections
1.12 Calculates the neutral axis, lever arm and moment of resistance of singly reinforced rectangular beam.
1.13 Design of singly reinforced rectangular beam in flexure.

2.0 Introduction to Limit state Design

2.1 Introduction to Limit state design, its philosophy and IS:456 – 2000 code provisions.
2.2 Define Limit State and state different limit states.
2.3 Distinguish *'strength'* and *'service ability'* limit states
2.4 Defines the *'characteristic strength'* of materials and *'characteristic loads'*
2.5 Explains the role of partial safety factors in limit state design.
2.6 Defines 'Design strength of materials' and *'Design loads'*
2.7 States the assumptions made in the limit, state design.
2.8 State the differences between the working stress method and limit state method of design of R.C elements

3.0 Understands the principles of analysis and design of singly reinforced and doubly reinforced R.C.C rectangular beams, by limit state method.

3.1 Calculate the maximum depth of neutral axis, lever arm and moment of resistances for singly reinforced beams. Moment of resistance of doubly reinforced rectangular beams. Also calculate the allowable working load for the given span.
3.2 Calculates the nominal shear stress, shear resisted by bent up bars and spacing of vertical stirrups. Design of shear reinforcement for beams.
3.3 Calculates the development length of bars in compression, tension, and the curtailment position for main tension bars. State the importance of anchorage values of reinforcement.
3.4 Design a singly / doubly reinforced simply supported rectangular beams for the given grades of materials, span and loading, for flexure including shear design with the curtailment of reinforcements and check for the deflection using simplified approach of the code.
3.5 Design an independent lintel subjected to triangular loading.

4.0 Understands the principles involved in the design of R.C.C slabs by Limit state method.

4.1 Distinguish between one-way slabs and two way slabs.
4.2 Design one-way slab for given grades of materials, loads and span for flexure and including shear design. Check for deflection using stiffness criteria.
4.3 Understand Load distribution in two-way slabs. Design two-way slabs with different end conditions for flexure including shear using B.M coefficients. Provision of torsional reinforcement in the restrained slabs. Check the deflection using simplified approach of stiffness criteria.
4.4 Sketch the detailing of reinforcement in stairs spanning longitudinally (Dog legged staircase only)

5.0 Understands the principles involved in the analysis of T-beams

5.1 List the advantages of T-beam.
5.2 Write the formula for effective width of flange of a T-beam as per IS 456-2000.
5.3 Describe the three cases of T-beams with sketches and notations.
5.4 Calculate the moment of resistance of the given Tee section using the expressions given in the code.

6.0 Understands the principles involved in the design of Continuous beams and slabs

6.1 Explains the behaviour of continuous beams and slabs subjected to loading and advantages of continuous beams and slabs.
6.2 Calculates the B.M and S.F of continuous beams and slabs (Minimum of three spans) at critical sections using B.M and S.F coefficients given in the code.

6.3 Design the tension reinforcement at a given section only

7.0 Understands Analysis and Design of columns

7.1 Defines column and understands its behaviour under loading.
7.2 Code provisions of columns
7.3 Differentiates between short and long columns and Understand their failure behaviour.
7.4 Determine load carrying capacity of a given axially loaded short column.
7.5 Designs a Short Square, rectangular, circular column with lateral ties (subjected to axial load only).

8.0 Understands Design of Footings

8.1 Defines Footing and State different types of Footings (Square/Rectangular Isolated footings of Uniform/Tapered sections).
8.2 Explains the code provisions for the design of R.C.C footings.
8.3 Design the isolated square footing of uniform thickness for an axially loaded square column.
8.4 Checking of the footing for one-way shear, two-way shear, bearing stress and for development length.

Note: Students may be encouraged to use design aid SP-16, SP-34 and SP-23 for design of slabs, beams for general practice. I.S.456 – 2000 is allowed in the Examination.

COURSE CONTENTS:

1.0 Introduction to R.C.C and Principles of working stress design

1.1 Introduction to R.C.C, Loads to be considered and Introduction to I.S Codes and Assumptions in working stress method.
1.2 Characteristic compressive strength, modulus of elasticity of concrete.
1.3 Loads to be adopted in R.C.C. design – dead load, Live load, wind load(as per IS 875-1987) and earth quake loads(as per IS-1893).
1.4 Nominal Mix – Design Mix – differences.
1.5 Modular ratio – critical percentage of steel.
1.6 Balance, under reinforced, over reinforced sections.
1.7 Critical and actual neutral axis depth of singly reinforced beams.
1.8 Moment of resistance of simply supported singly reinforced beam sections.
1.9 Design of singly reinforced rectangular beam for flexure.

2.0 Philosophy of limit state Design

2.1 Introduction to Limit state design – philosophy – Limit state – Types of Limit states.
2.2 Strength and serviceability limit states, characteristic strength of materials and characteristic loads and partial safety factors.
2.3 Design strength of materials and design loads.
2.4 Assumptions made in the limit state design.

3.0 Analysis and design of Rectangular beams

3.1 Stress-strain diagram of singly reinforced RCC beam.
3.2 Depth of neutral axis, lever arm.
3.3 Moment of resistance of singly reinforced Rectangular section – balanced, under reinforced.
3.4 Critical percentage of steel.

3.5 Calculation of moment of resistance of the given section and design of singly reinforced rectangular beam for the given load as per IS 456-2000.

3.6 Doubly reinforced sections - necessity, use.

3.7 Calculation of neutral axis and moment of resistance for the given section and grades of concrete and steel (no derivation of the equations).

3.8 Shear in singly reinforced beams - nominal shears stress - permissible shear stress.

3.9 Methods of providing shear reinforcement in the form of vertical stirrups - combination of vertical stirrups and bent up bars.

3.10 Code provisions for spacing of stirrups and minimum shear reinforcement (no derivation of equations).

3.11 Development of bond stress in reinforcing bars.

3.12 Design bond stress - development length – bond and anchorage concepts and their importance.

3.13 Curtailment of tension reinforcement.

3.14 Simple problems on development length.

3.15 Design of simply supported singly and doubly reinforced rectangular beam for flexure including shear and check for deflection using stiffness criteria - Use of design aids (SP-16).

3.16 Design of an independent lintel subjected to triangular loading.

4.0 Design of slabs

4.1 Slabs as structural and functional members

4.2 One way and two way slabs

4.3 Minimum reinforcement and maximum spacing of reinforcement – concrete cover - stiffness criterion-stiffness ratios for simply supported, cantilever and continuous slabs.

4.4 One way and two way slabs with various end conditions as per I.S:456 code.

4.5 Design of one-way slab for flexure and shear for the given grades of concrete, steel, span and loading.

4.6 Check for deflection using simplified approach of stiffness criteria.

4.7 Design of two-way slabs with different end conditions, using B.M coefficients for the unrestrained and restrained conditions as per code.

4.8 Design of torsion reinforcement for the restrained slabs - Deflection check using stiffness criteria - Use of design aids (SP-16).

4.9 Detailing of reinforcement in stairs spanning longitudinally.

5.0 Analysis of T-beam

5.1 Conditions needed for design of a beam as T-Section–advantages - Code provisions for effective flange width - three cases of T- beams.

5.2 Neutral axis, lever arm and moment of resistance for under reinforced, balanced sections using the equations given in the code (no derivations).

5.3 Calculation of the moment of resistance of tee section using the equations given in the code – Use of design aids (SP16).

6.0 Design of Continuous beams and Slabs

6.1 Behaviour of continuous members and advantages of continuous beams and slabs.

6.2 Determination of B.M and S.F of continuous beams and slabs of minimum three spans using BM & SF coefficients given in the code-Use of design aids (SP-16).

6.3 Design the tension reinforcement at a given section only.

7.0. Design of columns

7.1 Definition of column – Difference between Column and Pedestal.

7.2 Types of columns (Long and Short) - effective length for different end conditions.

7.3 Code provisions for design of columns- square, rectangular and circular columns with lateral ties

7.4 Determination of Load carrying capacity of short column (subject to axial load only).

7.5 Design of short square, rectangular and circular columns (with lateral ties only).

8.0 Design of Footings

8.1 Footings - Need for footings

8.2 Footings under isolated columns – loads on footings

8.3 Code provisions for design of footings - size of footings for given bearing capacity

8.4 Design of an isolated square footing of uniform thickness under a column

8.5 Checking of the footing for one-way shear, two-way shear, bearing stress and for development length.

REFERENCE BOOKS

1. *'Limit state design of R.C.C structures'* by Ashok K.Jain, Nem chand brothers, Roorkee.

2. 'Limit state Design of concrete structural elements', continuing Education module prepared by N.I.T.T.T.R Chennai and published by I.ST.E continuing education cell, university Visveswaraiah College of Engineering, (UVCE)Campus, Palare Road, Bangalore – 560001.

3. Structural Engineering(RCC) by Ramamrutham.

4. Structural Engineering (RCC) by Vazirani and Ratwani.

5 R.C.C Structural Engineering by Guru charan Singh.

6 Reinforced Concrete Structures by I.C.Syal and A.K.Goyal

7 Limit state design of reinforced concrete by P.C. Verghese

8 Concrete technology and practice by M.S Shetty

9 SP:34 - Handbook on concrete reinforcement and detailing.

10 Structural Design & Drawing by N. Krishna Raju (Universities press)

IRRIGATION ENGINEERING

Subject Title : Irrigation Engineering

Subject Code : C-402
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Nature and scope of Irrigation Engineering	07	13	01	01
2.	Elements of Hydrology	07	13	01	01
3.	Head works	07	13	01	01
4.	Gravity dams and Earth dams	13	23	01	02
5.	Distribution works	08	16	02	01
6.	Soil Erosion, Water logging and River Training works	07	13	01	01
7.	Water Management	04	06	02	--
8.	Watershed Management	07	13	01	01
	Total	60	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the Nature and scope of Irrigation

1.1 Define Irrigation
1.2 Understand the necessity of irrigation.
1.3 List advantages of irrigation.
1.4 List disadvantages of irrigation
1.5 State different types of irrigation
1.6 Explain Perennial Irrigation
1.7 Explain Inundation Irrigation
1.8 Distinguish between
   1. Perennial and inundation irrigation,
   2. Flow and Lift irrigation, and
   3. Storage and Direct irrigation.
1.9 State Principal crops in India and their seasons
1.10 Explain Kharif crops
1.11 Explain Rabi Crops
1.12 Define the following terms:

1. Duty,
2. Delta,
3. Base period and
4. Crop period

1.13 Explain different methods of expressing duty
1.14 State the relationship between duty and delta and base period
1.15 Explain the factors affecting duty
1.16 State the requirement for precise statement of duty
1.17 State the duty figures for principal crops
1.18 Solve simple problems on duty

2.0 Understands the basic concepts of Hydrology

2.1 Explain the term Precipitation
2.2 State different types of rain gauges
2.3 Describe Simon's rain gauge
2.4 Explain the method of measurement of rainfall using Simon's Rain gauge
2.5 Explain the method of measurement of rainfall using float type automatic rain gauge
2.6 Explain precautions in setting and maintenance of rain gauges
2.7 State uses of rain fall records
2.8 Describe Hydrological cycle
2.9 Explain method of average annual rainfall of an area by Theisson's Polygon method
2.10 Solve the problem on calculation of average annual rainfall by Theisson's Polygon method
2.11 Define the following:
1. Catchment,
2. Intercepted catchment,
3. Free catchment and
3. Combined catchment area
2.12 State the characteristics of
1. Good catchment,
2. Average catchment and
3 .Bad catchment
2.13 Explain the term Run-off
2.14 Explain factors affecting runoff
2.15 Understand nature of catchment and runoff coefficient
2.16 Explain methods of estimating runoff using empirical formulae
2.17 Solve the problems on estimating run-off
2.18 Understand the term maximum flood discharge
2.19 Explain the methods of determining maximum flood discharge
2.20 State Ryve's and Dicken's Formulae
2.21 Solve simple problems on estimating maximum flood discharge
2.22 Explain the importance of river gauging
2.23 Lists the factors for selecting suitable site for a gauging station

3.0 Understands the head works for a diversion scheme and protective works for resisting percolation

3.1 Classify head works
3.2 State the suitability of different types of head works under different conditions
3.3 State the factors for selecting suitable site for diversion head works
3.4 Describe the component parts of Diversion works with sketch
3.5 Describe with sketch the component parts of a weir
3.6 Distinguish between barrage and Weir
3.7 Describe head regulator with sketch
3.8 Describe scouring sluice with sketch
3.9 Describe flood banks and other protective works
3.10 Define the following terms:
1. Percolation,
2. Percolation gradient,
3. Uplift and
4.Scour.
3.11 Explain percolation gradient
3.12 Explain uplift pressure

4.0 Understands the basic ideas about reservoirs, gravity dams and Earth dams

4.1 Distinguish between Rigid dams and Non-rigid dams
4.2 State factors influencing selection of site for reservoirs and dams.
4.3 Define the terms:
1. Full reservoir level,
2. Maximum water level,
3. Top bund level,
4. Dead storage,
5. Live storage,
6. Free board,
7. Gravity dam and
8. Spillway.
4.4 Explain the causes of failure of gravity dams and their remedies.
4.5 Distinguish between low and high dams.
4.6 Draw the elementary profile of a gravity dam for a given height
4.7 Draw the practical profile of a low dam.
4.8 Explain uplift pressure
4.9 Explain need for drainage galleries with sketches
4.10 Explain construction and contraction joints with sketches
4.11 State need and types of grouting of foundations
4.12 State different types of spillways and their suitability and draw sketches
4.13 State the situations in which earth dams are suitable
4.14 State the three types of earth dams with sketches of typical cross sections
4.15 Explain causes of failure of earthen dams and their precautions
4.16 Explain the terms with sketches
1. Saturation gradient and

2. Phreatic line

4.17 Explain drainage arrangements in earth dams with a neat sketch

4.18 State the method of constructing rolled fill earth dams and their maintenance.

4.19 Explain breach filling in earthen dams

4.20 Explain the maintenance of earth dams

5.0 Understands the basic ideas about canals & cross masonry works

5.1 Classify canals.

5.2 State the different methods of canal alignment and the situations in which each is suitable.

5.3 Sketch typical cross sections of canals

1. In cutting,
2. Embankment and
3. Partial cutting.

5.4 Explain balanced depth of cutting and its necessity

5.5 State the need for canal lining

5.6 State advantages of canal linings

5.7 State disadvantages of canal linings

5.8 Explain different types of canal linings

5.9 Explain the maintenance required for canals and their regulation

5.10 State different types of cross masonry works (cross regulator, drainage & Communication) and their objectives.

5.11 State need for cross drainage works

5.12 Describe the following with sketches

1. Aqueduct,
2. Super passage,
3. Under tunnel, siphon,
4. Level crossing and
5. Inlet and outlet

6.0 Understands the soil erosion, water logging and River training works

6.1 Explain terms:

1. Soil erosion,
2. Reclamation, and
3. Water logging.

6.2 State causes of soil erosion

6.3 State ill effects of soil erosion

6.4 Explain various methods of prevention of soil erosion.

6.5 State causes of water logging

6.3 State ill effects of water logging

6.4 Explain various methods of prevention of water logging

6.5 State methods of land reclamation.

6.6 State different stages of flow of rivers

6.7 Explain characteristics of Delta Rivers

6.8 Explain term meandering of river

6.9 State objectives of river training works

7.0 Understands the principles of water management

7.1 State soil-water plant relationship.
7.2 Describe the following irrigation methods:
1. Broader irrigation,
2. Check basin irrigation,
3. Furrow irrigation,
4. Sprinkler irrigation and
5. Drip irrigation
7.3 Explain on farm development
7.4 Describe 1. Warabandi system and 2. Water user associations
7.5 State the duties of water user associations

8.0 Understands the basic ideas about watershed management

8.1 Explain the concept of
1. Water shed and
2. Water shed management
8.2 State the need for watershed management
8.3 List the objectives of watershed management
8.4 State need for watershed development in India
8.5 Describe different approaches to water shed management
8.6 Explain the methods of Rain water harvesting
8.7 Explain method water harvesting through check dams
8.8 Explain different methods of artificial recharge of ground water
8.9 Explain artificial recharges of ground water using percolation tanks

COURSE CONTENT

1. Nature and scope of Irrigation Engineering

a) Definitions-necessity of irrigation-advantages and disadvantages-Perennial and Inundation irrigation-Flow and Lift irrigation-Direct and Storage irrigation.

b) Principal crops-Kharif and Rabi crops-Dry and wet crops.

c) Definition of duty, delta, base period, and crop period, Duty-different methods of expressing duty-base period-relationship between duty and delta and base period - factors affecting duty – Requirements for precise statement of duty - Duty figures for principal crops-simple problems on duty.

2. Elements of Hydrology

a) Precipitation – Types of rain gauges – Simon's rain gauge - Float type automatic recording gauge – precautions in setting and maintenance – rain fall records – Hydrological cycle-average annual rainfall of an area –
Theissen's polygon method.

b) Catchment basin in catchment area - Free catchment - combined catchment - Intercepted catchment – Run- off - Factors affecting run-off -
Nature of catchment, run off coefficient - Methods of estimating run off

Empirical formulae -Maximum flood discharge - Methods of determining maximum flood discharge, Ryve's and Dicken's formulae,– Simple problems on M.F.D.

c) River gauging – Importance – Site selection for river gauging

3. Head Works

a) Classification of head works-storage and diversion, head works - their suitability under different conditions-suitable site for diversion works - general layout of diversion works-brief description of component parts of diversion works, brief description of component parts of a weir.

b) Barrages and Weirs.

c) Head Regulator-scouring sluice-flood banks and other protective works.

d) Percolation-Percolation gradient-uplift pressures.

4. Gravity dams and Earth dams

a) Dams-rigid and non-rigid dams - main gravity dams-failures of gravity dams and remedial measures - elementary profile – limiting height of dam-low dam and high dam - free board and top width – Practical profiles of low dam - uplift pressure - drainage gallery - Contraction joints - grouting of foundations - spillways

b) Earth dams – situations suitable for Earth Dams types of earth dams-causes of failure of earth dams and precautions –saturation gradient and phreatic line-drainage arrangements-construction details of earth dams-breaching sections-breach filling-maintenance of earth dams.

5. Distribution works

a) Canals-classification-different methods of canal alignment-typical cross section of canal in cutting embankment, partial cutting and embankment – Berms - standard dimensions - balancing depth of cutting-canal lining-necessity - types –maintenance of canals.

b) Cross drainage works - Necessity – General description of aqueducts – Super passage – under tunnel - siphon level crossing- Inlet and outlet.

6. Soil erosion, Water logging and River Training works

a) Soil erosion-methods of prevention of soil erosion-causes and effects- of water logging-preventing water logging methods-land reclamation.

b) Different stages of flow of rivers-characteristics of Delta Rivers - Meandering - Object of river training - River training works.

7. Water management

Soil-water plant relationship-Irrigation methods-Broader Irrigation, check basin irrigation-Furrow Irrigation-Sprinkler irrigation-Drip irrigation – farm development, water user associations & Warabandi system.

8. Watershed Management

a) Introduction - Concept of Watershed Management – Objectives of watershed Management – Need for watershed development in India – Integrated and multidisciplinary approach for water shed management.
b) Rainwater water harvesting – Soil moisture conservation – Check dams – Artificial recharges and percolation tanks.

REFERENCE BOOKS

1. Irrigation Engineering by B.C Punmia
2. Irrigation Engineering and Water power Engineering by Birdie.
3. Irrigation Engineering by S.K.Garg
4. Irrigation Engineering by Basak-TMH

QUANTITY SURVEYING

Subject Title : Quantity Surveying
Subject Code : C-403
Periods/Week : 06
Periods/Year : 90

TIME SCHEDULE

Sl. No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	Introduction, units and specification	05	06	2	-
2	Detailed Estimates of Buildings	28	26	2	2
3	Analysis of rates and Abstract Estimates	17	23	1	2
4	Estimation of quantity of Steel of R.C.C elements	05	03	1	-
5	Earth work calculations	08	13	1	1
6	Detailed estimates of roads, culverts, open well and Public health Engineering works	17	23	1	2
7	Valuation of buildings –principles and methods of Valuation	08	13	1	1
8	Rent fixation of buildings	02	03	1	-
	TOTAL	**90**	**110**	**10**	**08**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand basic concepts of Quantity Surveying, Units and Specifications

1.1 Define:
   a) Quantity Surveying
   b) Estimation
1.2 State the need for quantity surveying and duties of Quantity Surveyor.
1.3 Distinguish among element of structure, item of a work & materials of construction
1.4 State the units of measurements, data and payment for different items of work and materials using I S : 1200
1.5 States the process of taking measurements for different works and tolerances
1.6 Gives the general specifications for important items of work
1.7 States different types of estimates.
1.8 Prepares approximate estimates for residential and non – residential buildings with given data of size/capacity and rates considering cost of building Services and other over heads.

2. Prepares detailed estimates for various Civil Engineering Structures

2.1 States the information required for preparation of detailed estimate of a building

2.2 Prepares the detailed estimate for various buildings from the given drawings specifications and site conditions.

2.2.1 Compound wall and steps.

2.2.2 One roomed building with verandah (load bearing type)

2.2.3 One/Two bed room building (load bearing type)

2.3 Prepares the estimation of a Steel Roof Truss for an Industrial Building with sloped roof.

3. Understands the Analysis of Rates and Abstract estimations

3.1 Defines different terms involved in rate analysis

3.2 Explains the computation of rate of an item of work

3.3 Prepares Lead Statement and data for different items of work

3.4 Tabulates the material requirements of mortars and concrete of different proportions

3.5 State different items involved in abstract estimate of the following

3.5.1 One roomed building with verandah

3.5.2 One/Two bed room building

4 Prepares the estimates for steel reinforcement for different R.C.C elements

4.1 States the different methods of estimation of steel required for R C C work involved in a building

4.2 Computes the quantity of steel reinforcement for a simply supported singly reinforced R.C.C beam in building by preparing a bar bending schedule using HYSD bars only.

5. Computes the volumes of earth work and reservoir capacity

5.1 States the different methods of computations of areas and volumes

5.2 Defines the lead and lift and states the standard values

5.3 Prepares a detailed estimate for volume of earth work for roads, canals and earthen bunds.

5.4 Computes gross and effective capacity of a reservoir from the areas of different elevations

6. Prepares the detailed estimates of irrigation and public health engineering structures

6.1 Prepares detailed estimates of different types of roads & culverts.

6.2 Prepares a detailed estimate for open well, R.C.C. overhead tank, Septic tank with soak pit / dispersion trench.

6.3 States the different items involved in the abstract estimates of the above structures.

7. Understands valuation of buildings

7.1 Explains terms: Valuation, Scrap value, salvage value, market value, book value, sinking fund, depreciation.
7.2 States the purpose of valuation.
7.3 States the factors governing valuation.
7.4 Calculates depreciation of a building.
7.5 Determines value of a building

8. Understands rent fixation of building

8.1 Determines rent for a building on plinth area method.

COURSE CONTENT

1. Introduction of Unit measurements and Specifications

1.1 Definition of quantity surveying/estimation –need for estimation –duties of Quantity Surveyor
1.2 Various items of Civil Engineering works as per I.S: 1200 and their Units of measurement.
1.3 Rules for measurement.
1.4 General specifications for different items of work
1.5 Define: Detailed Estimate – Abstract Estimates - Working estimates – Revised estimates – Supplementary estimates - Formats for detailed and abstract estimates.
1.6 Preliminary or Approximate Estimate – Plinth area estimate – Cubic rate Estimate methods
1.7 Problems in Preliminary estimate for residential and non-residential buildings (Plinth area method).

2 Detailed Estimates of Buildings

2.1 Detailed estimate for a Compound wall and steps
2.2 One roomed building with verandah (load bearing type structure)
2.3 One/Two bed room building (load bearing type structure)
2.4 Estimate for a sloped roof.

3 Analysis of Rates and Abstract Estimates

3.1 Define - rate analysis, standard data book, standard schedule of rates , standard data sheet, blasting charges, seinorage charges, cess charges, stacking charges, water charges, crushing charges, lead charges – purpose of analysis of rates.
3.2 Cost of materials at source and at site.
3.3 Computation of rate of an item of work - Cost of labour-Types of labour-Schedule of rates.
3.4 Prepare Lead statement and Data sheet for different items - materials required for mortars and concrete of different proportions
3.5 Abstract Estimate for
3.5.1 One roomed building with verandah.

3.5.2 One/Two bed room building.

4 Estimation of quantities of steel of R.C.C elements

4.1 Simply supported singly reinforced R.C.C beam.
4.2 Preparation of bar bending schedule for above using HYSD bars only

5 Earth work Calculations

5.1 Trapezoidal-Prismoidal-Mid-ordinate –mean sectional area rules for computing volumes in level sections for roads and canals.
5.2 Leads and Lifts and their standard values
5.3 Taking out quantities from L.S and C.S in cutting and embankment of level Sections.
5.4 Capacity of reservoirs from contours maps

6 Detailed Estimates of Roads, Culverts, Open well and public health Engineering Works

6.1 Water bound macadam road
6.2 Road with Bitumen Surface dressing
6.3 Cement concrete road
6.4 R.C.C slab culvert with straight returns.
6.5 Open well with masonry steining
6.6 R.C.C Overhead Water tank.
6.7 Septic tank with dispersion trench/soak pit.
6.8 Different items to be included in the abstract estimates of the above structures.

7. Basic Principles of Valuation

7.1 Define: Scrap value, salvage value, market value, book value, sinking fund, depreciation.
7.2 Definition and purpose of valuation.
7.3 Factors governing valuation-Life of structure, type location maintenance, legal control
7.4 Calculation of depreciation by different methods.
7.5 Methods of valuation.

8. Rent fixation of Buildings

8.1 Rental value based on plinth area method.

REFERENCE

1.	Estimating and Costing	by	B N Datta
2.	Estimating	by	Gurucharan Singh
3.	Estimating and Costing	by	S.C. Rangwala
4.	Quantity Surveying	by	A. Kamala
5.	Civil Engg Contracts & Estimates	by	B.S. Patil (Universities press)

TRANSPORTATION ENGINEERING

Subject Title : Transportation Engineering

Subject Code : C-404

Periods/Week : 05

Periods/Semester : 75

TIME SCHEDULE

S. No	Major Topics	No of periods	Weightage of Marks	Short Type	Essay Type
1	Introduction to Highways	14	16	02	01
2	Highway Surveys and Traffic Engineering	12	23	01	02
3	Highway Constructions and Maintenances	14	23	01	02
4	Introduction and Permanent way of Railways	12	13	01	01
5	Station yards and Maintenance of Railways	08	16	02	01
6	Bridges, Culverts and Cause ways	15	19	03	01
	Total	75	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to understand

1.0 Introduction to Highways

1.1 States the importance of transportation engineering.
1.2 States the importance and functions of I.R.C
1.3 States the classification of roads as per I.R.C
1.4 Explains the components of a road C/S with a sketch.
1.5 Defines the terms: width of pavement, shoulder, formation width, right of way, camber, gradient, ruling gradient, super elevation, sight distance.
1.6 States the necessity of providing super elevation and gives formula.
1.7 States the necessity of curves in highways.
1.8 States the different horizontal and vertical curves adopted in roads.

2.0 Understands Highway Survey and Traffic Engineering

2.1 Defines the term alignment.
2.2 States the factors influencing selection of alignment for a road in plain and hilly areas.
2.3 Lists the surveys required for fixing alignment.
2.4 States the different data required for the preparation of highway project.
2.5 States the importance of traffic census.
2.6 Explains with neat sketches traffic islands and Interchanges.
2.7 States the functions and types of pavement markings with sketches.
2.8 States the purposes and types of traffic signs with sketches.

3.0 Understands Highway construction and Maintenance

3.1 States the necessity of road drainage.

3.2 Explains the methods of providing surface and sub-surface drainage.

3.3 Explains the methods of construction of different types of roads.

3.4 Explains the maintenance of different types of roads.

3.5 States the materials used in construction of different types of roads, Granular Sub Base (GSB), Wet Mix Macadam (WMM) and tests on Bitumen

3.6 States the equipment/machinery used in construction of different roads.

3.7 States the different types of joints used in C.C roads with sketches.

3.8 States the need for joints in C.C roads.

4.0 Understands Introduction and Permanent way of Railways

4.1 States the advantages of Railways.

4.2 Defines gauge and states the types of gauges.

4.3 States the component parts of a permanent way and their functions.

4.4 States the requirements of good rail, rail joint, sleeper and ballast.

4.5 Flat footed rails, Types of rail joints, rail fittings, PSC sleepers, ballast - used in Indian Railways with sketches.

5.0 Understands Station yard and Maintenance of Railways

5.1 States the different types of turnouts and crossings with sketches.

5.2 States the classification of stations.

5.3 States different maintenance measures of a railway track.

5.4 States the duties of a permanent way inspector.

6.0 Understands Bridges, Culverts and Cause ways

6.1 States the classification of bridges.

6.2 States the factors influencing selection of site for a bridge.

6.3 States the data required for preparation of bridge project.

6.4 Defines terms: Waterway, linear waterway, afflux, vertical clearance, scour depth, free board.

6.5 States the formula for economical span and afflux.

6.6 States with sketches the different components of a bridge sub-structure and their functions.

6.7 Distinguishes between deck and through bridge.

6.8 Under stand the different types of bridge super structures.

6.9 Understand the different types of a causeways and culverts.

COURSE CONTENT:

1.0 Introduction of Highway

1.1 Importance of transportation engineering-I.R.C.-Classification of roads as per I.R.C.

1.2 Cross section of a road structure-sub grade-sub-base, base and wearing course-Width of pavement, shoulder, formation width, right of way, road boundaries-road widths for different classification of roads, traffic lane widths-camber–recommended I.R.C values of camber for different roads.

1.3 Gradients-Ruling gradient, limiting, exceptional gradient –Recommended I.R.C values of gradients.

1.4 Super elevation-Necessity -Curves-necessity of curves in roads-transition curves-Horizontal alignment and vertical alignment details.

2.0 Highway Surveys and Traffic Engineering

2.1 Alignment-Factors influencing alignment of road in plain and hilly areas –Surveys-Reconnaissance, preliminary and final location surveys- data required for the preparation of highway project .

2.2 Traffic census and its importance.

2.3 Road intersections-At grade intersections-Types-Traffic islands – Channelising islands-Round about – Interchange - Fly over - Diamond intersections-Clover Leaf junction.

2.4 Pavement marking and Kerb markings.

2.5 Traffic signs-informatory signs-Mandatory signs-Cautionary signs.

3.0 Highway constructions and Maintenance

3.1 Purpose of road drainage-Surface and sub-surface drainage-Typical cross section of highway in cutting and embankment.

3.2 Materials used- Water bound macadam roads - Granular Sub Base (GSB), Wet Mix Macadam (WMM) - Maintenance of W.B.M road – Machinery used in the construction-Construction procedure.

3.3 Bitumen – Properties – Tests on Bitumen (Flash amd Fire Point and consistency tests) – Bitumen roads-Different types-Surface dressing-interface treatments-seal coat, tack coat, prime coat – premix-methods- Bitumen carpet, Bitumen concrete, sheet asphalt - Construction procedure.

3.4 Cement concrete roads-Longitudinal joints-Transverse joints-Construction joints-Construction of concrete roads-Machinery used for construction.

4.0 Introduction and permanent way of Railways

4.1 Importance of Railways-Gauges-Types of gauges.

4.2 Structure of permanent way- requirements of a good rail – Flat footed rail.

4.3 Rail joints-Types of joints-Requirements of a good rail joint-Fixtures and fastenings of rails-coning of wheels.

4.4 Sleepers-Definition-Functions- PSC sleepers–characteristics of a good sleeper- Spacing of sleepers-Sleeper density.

4.5 Ballast-Definition-Function –Characteristics of good ballast.

5.0 Station yards and Maintenance of Railways

5.1 General description and sketches for turnout –general layout of a simple left hand and right hand turnout and different crossings.

5.2 General idea with sketches of station yards.
Marshalling yard, goods yard, passenger yard and loco yard.

5.3 Maintenance of track-Duties of P.W.I (permanent way inspector).

6.0 Bridges, Culverts and Causeways

6.1 Bridges-Classification -Selection of site for a bridge- data required for the preparation of bridge project.

6.2 Defines waterway, Afflux, vertical clearance, linear waterway, freeboard for bridges and culverts-Economical span-Scour depth.

6.3 Definition and Functions of pier, abutment, wing wall and approaches.

6.4 Deck and Through bridges-Sketches and suitability of different types of bridges – Masonry bridges – R.C.C beam and slab bridges, Plate girder bridges, prestressed concrete bridges, steel trussed bridges and suspension Bridges.

6.5 Sketches and suitability of different culverts- slab culverts, pipe culverts and box culverts-Types of cause ways – Low level causeway and high level causeway.

REFERENCE BOOKS:

1. Highway Engineering by S.C.Rangawala
2. Railway Engineering by S.C.Rangawala
3. Bridge Engineering by S.C.Rangawala
4. High way Engineering by Khanna and Justo
5. Transportation Engineering by H.Krishna sharma
6. Railway Engineering by Saxena
7. Transportation Engineering by P.Venkataiah
8. A Text book of Road Engineering by Basu and Bhattacharjee

CONSTRUCTION PRACTICE

Subject Title : Construction Practice
Subject Code : C-405
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Classification of buildings and Foundations	10	26	02	02
2.	Masonry	08	13	01	01
3.	Doors, Windows and Lintels, Sunshades	08	13	01	01
4	Roofs, Floors and Stair Cases	10	16	02	01
5	Staging, Shuttering and Scaffolding	08	13	01	01
6.	Protective, decorative finishes and Termite proofing	08	16	02	01
7.	Green Buildings, Energy Management and Energy Audit of Buildings & Project	08	13	01	01
	Total	60	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Know the classification of Buildings and design of foundations as per NBC

1.1 List the components of a building
1.2 Explain the functions of the components of a building
1.3 Classify the buildings according to National Building Code with examples.
1.4 Explain the investigations required for foundation as per N.B.C.
1.5 Describe the following with line diagrams –
1. Spread footings,
2. Raft foundation,
3. Pile foundation and
4. Well foundation.
1.6 State the loads to be considered in design of foundation.
1.7 List rules for minimum depth, width of foundation and thickness of concrete bed for spread footing foundation.
1.8 Explain the method of constructing spread footing foundation.
1.9 List the causes of dampness at basement level.
1.10 List the effects of dampness at basement level
1.11 List the measures for prevention of dampness at basement level.

2.0 Understand the construction of masonry work

2.1 List different types of stone masonry.
2.2 Explain the different types of stone masonry.
2.3 State the general principles to be observed in stone masonry construction
2.4 Explain the following terms in brick masonry

1. Bond,
2. Course,
3. Header, and
4. Stretcher

2.5 List general principles of brick masonry.

2.6 Explain with sketches, English bond for alternate layers brick masonry of one brick wall thickness.

2.7 Explain masonry with Precast concrete solid blocks, Hollow blocks, high quality building blocks with sketches.

3.0 Understand the types and principles of doors, windows, ventilators, Lintels and sunshades

3.1 State the principles of locating doors, windows and ventilators in buildings.

3.2 Explain with sketches common and special types of doors, windows and ventilators.

3.3 List the uses of different types of doors, windows and ventilators.

3.4 Explain the fittings and fastenings of doors, windows and ventilators.

3.5 Explain the functions and types of lintels.

3.6 Explain the functions of sunshades, canopy, sun-breakers and porticos.

3.7 Explain about thin lintel developed by CBRI with simple sketches.

4.0 Understand methods of construction and finishes of different types of roofs and floorings and Stair Cases

4.1 State the functions of roofs.

4.2 State the classification of roofs.

4.3 State the classification of trusses based on material and shape.

4.4 Explain with sketches king post truss, queen post truss, fan roof truss, north light roof trusses.

4.5 State the common and decorative ceilings used in construction work.

4.6 Explain the method of fixing Plaster of Paris and fibre glass ceilings.

4.7 State the component parts of flooring.

4.8 State the functions of flooring.

4.9 List the requirements of good floor.

4.10 Explain method of construction of C.C flooring, tiled flooring, mosaic flooring, Ceramic flooring and Marble flooring.

4.11 State the principles of locating stairs.

4.12 Explain terms: rise, tread, landing, flight, going, hand rail, newal post, baluster and balustrade.

4.13 Draw the line diagrams of different stairs.

5.0 Understand Staging, Shuttering and Scaffolding

5.1 State the concept of staging.

5.2 State the purpose of scaffolding.

5.3 Define scaffolding and mention the types.

5.4 List the component parts of tubular scaffolding.

5.5 Sketch and explain about tubular scaffolding.

5.6 State the advantages of tubular scaffolding.

5.7 State the objectives of shuttering/formwork.

5.8 State the requirements of shuttering/formwork.

5.9 State the advantages of steel formwork over Timber formwork

6.0 Understand Protective, decorative finishes and Termite Proofing

6.1 State the objects of plastering.
6.2 State the methods of plastering.
6.3 State the steps in providing cement plastering on masonry walls.
6.4 State the use of wall putty as a decorative finish on masonry walls.
6.5 State the objects of pointing.
6.6 State the types of pointing.
6.7 State the objects of painting.
6.8 Explain the method of painting new and old walls surfaces.
6.9 State the paints suitable for painting wood work and steel work.
6.10 Explain briefly the method of white washing, colour washing, distempering the brick masonry wall.
6.11 Define termite proofing.
6.12 Explain the method of termite proofing.

7.0 Appreciate the concept of green building, energy management and energy audit of buildings

7.1 Concept of Green building
7.2 Explain the possible ways of energy management of buildings.
7.3 State the aims of energy management of buildings.
7.4 Distinguish among energy auditing schemes.
7.5 State the response to audit questionnaire.
7.6 Explain energy surveying and audit report.
7.7 Formulate the energy flow charts.

COURSE CONTENT

1) Classification of Buildings and foundations

a) Component parts of a building –Their functions.
b) Classification of buildings according to National building code.
c) Site investigation for foundation as per N.B.C, Trial pit, auger boring.
d) Spread footing foundation for columns and walls.
e) Raft foundation.
f) Pile foundation – RCC Piles – Bearing piles, friction piles and under reamed pile.
g) Well foundation – component parts – sinking of well foundation.
h) Different loads to be considered for the design of foundation as per IS 875 – 1987.
i) Spread foundation – Depth of foundation by Rankine's formulae– width of foundation – Thickness of concrete bed.
j) Construction of foundation (spread footing foundation only).
k) Causes, effects and prevention of dampness at basement level.

2) Masonry

a) Classification of stone masonry – Ashlar, Random rubble and Coursed Rubble Masonry – general principles to be observed while constructing stone masonry
b) Brick Masonry – Bonds in brick masonry – (English bond only) for one brick wall thicknesses – General principles to be observed in construction of brick masonry.
c) Masonry with Precast concrete solid blocks, Hollow blocks, high

quality building blocks with sketches.

3) Doors, Windows, Lintels and Sunshades

a) Doors and windows – parts of door and window – positioning.
b) Common types of doors-panelled, Glazed and Flush doors.
c) Special types of doors – Flush doors with modern construction materials, revolving doors, collapsible doors, rolling shutters, sliding doors- referring to A.P.D.S.S for size of doors and windows.
d) Windows – Panelled and Glazed.
e) Ventilators – fixed, swinging type and louvered.
f) Fittings and fastenings for doors, windows and ventilator.
g) Lintels – Functions – Types of lintels – R.C.C., wood, stone and steel.
h) Sunshade, canopy and sun breakers – lintel cum sunshade.

4) Roofs and Floorings and staircases

a) Roof – functions of roofs.
b) Classification of roofs – flat roofs – pitched roofs.
c) Different types of trusses – classification based on material and shape - King post truss, Queen post truss, Fan roof truss, North light roof truss.
d) Weather proof course on R.C.C. roof.
e) Common and decorative ceilings for auditoriums – method of fixing Plaster of Paris –Fibre glass.
f) Parts of flooring – Requirements of a good floor.
g) Methods of constructing flooring – cement concrete flooring, cement plaster flooring, Tiled flooring, mosaic flooring and Marble flooring.
h) Location of stairs.
i) Terms in stairs.
j) Types of stairs – straight, Quarter turn, half turn, Dog legged, open well, bifurcated, spiral/helical stair case, free standing and slab less stairs/staircase.

5) Staging, Shuttering and Scaffolding,

a) Staging- concept
b) Scaffolding – Purpose and types – component parts and advantages of tubular scaffolding only.
c) Shuttering/Form work – objectives

6) Protective, decorative finishes and Termite proofing

a) Plastering – purpose – Types of plastering – procedure for plastering.
External finishing – sand faced, pebble dash, acoustic plastering and marble chips – Internal finishing – wall paper and wall putty finishing.

b) Pointing – purpose –Types of pointing
c) Painting – objectives – method of painting new and old wall surfaces, wood surface and metal surfaces – powder coating and spray painting on metal surfaces.
d) White washing – colour washing – Distempering – internal and external walls.
e) Termite proofing – method.

7) Energy Management and Energy Audit of Buildings

a) Introduction to Energy Management and Energy Audit of Buildings.
b) Aims of energy management of buildings.
c) Types of energy audit.
d) Response energy audit questionnaire.
e) Energy surveying and audit report.

f) Energy flow charts.

REFERENCE BOOKS

1. N.B.C, National Building code
2. Building Construction By S.P. Arora & S.P. Bindra
3 Building Construction By Sushil Kumar
4. Building Construction By S.C.Rangawala
5. Explanatory handbook on Masonry code, SP20
6. Design of foundation structures principles and practice By Nainan P. Kurian

CIVIL ENGINEERING DRAWING-II

Subject Title : Civil Engineering Drawing -II

Subject Code : C- 406
Periods per Week : 04

Periods per Semester : 60

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1	Structural Planning & Marking of Frame Components	9	08	02	-
2.	R.C.C Working Drawing	42	44	01	02
3	Reading and Interpretation of Structural Drawings	9	08	02	-
	Total	**60**	**60**	**05**	**02**

Note: All questions are to be answered. Part-A 5x4=20marks & Part-B 2x20=40marks
NOTE: Use HYSD bars for main reinforcement.

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understands the structural planning of a building and marking of Frame components

1.1 Positioning & Orientation of columns
1.2 Positioning of beams
1.3 Spanning of slabs
1.4 Layout of stairs
1.5 Types of footings
1.6 Column reference scheme and
1.7 Grid reference scheme (Scheme as per IS:5525 - recommended for detailing of reinforced concrete works and SP:34)

2.0 Draws the detailed working Drawings of R.C.C.

2.1 Draws the longitudinal section and cross sections of singly reinforced simply supported beam. Prepare schedule of reinforcement and quantity of steel
2.2 Draws the longitudinal and cross section of lintel cum sunshade and prepare schedule of reinforcement and quantity of steel
2.3 Draws the plan and longitudinal section of one-way slab showing reinforcement details. Also prepare schedule of reinforcement and quantity of steel

2.4 Draws the details of reinforcement of two-way simply supported slab with corners not held down condition. Top and bottom plan and section along short and long spans have to be Drawn. Also prepare schedule of reinforcement

2.5 Draws the details of reinforcement of two-way simply supported slab with corners held down conditions. Top and bottom plan and section along short and long spans have to be drawn. (Scheduling of reinforcement is not necessary)

2.6 Draws the details of reinforcement of one-way continuous slab along with T-beam with details of slab and T-beam (plan and section of continuous slab and longitudinal section of T-beam have to be drawn). (Scheduling of steel is not necessary)

2.7 Draws the details of column and square footing (plan and sectional elevation) prepare schedule of reinforcement of column and footing and quantity of steel required

2.8 Draws the reinforcement details of dog legged stair case (section only) also prepare schedule of reinforcement for one flight including landing

3.0 Read and interpret the Drawings

3.1 Prepares the Schedule of reinforcement for a given structural Drawing

COURSE CONTENT

1.0 Structural planning of a building and marking of Frame components

1.1 Draws the position of columns, beams, slabs, stairs and footing in a given line diagram of building

1.2 Prepare member reference scheme of given building following Column reference scheme & Grid reference scheme as per IS: 5525 – (recommendations for detailing of reinforced concrete works). & SP:34

2.0 Detailed working Drawings of

2.1 Singly reinforced simply supported rectangular beam.

2.2 Lintel cum sunshade.

2.3 Simply supported one-way slab.

2.4 Two-way slab simply supported corners not held down.

2.5 Two-way slab simply supported corners held down.

2.6 One-way continuous slab and T-beam (with details of slab and T-beam)

2.7 Column with uniform thick and sloped footings.

2.8 Stair case – stairs spanning longitudinally (Dog legged stair case)

3.0 Read and interpret the Drawings

3.1 Preparation of Schedule of reinforcement for a given structural Drawing

REFERENCE BOOKS

1.0 Designing and detailing hand book (IS CODE)

C.A.D PRACTICE – I

Subject Title : CAD PRACTICE - I

Subject Code : C - 407

Periods/Week : 06

Periods/semester : 90

TIME SCHEDULE

S.No	Major Topics	No. of Periods
1.	Introduction and Practice on Computer aided Drawing	12
2.	Geometric Constructions & Elements of building drawing	18
3.	Preparation of building drawing using AUTO CAD	24
4.	Preparation of Structural Engineering drawings using CAD software.	18
5.	Preparation of Approval drawings	18
	Total	**90**

OBJECTIVES:

1.0. Introduction and Practice on Computer aided drafting (CAD)

1.1 State the applications and advantages of CAD
1.2 State the features of Auto CAD as drafting package
1.3 State the hardware requirements to run Auto CAD
1.4 Studies the drawing editor screen.
1.5 Practices the methods of selecting/entering commands to start new drawing accessing Auto CAD commands by selecting from menus, tool bars and entering Commands on command line.
1.6 Sets the limits of the drawing to get the needed working area.
1.7 Practices the 'setting commands' Grid, Snap, & Ortho Commands.
1.8 Practices 'Draw commands'- point, line, Pline, rectangle, circle, tangent, ellipse, arc, polygon.
1.9 Dimensions the given figures.
1.10 Practices 'modify commands' – erase, copy, mirror, move, rotate, scale, stretch, trim, extend, break, chamfer, fillet, explode, Pedit, Mledit.
1.11 Practices 'construct commands '– offset, array, Divide, measure.
1.12 Practices 'edit commands' – Undo, Redo, Oops, CopyClip, PasteClip, Del.
1.13 Practices 'view commands' – Redraw, Regen, Zoom, Pan.
1.14 Practices 'Hatch commands' – Bhatch, Hatch.
1.15 Practices 'insert commands' – Block, Wblock, Insert, Minsert.

2.0 **Practice on Geometric Constructions and Components of Building Drawings**

3.0 Draw Plan, Section and Elevation of residential buildings using Auto CAD commands.

4.0 Draw the structural detailing drawings of the residential building.

5.0 Prepares standard drawings for Municipal approval.

COURSE CONTENT:

1.0 Introduction and Practice on computer aided drafting (CAD)

1.1 Computer graphics
1.2 Definition of CAD
1.3 Applications of CAD
1.4 Advantages of CAD
1.5 Introduction to Auto CAD as Drafting package
1.6 Study of drawing editor screen
1.7 List out methods to access Auto CAD commands.
1.8 Practice of setting up of drawing area using utility commands, & using setting commands.
1.9 Practice of entity draw commands.
1.10 Draw the given geometrical figures using draw commands.
1.11 Dimension the figures using dimensioning commands.
1.12 Practice of Modify commands.
1.13 Practice of construct commands.
1.14 Practice of edit commands
1.15 Practice of view commands.
1.16 Practice of Hatch commands.
1.17 Practice of insert commands.

2.0 Employ CAD software commands to prepare Geometric Constructions and drawings related to Building components.

2.1 Divide a given line into desired number of equal parts internally.
2.2 Draw tangent lines and arcs
2.3 Construct a hexagon from the given data.
2.4 Construct ellipse, parabola, hyperbola, cycloid, and helix.
2.5 Draw conventional signs as per I.S. standards, symbols used in civil engineering drawing.
2.6 Draw the important joinery components of the building like elevation of fully panelled double leaf door, elevation of partly glazed and partly panelled window.
2.7 Draw the important building components like section of a load bearing Wall foundation to parapet.

3.0 Residential buildings

3.1 Plan, Elevation, Section of single roomed building
3.2 Single storied load bearing type residential building
3.2.1 One bed Room House
3.3 Single storied framed structure type residential building
3.3.1 One bed Room House

4.0 Structural detailing drawings

4.1 Singly reinforced simply supported rectangular beam.
3.2 Lintel cum sunshade
3.3 Continuous Beam.
3.4 Simply supported two way slab.
3.5 Isolated Column with square footing

5.0 Drawings to be submitted for approval to corporation or municipality showing required details in one sheet such as

5.1 Plan – Showing Dimensions of all rooms

5.2 Section – showing Specifications and Typical Foundation Details

5.3 Elevation

5.4 Site Plan – Showing Boundaries of Site and Plinth Area, Car Parking, Passages and location of Septic Tank

5.5 Key plan – Showing the location of Building

5.6 Title Block – Showing signature of Owner & Licensed surveyor

COMMUNICATION SKILLS

(Common to all Branches)

Subject title : Communication skills
Subject code : C-408
Periods per week : 3
Periods per semester : 45

Introduction :

In the context of globalization , competence in speaking skills is the need of the hour The gap between the needs of the industry and the curriculum can be bridged by enabling the students to hone their speaking and listening skills. This course aims at providing opportunities for practicing speaking.

Time Schedule

Sno.	Topic	Periods	Weightage of marks (End Exam)	Sessional marks	Total
1	Listening I	3			
2	Listening II	3	10	10	20
3	Introducing oneself	3			
4	Describing objects	3			
5	Describing events	3			
6	Reporting past incidents	3			
7	Speaking from observation / reading	3	50	30	80
8	JAM	6			
9	Group discussion	6			
10	Mock interviews	6			
11	Making presentations	6			
		45	60	40	100

Objectives : Upon completion of the subject the student shall be able to

- Strengthen their listening skills
- Strengthen their speaking skills

Competencies and key competencies to be achieved by the student

Topic	**Teacher's input/ methodology**	**Students competence**
Listening I Listening II	Pre- Listening –eliciting, pictures While - Listening Post –Listening –project , writing	Identifying the main idea, Identifying specific details, Identifying parallel and contradictory ideas Drawing inferences, Reasoning
Introducing oneself	Kinds of introduction --official/ personal, dynamic vocabulary, Body language, Model introduction, Use of line ups	Use of simple present tense, Sequencing, Appropriate vocabulary
Reporting incidents	Group work /pair work, Elicit, Use of past tense, Student presentations	Use of past tense, Relevant vocabulary
Describing objects	Vocabulary , Use of adjectives, Games—I spy, Group presentations	Use of adjectives, Dimensions,shapes Compare and contrast, Sequence
Describing events	Group work/pair work Use of appropriate tense	Use of appropriate tense, Sequencing

Reporting past incidents	Use of past tense, Vocabulary Student presentations	Use of past tense , sequencing
Speaking from observation/reading	Group work/pair work, Reading techniques ,	Use of past tense, Summarising , evaluating, comprehension
JAM	Effective techniques , Good beginning , conclusion, tips, Use of line ups	Vocabulary, Sequencing, Fluency, Thinking spontaneously
Group discussion	Expressing opinion, body language	Expressing opinion, agree/ disagree, fluency, Persuasive and leadership skills
Mock interview	FAQs , body language	Role play, body language,
Making presentations	Student presentations	Using charts , pictures, interpreting data, sequencing, PPTs

Communicative methodology (CLT) should be used to create an interactive class. Apart from the suggestions given teachers are free to innovate to use any activity to improve the language competence of students . Attention can also be given to improve the accent and intonation of students.

Note:

* This subject is a theory subject.

** The workload should be calculated as theory workload.

***Examinations in the subject will be treated as a practical one.

BUILDING CONSTRUCTION PRACTICES

Subject Title : Building Construction Practices
Subject Code : C- 409
Periods/Week : 04
Periods/Semester : 60

TIME SCHEDULE

S. No	Major Topics	No. of Periods
1.	Marking for the earth work of a column foundation	04
2.	Marking for the earth work for the junction of two walls	04
3.	Marking the centre line of a one roomed building	04
4.	Marking for the earth work of a simple two roomed building	08
5.	Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.	04
6.	Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.	04
7.	Supervisory skills of Plastering of a wall.	04
8.	Supervisory skills for construction of Cement Concrete Flooring.	04
9.	Supervisory skills of fixing of floor trap, gully trap and their connections to drain.	08
10.	Placement of reinforcement in an Isolated Column Footing with proper cover.	04
11.	Placement of reinforcement for stairs spanning longitudinally (with specific attention at the junction of waist and landing slabs).	04
12.	Placement of reinforcement for sunshade, Placement of reinforcement for slab (with specific attention of chairs). OR Placement of reinforcement for a Beam column junction (with specific attention to Earth quake resistance design).	08
	Total	60

OBJECTIVES : Upon completion of the subject the student shall be able to

1.0 Marking for the earth work of a column foundation

1.1 Note down the measurements of column foundation for earth work excavation.
1.2 Mark the centre lines of column in either direction.

1.3 Mark the size of column with reference to the centre lines.
1.4 Mark the size of column footing on ground using lime powder.

2.0 Marking for the earth work of a junction of a wall

2.1 Read the width of walls at super structure from drawing.
2.2 Mark the centre line of main walls from the markings on marking pedestals.
2.3 Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.
2.4 Transfer the same by pouring the lime on the centre line.

3.0 Marking the centre line of a one roomed building

3.1 Read the width of walls at super structure and width of earth work excavation from drawing.
3.2 Mark the centre line of main wall from the markings on marking pedestals.
3.3 Mark the centre line of cross wall perpendicular to main wall with the help of wooden set square or by other means.
3.4 Mark the width of walls with reference to centre lines of walls.
3.5 Transfer the same by pouring the lime to proceed for excavation.
3.6 Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.
3.7 Transfer the same by pouring lime to proceed for excavation.

4.0 Marking for the earth work of a simple two roomed building

4.1 Prepare the centre line diagram from a given drawing.
4.2 Note down width of earthwork excavation.
4.3 Mark the centre lines on the ground with the help of plumb bob.
4.4 Check the accuracy by measuring length of two diagonals and their equality.
4.5 Mark the width of excavation with the help of threads placed parallel to the centre line and at a distance equal to half the width of excavation on either side of centre line.
4.6 Transfer the same by pouring lime to proceed for excavation.

5.0 Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning

5.1 Note the mix proportion and take the respective quantities of cement and sand (volume of 1bag of cement = 0.035 cubic meter).
5.2 Place the measured quantity of sand to a suitable stack on an impervious hard surface.
5.3 Spread the cement uniformly over the sand stack.
5.4 Dry mix both sand and cement thoroughly to a uniform colour.
5.5 Sprinkle sufficient quantity of water on the dry mix while thoroughly mixing the dry mortar, which can be used for 30 minutes.
5.6 Continue the mixing to bring the mortar to a stiff paste of working consistency.

6.0 Construction of 230mm thick brick wall in English Bond at the corner of a wall and check for horizontality and verticality

6.1 Soak the bricks in water and air dry before their use.
6.2 Prepare C.M of specified proportion and keep ready for use
6.3 Sketch the two threads perpendicular to each other at specified corner in line with the outer edges of wall.

6.4 Arrange the quion header in line with the two perpendicular threads
6.5 Arrange the queen closure adjacent to quoin header.
6.6 Continue one layer with headers on one face and stretchers on the perpendicular face to the true line.
6.7 Continue the next layer with stretchers on headers and headers on stretchers.
6.8 Check the verticality of the wall with the help of plumb bob and horizontality with the help of level tube for every three to four layers.
6.9 Place the bricks, with frog at the top.
6.10 Fill the vertical joint in each layer with mortar using trowel.

7.0 Supervisory skills of Plastering of a wall

7.1 Prepare the surface by raking the joints and brushing the efflorescence if any by brushing and scraping dust and loose mortar.
7.2 Remove efflorescence if any by brushing and scraping.
7.3 Wash the surface thoroughly with water and keep the surface wet before commencement of plastering.
7.4 Complete the ceiling plaster before commencement of wall plaster
7.5 Fill all put log holes in advance of the plastering.
7.6 Start plastering from top and work down towards the floor.
7.7 Apply 15cm x 15cm plaster of specified thickness first, horizontally and vertically at not more than 2.0m intervals over the entire surface to serve as gauges.
7.8 Check the surfaces of gauges for truly in plane of the finished plaster surface by using a plumb bob.
7.9 Apply the mortar on the wall between the gauges with a trowel to a thickness slightly more than the specific thickness.
7.10 Use a wooden straight edge to bring to the true surface with small upward and sideways movement at a time reaching across the gauges.
7.11 Use trowel to obtain final finish surface as a smooth OR wooden float for sandy granular texture.
7.12 Avoid excessive use of trowel or over working the float.

8.0 Supervisory skills for construction of Cement Concrete Flooring

a. Base Concrete

8.1 Use cement concrete of specified mix
8.2 Provide base concrete with the slopes towards floor trap required for the flooring using tube level.
8.3 Provide a slope ranging from 1:48 to 1:60 for flooring in varandah, courtyard, kitchen and bath.
8.4 Provide a slope of 1:30 for floors in water closet portion.
8.5 Provide necessary drop of 6mm to 10mm in flooring in bath, water closet and kitchen near floor traps to avoid spread of water.

b. Finishing

8.6 Follow the finishing of the surface immediately after the cessation of beating.

8.7 Allow the surface till moisture disappears from it.
8.8 Use of dry cement or cement mortar to absorb excessive moisture not permitted.
8.9 Spread the thick slurry of fresh cement and water @ 2kg of cement over an area of 1 square metre of flooring, while flooring concrete is still green.
8.10 The cement slurry shall be properly processed and finished smooth.

8.11 Finish the edge of sunk floor rounded with C.M 1:2 and finish with a floating coat of neat cement.
8.12 Cure the surface for a minimum period of 10 days.
8.13 Lay the flooring in lavatories and bath rooms only after fixing of water closets and squatting pans and floor traps.
8.14 Plug the traps while laying and open after curing and cleaning.

9.0 Supervisory skills of fixing of floor trap, gully trap and their connections to drain.

9.1 Identify the Floor trap and Gully trap
9.2 Identify the location of fixing the floor trap and gully trap
9.3 Connect the floor trap to the drain pipe.
9.4 Fix the joint using proper filler and adhesive material such that the joint is water tight.
9.5 Fix gully trap on cement concrete foundation 65 mm x 65 mm and not less than 10 mm thick.
9.6 Prepare a mix of concrete 1:5:10 and jointing of gully outlet to the branch drain is done
9.7 Tarred gasket soaked in thick cement slurry shall first be placed round the spigot of the drain
9.8 The remainder of the socket is filled with stiff mixture of cement mortar in the proportion of 1:1.

10.0 Placement of reinforcement for an Isolated Column Footing and Column.

10.1 The grill of column footing should be kept ready as per design data.
10.2 Mark the centre lines in both directions on levelling course / bedding concrete with the help of plumb bob from the string stretched over the marking pedestals.
10.3 Mark centre of the outer reinforcing rods of footing in either direction.
10.4 Carefully place the grill such that centre line markings of outermost reinforcing rods are exactly above the centre lines marked on the bedding concrete.
10.5 Place the chairs/cover blocks of specified thickness below the bottom layer of reinforcing rods.
10.6 Exercise care for rectangular column footing while placing reinforcing mat such that bars in longer direction are at bottom.
10.7 Place the column reinforcement with chairs or cover blocks over the foundation mat.
10.8 Prepare the reinforcement as per the drawing.
10.9 Check for the verticality of column reinforcement with plumb bob
10.10 Provide lateral support for the column reinforcement to keep them in position.
10.11 Prepare the shuttering and apply waste oil inside surface of the shuttering box and fastenings
10.12 Place the shuttering box around the column and fix the fastenings.
10.13 Check for the verticality of shuttering with plumb bob

11.0 Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs)

11.1 Read the reinforcement details from the bar bending schedule
11.2 Prepare the shuttering for the stairs as per the design.
11.3 Bend the reinforcing bars to the shape and length confirming to the bar bending schedule.
11.4 Place the bars at the specified spacing maintaining the cover with the help of chairs or cover blocks.

11.5 Exercise care in the placement of reinforcement at the junction of waist and landing slab.
11.6 Tie the distributors parallel to risers at the specified spacing

12.0 Placement of reinforcement for sunshade and slab

12.1 Prepare the reinforcement as per design
12.2 Prepare the centering for sun shade
12.3 Place the grill for sun shade such that the main reinforcement is in the top zone leaving the cover
12.4 Place the cement mortar cover blocks or chairs of specified height below the main reinforcement to have prescribed cover above the reinforcement
12.5 Observe for sufficient length of anchorage of main reinforcement into the lintel or the beam etc.
12.6 Prepare the reinforcement as per design
12.7 Rest the reinforcement in slabs on bar chairs
12.8 Securely fix the bar to chairs so that it won't move when concrete is placed around it.
12.9 Locate reinforcing bars and mesh so that there is enough room between the bars to place and compact the concrete.
12.10 Anchor the reinforcement to improve the transfer of tensile forces to the steel by bending or hooking or lapping the bars.
12.11 Read the reinforcement details from the bar bending schedule
12.12 Note down proper cover-clear cover, nominal cover or effective cover to reinforcement.
12.13 Decide detailed location of opening/hole and supply adequate details for reinforcements around the openings.

12.14 Show enlarged details at corners, intersection of beams and column Junction
12.15 Avoid congestion of bars at points where members intersect and make certain that all reinforcement is properly placed.

12.16 In the case of bundled bars, Make lapped splice of bundled bars by splicing one bar at a time.
12.17 Stagger such individual splices within the bundle.
12.18 Make sure that hooked and bent up bars can be placed and have adequate concrete protection.

COURSE CONTENT

1. Marking for the earth work of a pillar.
2. Marking for the earth work for the junction of two walls.
3. Marking the centre line of a one roomed building
4. Marking for the earth work of a simple two roomed building.
5. Preparation of cement mortar with specified mix proportion by manual mixing and volumetric proportioning.

6. Construction of 230mm thick brick wall in English Bond at the corner of a Wall and check for horizontality and verticality.
7. Supervisory skills of Plastering of a wall.
8. Supervisory skills for construction of Cement Concrete Flooring.
9. Supervisory skills of fixing of floor trap, gully trap and their connections to drain.
10. Placement of reinforcement in an Isolated Column Footing and column with proper cover.
11. Placement of reinforcement for stairs spanning longitudinal case (with specific attention at the junction of waist and landing slabs).
12. Placement of reinforcement for sun shade, slab, Beam column junction (with specific attention to Earth quake resistance design).

REFERENCE BOOKS

1. CPWD SPECIFIATIONS, Govt of India — Vol I&II, 2009
2. Practical Civil engineering hand book — Kale and Shaw
3. Building Construction — Bindra & Arora
4. National Building Code — BIS publication

V SEMESTER

DIPLOMA IN CIVIL ENGINEERING
SCHEME OF INSTRUCTIONS AND EXAMINATION

CURRICULUM-2016

V Semester

Sub Code	Name of the Subject	Instruction Periods/Week		Total Periods	Scheme Of Examinations			
		Theory	Practicals	Per Semester	Duration (hrs)	Sessional Marks	End Exam Marks	Total Marks
THEORY SUBJECTS								
C-501	Steel Structures	5	-	75	3	20	80	100
C-502	Construction Technology and Project Management	5	-	75	3	20	80	100
C-503	Environmental Engineering	6	-	90	3	20	80	100
C-504	Geotechnical Engineering	4	-	60	3	20	80	100
C-505	Advanced Civil Engineering Technologies	6	-	90	3	20	80	100
PRACTICAL SUBJECTS								
C-506	Civil Engineering Drawing III	-	4	60	3	40	60	100
C-507	CAD Practice - II	-	6	90	3	40	60	100
C-508	Life skills	-	3	45	3	40	60	100
C-509	Civil Engineering Work shop	-	3	45	3	40	60	100
	Total	**26**	**16**	**630**	**-**	**260**	**640**	**900**

STEEL STRUCTURES

Subject Title : Steel Structures
Subject Code : C-501
Periods/Week : 05
Periods/Semester : 75

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Introduction and Fundamentals of Limit State Design of Steel structures	04	03	01	-
2.	Design of fillet welded joints	10	16	02	01
3.	Design of Tension members	08	13	01	01
4.	Design of Compression members, Columns &Column bases	22	36	02	03
5.	Design of Beams	20	26	02	02
6.	Design of Roof trusses	11	16	02	01
	Total	75	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Know the Introduction and fundamentals of limit state design of steel structures

1.1 State common types of steel structures.
1.2 State the merits of Steel Structures.
1.3 State the demerits of Steel Structures
1.4 List the loads considered in the design of steel structures as per I.S:875-1987.
1.5 Describe various types of loads to be considered in the design of steel structures.
1.6 Understand the code of practice I.S. 800-2007
1.7 List physical properties of structural steel.
1.8 List mechanical properties of structural steel
1.9 Sketch different types of rolled steel sections
1.10 Classify cross sections of class 1 to 4
1.11 List types of elements.
1.12 Explain the Concept of Limit State Design.
1.13 Define ‘limit state’.
1.14 State types of limit states.
1.15 Define the following terms:
1. Characteristic action
2. Design action

3. Design strength

1.16 State the partial safety factor values for loads in limit state of strength and serviceability.

1.17 State the partial safety factor values for materials in limit state.

1.18 State the deflection limits for
1. Simply supported beam
2. Cantilever beam
3. Purlins

2.0 Understand the principles of design of Fillet Welded Joints

2.1 State different types of joints.

2.2 Differentiate the welded joints and Riveted joints

2.3 Sketch the different forms of welded joints.

2.4 Explain the features of a fillet welded joint.

2.5 State stresses in welds as per I.S.800-2007.

2.6 State formula for design strength of a fillet welded joint.

2.7 Calculate the design strength of a fillet welded joint.

2.8 Design a fillet welded joint for a given load, thickness of plate and permissible stresses as per code.

2.9 Design a fillet welded joint for a single angle connected to the gusset plate by fillet welds along the sides and at ends carrying axial loads.

2.10 Design a fillet welded joint for a double angle connected to the gusset plate by fillet welds along the sides and at ends carrying axial loads.

3.0 Understand the principles of design of Tension Members

3.1 Define ‘ tie’

3.2 State the applications of tension members.

3.3 Sketch different forms of tension members.

3.4 Understand the behaviour of tension members.

3.5 State the different modes of failures

3.6 Describe different modes of failures of tension members with sketches

3.7 State the maximum values of effective slenderness ratios as per code.

3.8 Determine the net effective area of single angle connected to gusset plate by welding.

3.9 Determine the design strength due to yielding of gross section, rupture of critical section and block shear failure of a single angle connected by welding

3.10 Understand design procedure of tension members.

3.11 Design a single angle tension member connected by welding only.

4.0 Understand the principles of design of Compression Members, Columns and Column bases

4.1 Understand the compression members

4.2 State different types of compression members (like column, strut)

4.3 Sketch different forms of compression members.

4.4 Understand the behaviour of compression members

4.5 Classify cross sections.

4.6 Distinguish between actual length and effective length.

4.7 Define the terms 1. Least radius of gyration and 2. Slenderness ratio.

4.8 State effective lengths to be used for different end conditions.

4.9 Understand buckling class of cross section like 1. Imperfection factor and 2. Stress reduction factor for different buckling classes – column buckling curves.
4.10 State maximum values of effective slenderness ratios as per code
4.11 Understand the design compressive stress for different column buckling classes.
4.12 Determine the design strength of compression members
4.13 Understand design procedure of compression members.
4.14 Design columns with I sections without built up sections.
4.15 Understand design details - effective sectional area – IS code provisions for angle struts.
4.16 Design single angle and double angle struts.
4.17 Understand IS code provisions of single / double lacing and battening for built-up columns.
4.18 Design a slab base along with a cement concrete pedestal also design the welded connection.

5.0 Understand the principles of design of Steel Beams

5.1 Understand the concept of limit state design of beams
5.2 Define the terms:
1. Elastic moment of resistance,
2. Plastic moment of resistance,
3. Elastic section modulus,
4. Plastic section modulus and
5. Shape factor.
5.3 Determine the shape factor values for rectangular, T and I sections
5.4 Understand the behaviour of steel beams.
5.5 Classify beams based on lateral restraint of compression flange.
5.6 Determine the design strength in bending (flexure) and in shear.
5.7 List the factors affecting lateral stability – influence of type of loading.
5.8 Distinguish between web buckling and web crippling.
5.9 Understand the beams failure by flexural yielding – types.
5.10 List the types of beams failure by flexural yielding
5.11 Understand laterally supported beam – holes in tension zone – shear lag effects – design bending strength.
5.12 Understand laterally unsupported beam – lateral torsional buckling of beams (theoretical concept only – no problems).
5.13 Explain effective length of compression flanges.
5.14 Understand concept of shear in beams – resistance to shear buckling.
5.15 Understand shear buckling design methods like 1. Simple post critical method and 2. Tension field method.
5.16 Understand the design of simple beams with solid webs.
5.17 Understand component parts of plate girders with sketches
5.18 Describe different types of Stiffeners with their suitability.
5.19 Design laterally supported simply supported beam considering all IS code requirements.

6.0 Understand the principles of design of Roof Trusses

6.1 List types of trusses – 1. Plane trusses and 2.Space trusses.
6.2 Understand the situations where roof trusses are used.
6.3 Sketch different types of roof trusses with their suitability for a given span.
6.4 Sketch a roof truss and name the component parts.

6.5 Understand the configuration of trusses like1. Pitched roof and 2. Parallel chord trapezoidal trusses.
6.6 Understand cross sections of truss members.
6.7 Understand the loads on roof trusses as per I.S – 875.
6.8 Explain the method of calculating the wind load on roof trusses..
6.9 Determine loads at nodal points of a given roof truss due to dead load, live load and wind load , given the coefficients K1, K2, K3 ,design wind speed, design wind pressure ,external and internal pressure coefficients.

COURSE CONTENT

1.0 Introduction and fundamentals of limit state design of steel structures

1.1 Merits and demerits of steel structures.
1.2 Loads considered in the design of steel structures as per I.S:875 -1987.
1.3 Introduction to I.S. 800-2007 - Mechanical properties of structural steel – yield stress (fy), ultimate tensile stress (fu) and maximum percent elongation (table -1 of IS:800-2007)
1.4 Standard structural sections – Classification of cross sections – class 1(plastic) class2(compact) class3(semi compact) and class4(slender) – types of elements – internal elements, outstands and tapered elements.
1.5 Concept of Limit State Design – limit state of strength – limit state of serviceability – classification of actions – strength – partial safety factors for loads and materials – deflection limits.

2.0 Design of Fillet Welded Joints

2.1 Different types of joints – lap joints – butt joints.
2.2 Differentiation of welded joints and riveted joints.
2.3 Different forms of welded joints – sketches of fillet and butt weld joints, slot weld and Plug weld.
2.4 Fillet welded joint – detailed sketch showing the component parts.
2.5 Stresses in welds as per I.S.800-2007 – Code requirements of welds and welding.
2.6 Problems on calculation of strength of a fillet welded joint.
2.7 Design of fillet welded joint for a given load, thickness of plate and permissible stresses as per code.
2.8 Design of fillet welded joint for single or double angles carrying axial loads.

3.0 Design of Tension Members

3.1 Introduction to tension members and different forms of tension members.
3.2 Behaviour of tension members.
3.3 Different modes of failures – gross section yielding, net Section rupture and block shear failure.
3.4 Maximum values of effective slenderness ratios as per code.
3.5 Calculation of net effective sectional area of single angle with welded connection only.
3.6 Calculation of the design strength due to yielding of gross section, rupture of critical section and block shear – problems on single angle with welded connection only.
3.7 Design procedure of tension members.
3.8 Problems on design of tension members single angle with welded connection only.

4.0 Analysis and design of Compression Members, columns and column Bases

4.1 Introduction to compression members - different forms of compression members.

3.6 Behaviour of compression members – Classification of cross sections – class 1 (plastic) class2 (compact) class3 (semi compact) and class4 (slender).

4.3 Effective lengths to be used for different end conditions – table 11 of I.S:800.

4.4 Buckling class of cross section – imperfection factor and stress reduction factor for different buckling classes – column buckling curves.

4.5 Maximum values of effective slenderness ratios as per code – design compressive stress for different column buckling classes.

4.6 Calculation of design strength of compression members – problems.

4.7 Design procedure of compression members – problems on simple sections only (no builtup sections).

4.8 Design details - effective sectional area – code provisions for angle struts – single angle and double angle – discontinuous and continuous struts.

4.9 Code provisions of single / double lacing and battening for built-up columns (no problems).

4.10 Design of slab base along with a cement concrete pedestal, design of welded connection of base plate and column – problems.

5.0 Analysis and design of Steel Beams

5.1 Concept of limit state design of beams – shape factor and plastic properties of beams – Problems on shape factor.

5.2 Behaviour of steel beams – design strength in bending (flexure).

5.3 Factors affecting lateral stability – influence of type of loading-web buckling and web crippling.

5.4 Beams failure by flexural yielding – types.

5.5 Laterally supported beam – holes in tension zone – shear lag effects -– design bending strength

5.6 Laterally unsupported beam – lateral torsional buckling of beams - (theoretical concept only – no problems).

5.7 Effective length of compression flanges.

5.8 Concept of shear in beams – resistance to shear buckling.

5.9 Shear buckling design methods - simple post critical method – tension field method.

5.10 Design of laterally supported simple beams with solid webs.

5.11 Component parts of plate girders with sketches – brief description of different types of stiffeners.

5.12 Design of laterally supported simply supported beam considering all code requirements.

6.0 Design of Roof Trusses

6.1 Types of trusses – plane trusses, space trusses.

6.2 Sketches of different roof trusses with their suitability for a given span.

6.3 Cross sections of truss members.

6.4 Loads on roof trusses as per I.S – 875.

6.5 Determination of loads at nodal points of a given roof truss due to dead load, live load and wind load, given the coefficients K1, K2, K3 ,design wind speed, design wind pressure ,external and Internal pressure coefficients.– problems.

REFERENCE BOOKS

1.	Code of practice: IS 800-2007	BIS, New Delhi
2.	Limit state Design of Steel Structures	S.K. Duggal/TMH
3.	Structural steel design	M.L.Gambhir/TMH
4.	Design of Steel Structures	N.Subramanian
5.	Design of Steel Structures	S.S.Bhavikatti
6.	Structural Engineering	A.P.ArulManickam
7.	Teaching Resource Material : http://www.steel-insdag.org	
8.	Teaching Resource Material : http://www.nptel.iitm.ac.in	

CONSTRUCTION TECHNOLOGY AND PROJECT MANAGEMENT

Subject Title : Construction Technology and Project Management

Subject Code : C-502

Periods per Week : 05

Periods per Semester : 75

TIME SCHEDULE

S No	Major Topics	No. of Periods	Weightage of marks	Short type	Essay Type
1.	Concrete Technology	15	23	01	02
2.	Construction Machinery and Equipment	06	03	01	-
3.	Building Services	07	06	02	-
4.	Preliminary planning & Organisational aspects	09	16	02	01
5.	Constructional planning, Contracts & Tenders	15	23	01	02
6.	Execution of works, Payment & Stores	15	23	01	02
7.	Basic concepts & Opportunities of Entrepreneurship	08	16	02	01
	Total	**75**	**110**	**10**	**08**

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the concrete Technology

1.1 Explain the relation between strength of concrete , workability and water/cement ratio
1.2 Understand 'Grades' of concrete.
1.3 State the grades of concrete recommended for different types of works.
1.4 Differentiate 'Normal strength concrete and High strength concrete'
1.5 State the factors affecting variability of concrete strength.
1.6 Understand the following special concretes
1. Fiber Reinforced Concrete,
2. Fal-G-Concrete,
3. Light weight concrete,
4. High density concrete,
5. Polymer concrete and
6. Self compacting concrete
1.7 Understand concreting under special exposure conditions like
1. Under- water concreting,
2. Cold weather concreting,
3. Hot weather concreting and
4. Concreting in high rise buildings

1.8 Explain ‘Micro concrete’ and ‘Shotcrete’.

2.0 Understand the Construction Machinery and Equipment

2.1 Understand the need for mechanization and construction activities
2.2 State the factors to be considered for the selection of type of construction equipment.
2.3 State different types of construction equipment.
2.4 Explain the uses of different construction equipment.

3 **Understand the Buildings services**

3.1 State the requirements of good lighting in building.
3.2 Define the terms 1. Glare and 2. Day light factor
3.3 State the precautions to be taken to avoid glare in building
3.4 State the requirements of good electrical wiring.
3.5 List the power rating of different domestic electrical appliances.
3.6 List the different types of electrical wirings.
3.7 State the objectives of electrical earthing.
3.8 Explain the methods of earthing
3.9 State the requirements of good ventilation.
3.10 Explain 1. Natural ventilation and 2. Artificial ventilation.
3.11 State the principles of fire protection in buildings.
3.12 State the causes of fire.
3.13 Explain about fire fighting.
3.14 State different fire detectors.
3.15 State different fire extinguishers
3.16 State different fire resistant building materials.
3.17 Explain about air conditioning.
3.18 State different types of cooling systems.
3.19 State the necessity of Safety alarm systems in buildings
3.20 State the concept of HVAC system in a residential building.

4.0 Know the objectives of Preliminary planning and organisational aspects

4.1 Defines the term construction management.
4.2 States the need for construction management.
4.3 Lists the factors involved in construction management.
4.4 Explains the importance of preliminary planning.
4.5 Explains the difference between feasibility report and project report.
4.6 Explains the data to be collected and aspects to be considered in project report.
4.7 Lists the aspects to be considered during preliminary planning in respect of:
  4.7.1 Minor irrigation project.
  4.7.2 Road project.
  4.7.3 Rural water supply project
  4.7.4 Housing colony
  4.7.5 Rural hospital.
4.8 Lists the different engineering departments of the government.
4.9 Gives the organisational structure of I and CAD, Roads and Buildings, Panchayat Raj and Public Health departments.
4.10 State the duties of various officers in Engineering Departments
4.11 Defines the terms administrative approval and technical sanction.

5.0 Understands Constructional Planning, Contracts and tender systems

5.1 Distinguishes between construction stages and construction Operations
5.2 Explains the concept and use of construction schedules.
5.3 States the need for material schedule and labour schedule.
5.4 Explains the methods of procurement of labour, material and equipment.
5.5 Explains the use of bar chart and its limitations
5.6 Lists the effects and causes of accidents and safety measures to be adopted in construction industry.
5.7 Prepares network diagram based on C.P.M for construction works.
5.8 Defines terms; Contract and contractor
5.9 Explains the various contract systems available for construction works.
5.10 Lists the merits and limitations of each of the contract systems.
5.11 Explains the need for calling of tenders.
5.12 Lists the steps involved in fixing up the agency through tender system.
5.13 Drafts a tender notice for a work.
5.14 Prepares tender documents.
5.15 Explains the need of earnest money and security deposit.
5.16 Draws up a comparative statement.
5.17 Lists out the conditions of contract agreement.

6.0 Understands Methods of execution of works, payments & stores

6.1 Explains the difference between the regular establishment and work charged establishment .
6.2 Explains the need for inspection of works.
6.3 Explains the need and methods of quality control
6.4 State the necessity for sampling and testing of materials.
6.5 States the need for departmental execution.
6.6 Explains the preparation and closing of muster rolls,
6.7 Explains the need for imprest amount.
6.8 Lists the common irregularities in a muster roll.
6.9 State the importance of Labour laws and minimum wages act
6.10 States the importance of measurement book.
6.11 Lists the rules to be followed in recording measurements.
6.12 States the need of obtaining contractors acceptance for the measurements in the M-Book.
6.13 States the need for pre-measurement and check measurement.
6.14 Lists the methods of payment to contractors.
6.15 Identifies the types of bills to be used.
6.16 States the steps involved in checking the bills.
6.17 Lists the recoveries to be made from the bills.
6.18 Identifies the different types of stores materials.
6.19 States the classification of the items held in general stock.
6.20 States the need for materials at site account.
6.21 List the use of indent, invoice in store accounts.
6.22 Explains the necessity of periodical inspection of stores.

7.0 Understands the Basic concepts & opportunities of entrepreneurship

7.1 Understands the requirements of a licenced surveyor, contractor
7.2 Lists various assisting institutions set up for development of Small Business.
7.3 Explain the assistance provided by different institutions such as NISIET, SISI, NSIC,APIDC.
7.4 State the role of financial organisation in the development of Small Scale Industries and Small Business, such as APSFC, Nationalised Bank etc.
7.5 Gives the concepts contracting.
7.6 Lists the formalities to become a contractor.
7.7 States the various concessions given to civil Engineer to start on enterprise and execute contracts.

COURSE CONTENT

1.0 Concrete Technology

1.1 Introduction – Ingredients of Concrete – Properties of Concrete – Workability-Factors influencing workability –Water/Cement Ratio-Relation between Strength of concrete and Water/Cement Ratio.
1.2 Curing of Concrete-Methods of curing.
1.3 Grade of concrete--Normal strength concrete and High strength concrete, factors affecting variability of concrete strength.
1.4 Special Concretes – fiber reinforced Concrete – Fal G-Concrete, high density Concrete, Light weight Concrete, polymer Concrete and micro Concrete – Self Compacting Concrete-Properties – uses.
1.5 Concreting under special exposure condition – cold weather Concreting – hot weather Concreting – under water concreting – Shotcrete – Concreting in high rise buildings - Micro concrete – Shotcrete.

2.0 Construction machinery and equipment

2.1 Need for use of construction Machinery.
2.2 Factors affecting selection of equipment.
2.3 Types – Crawler and Pneumatic tyred.
2.4 Excavation equipments – Tractors, Bulldozer, Grader, Scrapper, Shovel, Dragline, Clamshell, Dredgers – description-Uses.
2.5 Compaction equipments – Rollers, Tamping roller – Smooth wheeled roller – Pneumatic tyred rollers – Vibrating compactors – Description – uses.
2.6 Hauling equipments – Trucks, Dump trucks, Dumpers.
2.7 Cranes –Tower cranes.
2.8 Conveying equipments – Belt conveyors.

3.0 Building Services

1.1 Lighting requirements in a building – precautions to be taken to avoid glare in building – glare – daylight factor.
3.2 Electrical services – Requirements of good electrical wiring – types of electrical wirings – earthing – methods.
3.3 Ventilation – Requirement of good ventilation – Natural and Artificial ventilation
3.4 principles of fire protection in buildings - causes of fire - fire fighting – fire detectors - fire extinguishers - fire resistant building materials.

3.4 Air conditioning – Purpose – Air conditioning layout – Components –Types of cooling systems – Air coolers – Air conditioner – Centralized Air conditioner – Split type Air Conditioner.

3.6 Safety alarm system in buildings- necessity.

3.7 HVAC system in residential buildings- Concept.

4.0 Preliminary Planning & Organisational aspect

4.1 Construction Management –definition-need for construction Management factors involving construction management.

4.2 Importance of planning-site investigation-feasibility report and project report - collection of data and preparation of project report.

3.7 Aspects to be considered during preliminary planning - Minor irrigation project, road project, rural water supply project, housing colony, rural hospital.

4.4 Different organisations of engineering department –Organisational structure of I and CAD, Roads and Buildings, Panchayat Raj and Public Health departments P.W.D., duties of various officers – AE/AEE, DEE, EE & SE - administrative approval and technical sanction.

5.0 Construction Planning, Contracts & Tenders

5.1 Construction stage-construction operation - need for material schedule and labour schedule - procurement of labour, material and equipment -Bar chart - safety measures in construction - critical path method -preparation of net work diagram – Problem - critical path.

5.2 Terms: Contract and contractor - Legality of contracts – types of contracts – piece work – contracts –lumpsum contract – item rate contract – percentage contract – Negotiated rates –merits and limitations of each contract system

5.3 Necessity of tenders – sealed tenders – tender notice – tender documents – Earnest Money Deposit and Security Deposit – Opening of tenders – scrutiny of tenders – Comparative Statement – Acceptance of tenders, work order –contract agreement.

6.0 Execution of Works, payment of bills & stores

6.1 Regular and work charged establishment – inspection of works - need and methods of quality control - necessity for sampling and testing of materials.

6.2 Departmental execution of works- Muster roll -Imprest .

6.3 Labour laws and minimum wages act- Importance- brief explanation.

6.4 Measurement book-rules to be followed in recording measurement-pre-measurements and check measurement – contractors acceptance of measurements-preparation of bill-Types of hand receipts – modes of payment-checking of bills–-recoveries to be made from bills

6.5 Classification of stores-general stock items- consumables and non consumables-issue of stores-material-receipts-issues –transfer entry order-materials at site account-Indent-invoice–stock register-issue rate-verification of stores-accounting of shortages and surplus – write off.

7.0 Concept & opportunities of Entrepreneurship in civil engineering

7.1 Licenced surveyor, contractor, consultancy and contract services in building construction,

7.2 Significance and Concept of Small business enterprise-Assistance Programme for Small Business enterprises - Assistance provided by different institutions such as NISIET, SISI, NSIC,APIDC –Role of Banks in the development of Small Business Enterprise such as APSFC, Nationalised Bank.

7.3 various concessions given to civil Engineer to start on enterprise and execute contracts.

REFERENCE BOOKS

1. Concrete Technology M S Shetty
2. Hand book on Design of Concrete mixes S.P.23
3. Enterprenenuership and construction Management P.Venkataiah
4. Entreprenuership and construction Management N. Sreenivasulu
5. Construction Management and Accounts V.N Vazirani
6. Construction Management and Accounts Sharma
7. Management in Construction industry P.P Dharwadekar

ENVIRONMENTAL ENGINEERING

Subject Title : Environmental Engineering

Subject Code : C- 503

Periods/Week : 06

Periods/Semester : 90

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Water Supply Scheme	05	03	01	-
2.	Sources and Conveyance of Water	11	13	01	01
3.	Quality and Purification of Water	17	19	03	01
4.	Distribution System	11	13	01	01
5.	Introduction to Sanitary Engg & Quantity of Sewage	09	13	01	01
6.	Laying of Sewers & Sewers appurtenances	09	13	01	01
7.	Characteristics of Sewage, treatment & disposal	19	23	01	02
8.	Sanitation in buildings	09	13	01	01
	Total	90	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Know the scheme of water supply.

1.1 Explain the need for water supply schemes in the present day civil life.
1.2 Explain the connection between water supply engineering and public health.
1.3 State the need of protected water supply.
1.4 List the objectives of a protected water supply scheme.
1.5 Draw the flow chart of a typical water supply scheme of a town.
1.6 List the factors affecting per capita demand of a town/ city.
1.7 State the requirements of water for various purposes:
1. Domestic purpose,
2. Industrial use,
3. Fire fighting
4. Commercial and institutional needs and
5. Public use.
1.8 Explain the variation in demand for water supply.
1.9 Estimate the quantity of water required for a metropolitan area.
1.10 State the per capita demand for a small town for various purposes with a population of 50000
1.11 State the need for forecasting population in the design of water supply scheme.
1.12 State different methods of forecasting of population
1.13 Work out simple problems on forecasting population by different methods.

2.0 Understand the different sources and conveyance of water.

2.1 State the common sources of water for a water supply scheme
2.2 State different types of surface sources of water.
2.3 State different types of sub surface sources of water.
2.4 State the merits and demerits of surface and ground water sources for a water supply scheme of a town.
2.5 State the salient features of various surface sources.
2.6 Define
1. Aquifer,
2. Aquiclude and
3. Ground water table.
2.7 Classify wells according to construction.
2.8 Define
1. Draw down,
2. Critical depression of head,
3.Circle of influence,
4. Cone of depression,
5. Confined aquifer,
6. Unconfined aquifer and
7. Specific yield.
2.9 Explain the procedure for determining yield of a well by pumping tests (Constant Pumping and Recuperation Tests)
2.10 Explain the following with sketches:
1. Infiltration galleries.
2. Infiltration wells.
2.11 Describe the intakes for collection of water (reservoir intake, river intake, canal intake and lake intake) with sketches
2.12 Explain different methods of conveyance of water.
2.13 List the merits and demerits of different types of pipes used for conveyance of water.
2.14 Explain different joints used for connecting pipes with sketches
2.15 Describe the standard method followed in laying and testing the water supply mains.

3.0 Understand the Quality as per IS code and methods of purification of water

3.1 State different types of impurities present in water.
3.2 State the need for laboratory tests for testing water.
3.3 Explain the method of obtaining samples for testing.
3.4 Explain different tests for analyzing quality of water with their significance.
3.5 Define
1. E-coli index and
2. Most Probable Number (MPN).
3.6 Explain the significance of E-Coli in water analysis.
3.7 Explain the importance of chemical and bacteriological analysis of water used for domestic purpose.
3.8 State the various water borne diseases in India.
3.9 State the maximum acceptable limits of the following for the public drinking water:
1. Turbidity,
2. Hardness,
3. Nitrates and

4. Fluorides

3.10 State the objectives of treatment of water.

3.11 Sketch the overall layout of a water treatment plant indicating the different stages.

3.12 List the points to be considered in the location and layout of treatment plant.

3.13 State the objectivess of
1. Aeration,
2. Plain sedimentation,
3. Sedimentation with coagulation,
4. Filtration and
5. Disinfection.

3.14 Explain the process of
1. Aeration,
2. Plain sedimentation,
3. Sedimentation with coagulation and
4. Filtration

3.15 Describe different types of sedimentation tanks.

3.16 Describe the construction and operation of
1. Slow sand filters and
2. Rapid sand filters

3.17 Compare
1. Slow sand filters and
2. Rapid sand filters

3.18 Define disinfection of water

3.19 Explain the need for disinfecting water

3.20 Explain the methods of disinfection of water.

3.21 Explain different forms and points of Chlorination.

3.22 Explain the temporary hardness and permanent hardness of water

*NOTE: no design of treatment units.

4.0 Understand the systems of distribution and Water supply arrangements in Buildings

4.1 State the requirements of good distribution system.

4.2 Classify distribution system.

4.3 Explain different systems of distribution with sketches

4.4 State and explain different methods of water supply system with their merits and demerits.

4.5 State the necessity for service reservoirs.

4.6 List various appurtenances used in a distribution system of water supply system to a town.

4.7 Explains with sketches the location and functioning of various appurtenances used in a distribution system of water supply

4.8 Define terminology used while making water supply arrangements in buildings.

4.9 State the principles in laying pipelines within the premises of a building.

4.10 Explain the general layout of water supply connections of buildings with mains and suggests a suitable interior water supply arrangements for single and multi-storied buildings as per I.S Code.

4.11 State the general precautions to be taken in plumbing work for buildings.

4.12 Describe the constructional details and uses of different fittings: ferrule, goose neck, stopcock.

5.0 Understand the basics of sanitary engineering and Quantity of sewage

5.1 State the objectives of sewage disposal works.
5.2 Define the terms:
1. Sewage,
2. Sewer and
3. Sullage.
5.3 Explain the following:
1. Sewerage,
2. Refuse and
3. Garbage
5.4 List the objectives of sewerage works.
5.5 Explain types of sewerage systems and their suitability – separate, combined and partially separate systems.

5.6 Define Dry weather flow.
5.7 State the factors affecting dry weather flow.
5.9 Explain the variation in rate of sewage.
5.10 Estimate the quantity of storm water flow using 1. Rational method and 2. Empirical formulae.
5.11 List the requirements of good surface drains.
5.12 Describe different types of surface drains with their merits and demerits.
5.13 State the limiting velocities of flow in sewers.
5.14 Works out simple problems on design of sewers running half full only.

6.0 Understand the Types of sewers, laying of sewers and appurtenances

6.1 State various shapes of sewers.
6.2 Explain the circular sewer with a sketch
6.3 List the merits and demerits of circular sewer
6.4 Mention different materials used for sewers.
6.5 Explain the method of laying the sewers as per given alignment.
6.6 State the necessity to provide sewer appurtenances on the sewer lines.
6.7 List the various sewer appurtenances on a sewer line.
6.8 Explain the necessity of providing manhole in sewer line with the help of a sketch.
6.9 Explain the construction, function and location of the different sewer appurtenances.

7.0 Understand the characteristics of sewage

7.1 Define strength of sewage.
7.2 Describe the method of sampling sewage.
7.3 State the physical, chemical and biological characteristics of sewage.
7.4 Define C.O.D and B.O.D
7.5 State the significance of the BOD test to analyse sewage.
7.6 State the characteristics of industrial waste water.
7.7 State the objects of sewage treatment.

7.8 Draw the conventional sewage treatment plant of a town and indicate the main function of each unit.

7.9 State the function of screens, skimming tanks and grit chambers.

7.10 Explain briefly the working of screens, grit chambers, skimming tanks.

7.11 Describes with sketch wherever necessary the following treatment works.

a) sedimentation tank.
b) Trickling filters.
c) Activated sludge process.

7.12 Explain Sludge digestion process and list the methods of sludge disposal.

7.13 Explain with sketch the treatment of sewage by septic tank.

7.14 Determine the dimensions of a septic tank for given data.

8.0 Know the Sanitation in Building

8.1 State the aims of building drainage .

8.2 State the requirements of good drainage system in buildings.

8.3 Explain the terms: soil pipe, waste pipe, vent pipe, anti- syphonage pipe.

8.4 Describe the layout of sanitary fittings and house drainage arrangements for buildings (single and multi-storied).

8.5 Explain with sketches the different types of plumbing systems.

8.6 Describe different sanitary fittings like water closets, flushing cisterns, urinals, inspection chambers, traps, anti-siphonage pipes.

8.7 Explain the procedures involved in the inspection, testing and maintenance of sanitary fittings.

COURSE CONTENT

1. Introduction to Water Supply Scheme and Quantity of water

1.1 General importance of water supply.

1.2 Development of Water supply.

1.3 Need for protected Water supply.

1.4 Flow chart of a typical water supply scheme.

1.5 Total quantity of water for a town, per capita demand and factors affecting demand.

1.6 Water requirements for domestic purposes, industrial use, fire fighting, commercial and institutional needs, public use.

1.7 Variation in demand - peak demand – seasonal, daily and hourly variation.

1.8 Forecasting population by arithmetical, geometrical and incremental increase methods-problems on above methods.

2. Sources and Conveyance of Water

2.1 Surface source- Lakes, streams, rivers and impounded reservoirs.

2.2 Underground sources-springs, wells, infiltration wells and galleries.

2.3 Yield from wells by constant pumping and recuperation tests. (No problems required)

2.4 Comparison of surface and subsurface sources.

2.5 Types of intakes:
(i) Reservoir intake;
(ii) River intake;
(iii) Canal intake.
(iv) Lake intake.

2.6 Conveyance of water-open channels, aqueduct pipes.

2.7 Pipe Materials - C.I Pipes, Steel Pipes, concrete pipes, A.C. Pipes, G.I. Pipes Plastic Pipes (PVC &HDPE), merits and demerits of each type.

2.8 Pipe joints - spigot and socket joint, flange joint, expansion joint for C.I. Pipe, joints for concrete and asbestos cement pipes.

2.9 Pipe Laying and testing-Leak detection

3. Quality and Purification of water.

3.1 Impurities of water - need for laboratory test – sampling- grab and composite sampling.

3.2 Tests of water - physical, chemical and bacteriological tests – p^H value of water.

3.3 Standard quality for domestic use and industrial purposes.

3.4 Flow diagram of different treatment units.

3.5 Aeration - methods of aeration.

3.6 Sedimentation - plain sedimentation and sedimentation with coagulation.

3.7 Filtration - Construction and operation of slow sand & rapid sand filters.

3.8 Disinfection of water - necessity and methods of chlorination , pre-chlorination, break point chlorination

3.9 Hardness – Types of Hardness

NOTE: No design of treatment units

4. Distribution system and water supply arrangements in a Building.

4.1 General requirements, systems of distribution - gravity system, combined system, direct pumping.

4.2 Methods of supply - Intermittent and continuous.

4.3 Storage - underground and overhead-service reservoirs - necessity.

4.4 Types of layout - dead end, grid, radial and ring system

4.5 Location and functioning of:
(i) Sluice valves.
(ii) Check valves or reflux valves.
(iii) Air valves.
(iv) Drain valves or blow-off valves
(v) Scour valves.
(vi) Fire Hydrants.
(vii) Water meters.

4.6 Water supply arrangements in building:
Definition of terms; water main, service pipe, communication pipe, supply pipe, distribution pipe, air gap.

4.7 General lay-out of water supply arrangement for single and multi- storeyed buildings as per I.S Code of practice-general principles and precautions in laying pipelines within the premises of a building.

4.8 Connections from water main to building with sketch.

4.9 Water supply fittings, their description and uses - stopcock, ferrule, goose neck etc.

5. Introduction and Quantity of Sewage

5.1 Object of providing sewerage works.

5.2 Definition of terms : sullage, sewage, sewer and sewerage – classification of sewage.

5.4 Types of sewerage systems and their suitability – separate, combined and partially separate systems.

5.5 Quantity of discharge in sewers, dry weather flow, factors affecting dry weather flow, variation in rate of sewage

5.6 Determination of storm water flow – run off co-efficient, time of concentration, rational method and empirical formulae for run-off.

5.7 Surface drainage - requirements, shapes of surface drains.

5.8 Simple problems on design of sewers (running half full only) using Manning's and Hazen Williams formulae .

6.0 Laying of Sewers and Sewer Appurtenances

6.1 Different shapes of cross section for sewers – circular and non-circular – merits and demerits of each.

6.2 Brief description and choice of types of sewers - stone ware, cast iron, cement concrete sewers and A.C Pipes.

6.3 Laying of sewers - setting out alignment of a sewer, excavation, checking the gradient , preparation of bedding, handling, lowering, laying and jointing, testing and back filling.

6.4 Brief description, location, function and construction of

i) Manholes.
ii) Drop manholes.
iii) Street inlets.
iv) Catch basins.
v) Flushing tanks.
vi) Regulators.
vii) Inverted siphon.

7.0 Sewage Characteristics

7.1 Strength of sewage, sampling of sewage, characteristics of sewage; physical, chemical and biological.

7.2 Analysis of sewage - significance of the BOD test.

7.3 Characteristics of Industrial waste water–principles of treatment, Reduction of volume and strength of wastewater, Equalization, Neutralization and proportioning.

7.4 Preliminary treatment - Brief description and functions of following units. i)Screens, (ii) Skimming tanks and (iii) Grit chambers.

7.5 Primary treatment - Brief description and functions of Plain sedimentation, simple problems on the design of sedimentation tanks.

7.6 Secondary treatment - Brief description of
i)Trickling filters (ii) Activated sludge process

7.7 Sludge digestion – Process and methods of sludge disposal.

7.8 Miscellaneous treatments- septic tank.- design of septic tank.

8.0 Sanitation in Buildings

8.1 Aims of building drainage and its requirements – General layout of sanitary fittings to a house - drainage arrangements for single and multi storied buildings as per IS code of practice-plumbing systems.

8.2 Sanitary fittings – traps, water closets, flushing cisterns, urinals, inspection chambers, anti siphonage - Inspection, testing and maintenance of sanitary fittings.

REFERENCE BOOKS

1. Environmental Engineering G.S. Birdie
2. Elements of Public Health engineering K.N. Duggal
3. Environmental Engineering Baljeet Kapoor
4. Public Health Engineering S.K. Hussain
5. Environmental Engineering Ramachandraiah
6. Water supply and sanitary Engineering V.N. Vazirani
7. Environmental Engineering N.N.Basak/TMH

GEOTECHNICAL ENGINEERING

Subject Title : GEOTECHNICAL ENGINEERING

Subject Code : C-504

Periods/Week : 04

Periods/Year : 60

TIME SCHEDULE

S. NO	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1	General characteristics of Soils	10	13	1	1
2	Soil exploration	03	8	1	½
3	Essential properties of soils	15	23	1	2
4	Classification of soils	02	10	-	1
5	Hydraulic and mechanical properties of soils	03	8	1	½
6	Bearing capacity of soils	10	16	2	1
7	Settlement of foundation	04	8	1	½
8	Consolidation of compressive soils	03	8	1	½
9	Compaction of soils	10	16	2	1
	TOTAL	**60**	**110**	**10**	**8**

OBJECTIVES

Upon completion of the subject the student shall be able to

1.0 General Characteristics of Soils

1.1 Explains the importance of soil mechanics
1.2 Lists the types of soils
1.3 Describes the hydrometer analysis and sieve analysis of soil particles
1.4 Knows the semi-logarithmic grain size curve.
1.5 Defines the physical properties of soils like plasticity, cohesion and consolidation

2.0 Understands the basic concepts of soil exploration

2.1 Explains the need for soil exploration
2.2 Lists the methods of soil exploration
2.3 Describe briefly the subsoil and ground water exploration

3.0 Understands the essential properties of soils

3.1 Explains the method of disturbed soil sampling for testing

3.2 Defines the terms *"soil moisture content", "plasticity". "Atterberg's Limits – Liquid limit, Plastic limit and Shrinkage Limit", "plasticity index",* specific gravity of soil particles, *"dry density", "saturated density", "submerged density", "void ratio",* and *"porosity"*

3.3 Explain the test for soil moisture content by oven drying method – tests for determination of Atterberg's Limits – test for specific gravity by Pycnometer method

3.4 Expresses the relationships between volume of voids, moisture content, density of soil mass, dry density, saturated density, submerged density, specific gravity, void ratio, porosity. Degree of saturation, percentage of air voids, air content and density index

3.5 Works out simple problems using the relationships between various soil parameters

4.0 Understand the various classifications of soils

4.1 States the different systems classification of soils

4.2 Explains the textural classification of soils with a neat sketch

4.3 I.S. classification of soils

5.0 Understands the hydraulic and mechanical properties of soils

5.1 Explains the permeability of soils and compressibility of confined layers of soil.

5.2 Explains the shear resistance concept of soils

5.3 Describes the direct shear test experiment.

6.0 Understand the basic principles of bearing capacity of soils

6.1 Defines the bearing capacity and its importance in the design of foundations

6.2 Explains the importance of 'factor of safety' and 'safe bearing capacity' values in foundation design

6.3 States the presumptive bearing capacity values and the IS code equation for the calculation of bearing capacity

6.4 Explains the 'field plate load test' for determining the ultimate bearing capacity of soils

7.0 Understand the basic principles of 'Settlement of Foundation'

7.1 Defines the concept of 'settlement'

7.2 Briefly explains the vertical pressure in soil beneath loaded areas

7.3 Describes briefly the importance of bearing capacity and also settlement in the design of foundations

8.0 Understand the basic concepts of consolidation of compressible soils

8.1 Defines the principle of 'consolidation'

8.2 Explain in detail, the Terzaghi's model analogy of compression springs, showing the process of consolidation

8.3 Explain the field implications of consolidation

9.0 Understand the basic principles of compaction of soils

9.1 Explains the basic principles of compaction and its objectives
9.2 Describes the factors affecting Compaction
9.3 Describes the proctor's compaction test and modified proctor's compaction test
9.4 Explains the field measurement of compaction by core cutter method and sand replacement method.
9.5 Explain the term C.B.R. and its importance in the design of pavements

COURSE CONTENT

1.0 General characteristics of Soils

1.1 Soil mechanics – its importance
1.2 Types of soils – Residual soil, Transported soil, sand, silt, clay, peat, loess, murram, caliche, , bentonite – soils in India
1.3 Mechanical analysis of soils – Hydrometer and sieve analysis of soil particles – semi logarithmic grain size curve
1.4 Physical properties of soils – plasticity, cohesion, consolidation

2.0 Soil Exploration

2.1 Soil exploration – need for soil exploration – methods of soil exploration – Sub soil and ground water exploration - a brief overview

3.0 Essential properties of soils

3.1 Preparation of disturbed soil samples for testing – soil moisture content – oven drying method - soil plasticity

3.2 Atterberg's Limits - liquid limit, Plastic Limit, Shrinkage Limit – tests for determination of Atterberg's Limits – plasticity index

3.3 Specific gravity of soil particles – pycnometer method

3.4 Definitions and relationships of volume of voids, moisture content, density of soil mass, dry density , saturated density, submerged density, specific gravity, void ratio, porosity, degree of saturation, percentage of air voids, air content, density index, - simple problems using the above relationships

4.0 Classifications of Soils

4.1 Classification of soils –different systems of classification of soils – textural classifications of soils – I.S. classification of soils

5.0 Hydraulic and Mechanical Properties of Soils

5.1 Permeability of soils

5.2 Compressibility of soils

5.3 Shearing resistance of soils – shear strength experiment with Direct shear apparatus. (Explanation of testing procedure only)

6.0 Bearing Capacity of Soils

6.1 Bearing capacity – definition – importance of bearing capacity in foundation design – bearing capacity of shallow footings

6.2 Importance of factor of safety – safe bearing capacity values in foundation design

6.3 presumptive bearing capacity values – code equation for computing bearing capacity (No derivation) - field plate load test

7.0 Settlement of Foundation

7.1 Settlement – definition – vertical pressure in soil beneath loaded areas – foundation settlement

7.2 Importance of bearing capacity and settlement in building foundations (qualitative treatment only)

8.0 Consolidation of Compressible Soils

8.1 Consolidation – definition- Terzaghi's model analogy of compression/ springs showing the process of consolidation – field implications

9.0 Compaction of Soils

9.1 Theory of compaction – compaction and its objectives – factors affecting compaction

9.2 Laboratory compaction tests – Proctor's compaction test – Modified Proctor compaction test

9.3 Field measurement of compaction by core cutter method and sand replacement method – California Bearing Ratio – definition and its importance in the design of pavements

REFERENCE BOOKS

1.	Soil mechanics and foundation engineering	Dr.B.C. Punmia
2.	Modern Geo technical Engineering	Alam Singh
3.	Soil Mechanics' (SI Version)	T. Willim Lambe and Robert V.Whitman
4.	Geo technical Engineering'	Dr. C. Venkatramaiah.

ADVANCED CIVIL ENGINEERING TECHNOLOGIES

Subject title : Advanced Civil Engineering Technologies

Subject code : C-505

Periods per week : 06

Periods per semester : 90

TIME SCHEDULE

S. No.	Major Topics	No. of Periods	Weightage of marks	Short Type	Essay Type
1.	Smart Technologies	20	16	2	1
2.	Electronic Surveying Instruments	10	13	1	1
3.	Pre stressed Concrete	15	23	1	2
4	Advanced methods in Earth retaining structures	15	16	2	1
5	Pre fabricated building technology	12	16	2	1
6	Earth quake resistant Structures	9	13	1	1
7	Solar energy utilization in buildings	9	13	1	1
	Total	90	110	10	08

OBJECTIVES: Upon completion of the subject the student shall be able to

1. **Knows the Smart Technologies**

1.1 Understand the overview of Internet of Things(IoT)

- 1.1.1 Define the term IoT
- 1.1.2 State the working principle of IoT.
- 1.1.3 List the key features of IoT
- 1.1.4 List the components of IoT (hardware, software, technology and protocols)
- 1.1.5 List the advantages and disadvantages of IoT

1.2 Understand the applications of IoTin various fields of engineering

- 1.2.1 Mention the application of IoT in Smart Cities
- 1.2.2 State the application of IoT in Smart Energy and the Smart Grid
- 1.2.3 Mention the application of IoT in Smart Transportation and Mobility
- 1.2.4 State the application of IoT in Smart Home, Smart Buildings and Infrastructure
- 1.2.5 Mention the application of IoT in Smart Factory and Smart Manufacturing
- 1.2.6 Mention the application of IoT in Smart Health
- 1.2.7 Mention the application of IoT in Food and Water Tracking and Security
- 1.2.8 Mention the application of IoT in Social Networks

2.0 Understand the principles and uses of Electronic Surveying instruments

2.1 List the modern surveying instruments
2.2 Explain the principle and uses of EDM
2.3 Explain the features of electronic theodolite and distomat
2.4 State the uses of electronic theodolite and distomat
2.5 Define GPS
2.6 Explain the working principle of GPS
2.7 Explain the segments of GPS
2.8 Enumerate the types of GPS receivers
2.9 Explain the method of taking coordinates of various points using GPS
2.10 List the applications of GPS in civil Engineering
2.11 List merits and demerits of GPS
2.12 Define GIS
2.13 State the components of GIS
2.14 List the types of data used in GIS
2.15 Explain the data used in GIS
2.16 Define map
2.17 List the types of map projections
2.18 List the uses and applications of GIS in civil Engineering

3.0 Understand the Pre stressed concrete

3.1 Understand fundamental principles of prestressed concrete, systems and types of Prestressing,merits and demerits
3.2 State the materials and permissible stresses
3.3 List the losses of prestress
3.4 Explain the methods of 1. Pre stressing and 2. Pretensioning system 3.Post-tensioning systems

4.0 Advanced methods in Earth retaining structures

4.1 Understand the concepts of advanced earth retaining structures
4.2 list the advantages of advanced earth retaining structures
4.3 List and explain the methods of advanced earth retaining structures – reinforced anchored earth wall – geogrids – geomats

5.0 Pre fabricated building technology

5.1 State alternatives for cast in-situ structures
5.2 Understand pre fabrication technology
5.3 State Importance for standardisation and modularisation
5.4 State the pre fabricated structures – explain their utility
5.5 State advantages of the pre fabricated structures
5.6 State Materials used in pre fabricated elements and explain their suitability for various climatic conditions
5.7 Explain types of pre fabricated systems – large panel systems - frame systems – slab / column systems with walls – mixed systems

6.0 Understand Earth quake resistant structures

6.1 List causes of seismic waves, basic terminology
6.2 Explain 1. Magnitude, 2. Intensity and 3. Energy release
6.3 Characteristics of earthquake
6.4 Understand basic terminology of Earthquake

6.5 Explain seismic zoning
6.6 Explain seismic resistant construction with brick/stone masonry buildings as per IScode provisions
6.7 Understand seismic resistant construction and detailing of R.C. buildings as per code provisions

7.0 Understand the concept of solar energy utilization in buildings

7.1 Explain the active and passive concepts in heating and cooling
7.2 List the various solar energy utilities like solar water heaters, solar air heaters, solar cookers , lighting and water pump sets and solar PV panels

COURSE CONTENT

1. Smart Technologies :

Overview of IoT - Define IoT, how IoT work, key features of IoT, components of IoT : hardware, software, technology and protocols, advantages and disadvantages of IoT - IoT Applications - Smart Cities, Smart Energy and the Smart Grid, Smart Transportation and Mobility, Smart Home, Smart Buildings and Infrastructure, Smart Factory and Smart Manufacturing, Smart Health, Food and Water Tracking and Security, Participatory Sensing, Social Networks

2. Electronic Survey instruments and GPS and GIS

2.1 Principle and uses of EDM – Electronic theodolite and distomat, features – uses
2.2 Global positioning system (G.P.S) – principle – segments – space, control and user segments – receivers – observation and data processing - applications in Civil Engineering – advantages and disadvantages of GPS
2.3 Geographical Information System (GIS) – definition – components – Map – Map projections – types data used – use and application of GIS in Civil Engineering.

3. Prestressed Concrete

3.1 Introduction – Basic principles – Systems of prestressing – Types of prestressing Advantages and Disadvantages.
3.2 Requirements of steel and concrete for prestressed concrete.
3.3 Losses of Prestress.
3.4 Tensioning devices – Method of Prestressing – Pretensioning system – Post tensioning systems – Freyssinet, Magnel-Blaton, Gifford Udal and LeeMcal Systems.

4 Advanced methods in Earth retaining structures

4.1 Concept of advanced earth retaining structures
4.2 Advantages of advanced earth retaining structures
4.3 Methods of advanced earth retaining structures –
Reinforced anchored earth wall
geogrids
geomats

4 Pre fabricated building technology

5.1 Alternatives for cast in-situ structures - Understand pre fabrication technology - Importance for standardisation and modularisation – pre fabricated structures their utility & advantages
5.2 Materials used in pre fabricated elements – suitability for various climatic conditions

5.3 Types of pre fabricated systems – large panel systems - frame systems – slab / column systems with walls – mixed systems

6 Earth quake resistant structures

6.1 Causes of seismic waves – Magnitude, intensity and energy release – basic terminology – Characteristics of earthquake – seismic zoning

6.2 Seismic resistant construction of brick and stone masonry buildings – Provisions of I S : 4326

6.3 Seismic resistant construction of R.C. Buildings – Detailing as per Provisions of I S : 13920

7 Solar Energy Utilization in Building

7.1 Active - Passive concepts of solar Heating and cooling

7.2 Solar energy utilities – water heaters, air heaters, cookers, lighting and water pump sets.

7.3 Roof top Solar power generation systems

REFERENCE BOOKS

1. Fundamentals of Geotechnical Engineering By Braja M.Das
2. Prestressed Concrete By N Krishna Raju, Mc Graw Hill, New Delhi.
3. CBRI Building materials and components.
4. NPTEL Lecture 31, Reinforced Soil Retaining walls-Design and Construction Prof. Sivakumar Babu, IISc, Bangalore.
5. Prefab Architecture, a guide to modular design & construction Ryan E Smith, John Wiley Publishers.
6. Earthquake resistant design of structures By Shashikant K.Duggal.
7. Earthquake disaster reduction: Masonry Buildings Design and Construction By Anand Swarup Arya.

CIVIL ENGINEERING DRAWING III

Subject Title : **Civil Engineering Drawing - III**

Subject Code : **C - 506**

Periods/Week : **04**

Periods/semester : **60**

TIME SCHEDULE

S.No	Major Topics	No. of Periods	Weightage of Marks	Short Type	Essay Type
1.	Culverts	10	25+12	1	01 (25marks)
2.	Bridges	10		1	
3.	Public health engineering drawings	18		1	
4.	Irrigation drawings	22	23	2	01 (15marks)
	Total	60	60	05	02

Note: All questions are to be answered. Part-A 5x4=20marks & Part-B 25+15 =40marks

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Draw different views of culverts.

1.1 Draws the plan, cross sectional elevation and longitudinal sectional elevation of pipe culvert, R.C.C –slab culvert and identifies the component parts from the given set of specifications.

2.0. Draws different views of T. Beam bridge

2.1 Labels the component parts of a given R.C.C. T-beam bridge.

2.2 Draws the sectional elevation, plan and cross section of Two span R.C.C T-beam bridges from the set of given specifications.

3.0 Draws the component parts of Public health Engineering works

3.1 Draws the sectional elevation, plan and cross section of public health Engineering works.

3.2 Draw the plan of water supply and drainage connections in a residential building

4.0 Draws the different views of irrigation Engineering structures

4.1 Draws the sectional elevation, plan and cross section of different Irrigation Engineering structures.

COURSE CONTENT

1.0 Simple Culvert.

Draw the plan, cross-sectional elevation and longitudinal sectional elevation of

1.1 Pipe culvert (Single Pipe)

1.2. R.C.C slab culvert with square returns.

1.3. R.C.C slab culvert with splayed wings

2.0 Bridges.

2.1 Two-Span R.C.C T-beam bridge with square return walls.
2.2 Two-Span R.C.C T-beam bridge with splayed wing walls and Returns walls.

3.0 Public health engineering drawings.

3.1 Sanitory block of a large building showing internal water supply and sanitary fittings and plumbing fixtures (Plan & Section across each unit)

3.2 Water supply and Sanitary connections to a residential building.
3.3 Septic tank with details of connection to a dispersion trench/soak pit
3.4 R.C.C overhead square tank.(four columns with accessories).

4.0 Irrigation engineering drawings

4.1 Earthen bunds –
a) Homogeneous b) Non Homogeneous (Zoned embankment)

4.2 Tank surplus weir with splayed wing walls.
4.3 Canal drop (notch type)
4.4 Tank sluice with tower head.
4.5 Canal regulator

REFERENCE:

1. Civil Engineering Drawing by A. Kamala.
2. Civil Engineering Drawing by Chakraborthy.

CAD PRACTICE – II

Subject Title : **CAD PRACTICE - II**

Subject Code : **C-507**

Periods/Week : **06**

Periods/semester : **90**

TIME SCHEDULE

S. No.	Major Topics	No. of Periods
1.	Culverts and Bridges	24
2.	Public health engineering drawings	24
3.	Irrigation engineering drawings	24
4.	Estimates of Quantities of building components using MS Excel	12
5.	Study of software packages for civil engineering	06
	Total	90

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Draws different views of culverts and bridges

1.1 Draws the plan,cross sectional elevation and longitudinal sectional elevation of pipe culverts, R.C.C.- slab culvert and identifies the component parts from the given set of specifications.

1.2 Draws the sectional elevation, plan and cross section of two span R.C.C. T-beam bridges from the given set of specifications.

2.0 Draws the Components of Public health engineering works

2.1 Draws the sectional elevation, plan and cross-section of public health engineering works.

2.2 Draw the Layout of water supply and drainage connections in residential buildings.

3.0 Draws the different views of irrigation engineering structures

3.1 Draw the sectional elevation, plan and cross section of different irrigation structures.

4.0 Practice exercises on Ms-excel- Reports with MS-Word.

5.0 Knows about different packages available for Analysis, Design, Drafting, Estimation packages.

COURSE CONTENT

1.0 Preparation of Plan,cross sectional elevation and longitudinal sectional elevation of

1.1 Pipe Culvert (Single Pipe)

1.2 R.C.C. slab culvert with square returns

1.3 Two-span R.C.C. T-beam bridge with square walls.

2.0 Preparation of Layouts of water supply & Sanitary lines in buildings

2.1 Sanitary block of a large building showing internal water supply and sanitary fittings and plumbing fixtures (Plan & Section across each unit)

2.2 Water supply & sanitary connections to a residential building

2.3 Septic tank with details of connection to a residential building.

2.4 R.C.C overhead square tank(four columns with accessories).

3.0 Preparation of Plan,cross sectional elevation and longitudinal sectional elevation Of

3.1 Earthen bunds –

a) Homogeneous b) Non Homogeneous (Zoned embankment)

3.2 Tank surplus weir with splayed wing walls

3.3 Canal drop (notch type)

3.4 Tank sluice with tower head.

3.5 Canal regulator.

4.0 Computer application by using MS Word & MS Excel

4.1 Test report of the building materials using MS-Word.

4.2 Complete estimation of a residential building using MS-Excel involving linkage of cells in different sheets viz., Lead statement, Data sheet, detailed . estimation and Abstract estimation

5.0 Study of Packages available for Analysis, Design, Drafting and Estimation.

5.1 Analysis – Staad pro, SCADS, Ansys, GT Studl, E-Tab, ASAP.

5.2 Design – Staad pro, STRUDS etc.,

5.3 Drafting – Auto CAD, Intelli CAD, Architectural CAD etc.,

LIFE SKILLS

Subject Title : Life Skills
Subject Code : C-508
Scheme : C-16
Periods/ Week : 03
Periods/Semester : 45

TIME SCHEDULE

Sl No.	UNITS	No. of periods Allotted		
		Explanation	Activities	Total
1.	ATTITUDE	1	3	4
2.	ADAPTABILITY	1	3	4
3.	GOAL SETTING	1	3	4
4.	MOTIVATION	1	3	4
5.	TIME MANAGEMENT	1	3	4
6.	CRITICAL THINKING	2	3	5
7.	CREATIVITY	1	3	4
8.	PROBLEM SOLVING	1	3	4
9.	TEAM WORK	1	3	4
10.	LEADERSHIP	1	3	4
11.	STRESS MANAGEMENT	1	3	4
TOTAL		12	33	45

Note: No Written Examination; The total 45 hours are to be considered as Theory hours.

Marks: Internal – 40; External – 60

OBJECTIVES

Upon the completion of this subject the student shall be able to

1.0 Understand the concept of Attitude

1.1 Define 'Attitude'

1.2 Explain the importance of Attitude

1.3 Distinguish between Positive and Negative Attitudes

1.4 Life Response: Need for change of Attitude

1.5 Positive Attitude: Key to success in Personal and Professional Lives

2.0 Understand the concept of Adaptability

2.1 Define the term 'Adaptability'

2.2 Explain the concept of Adaptability

2.3 Advantages of Adaptability

2.4 Disadvantages of Lack of Adaptability

2.5 Need for positive response to change

3.0 Understand the concept of Goal setting

3.1 Define the terms 'Goal' and 'Goal Setting'

3.2 Explain the significance of Goal setting & Long and Short term goals

3.3 Explain the following concepts

a) Wish b) Dream c) Goal

3.4 Explain the reasons for and consequences of not setting goals

3.5 The SMART features in Goal setting

4.0 Understand the concept of Motivation

4.1 Define 'Motivation' ; Inspiration Vs Motivation

4.2 Importance of motivation in Goal setting

4.3 Distinguish between Internal (Self) Motivation and External Motivation

4.4 De-motivating Factors and how to overcome them

4.5 Motivating oneself and others

5.0 Understand Time Management skills

5.1 Define 'Time Management'

5.2 Comprehend the significance of Time Management

5.3 Explain the Time Quadrant

5.4 Common Time wasters and how to overcome them.

5.5 How to meet deadlines and targets within time

6.0 Understand Critical Thinking

6.1 Define "Critical Thinking"

6.2 Understand the importance of Critical Thinking

6.3 Distinguish between facts and opinions (assumptions)

6.4 Inculcating different perspectives

6.5 Developing Reasoning abilities and form sound judgements

7.0 Understand Creativity

7.1 Understand the importance of and need for creative ideas

7.2 Distinguish between Linear Thinking and Lateral Thinking

7.3 Distinctive qualities of creative people

7.4 Unusual or creative use of familiar objects

7.5 Creative ways of solving problems

8.0 Understand Problem Solving

8.1. Define the concept of Problem solving

8.2 Viewing the problems as challenges

8.3 Different steps in solving a problem

8.4 Selecting the best solution to solve a problem

8.5 Lateral thinking in Problem solving

9.0 Understand Team Work

9.1 Define Team work

9.2 Develop Team skills

9.3 Advantages of team work

9.4 Understand responsibilities as a team player

9.5 Problems of working in a team and possible solutions

10. 0 Understand Leadership

10.1 Define Leadership

10.2 Identify Leadership qualities

10.3 Analyze one's strengths and limitations as a leader

10.4 Types of Leadership: Autocratic and Democratic

10.5 Leadership by example

11.0 Understand Stress Management

11.1 Define Stress

11.2 Explain the causes of stress

11.3 Learn Stress Management skills

11.4 Need for positive thinking and self esteem

11.5 Practice Stress Management strategies

CIVIL ENGINEERING WORK SHOP

Subject title : CIVIL ENGINEERING WORKSHOP

Subject code : C-509

Periods per week : 03

Periods per semester : 45

TIME SCHEDULE

Sl. No.	Major Topic	No. of periods
1	Carpentry	6
2	Bar Bending of steel reinforcement	12
3	Plumbing exercises	12
4	Electrical Exercises	12
5	Demonstration of modern surveying instruments	3
Total		45

OBJECTIVES: Upon completion of the subject the student shall be able to

1.0 Understand the elements of carpentry in connection with the erection of scaffolding and form work with a particular reference to use of braces

1.1 Study of Carpentry tools
1.2 State various components of scaffolding
1.3 State precautions to be taken while erecting scaffolding
1.4 Explain the method of fixing various elements of scaffolding
1.5 State precautions to be taken to fix the various elements of scaffolding at required position
1.6 Connect various elements of scaffolding
1.7 Explain various aspects of form work to be considered while fixing various elements
1.8 Explain the method of fixing of form work at required position for various elements of building construction
1.9 Connect various elements of formwork

2.0 Understand the skills of bending of reinforcing bars as per the bar bending schedule.

2.1 Identify various tools used for bending of reinforcing bars
2.2 Read the data required from bar bending schedule for bending of bars
2.3 Mark the salient points of location of bending on the bars as per the bar bending schedule

2.4 Bend the bars using the specified tools to the exact shape as per bar bending schedule as specified in IS-2502(Code of practice for bending and fixing of bars for concrete reinforcement)

2.5 Prepare the grills as per the drawings of the structural elements using binders, stirrups, links etc. appropriate to the element

3.0 Understand the elements of plumbing practice and procedure of fixing of various plumbing fixtures

3.1 Identify the different pipe specials and state their functions

3.2 Practice thread cutting on PVC/GI pipes

3.3 Assemble the pipe line for toilet block with taps, showers and wash basins using specific pipe specials

3.4 Fix the floor trap, gully trap and water closet of a house to the drainage pipes

4.0 Understand the various aspects of electrical installations used in buildings and their fixing at appropriate locations

4.1 Identity various electrical accessories, Wires and cables

a. Mains switch
b. MCB
c. Fuse
d. Switches (SPST SPDT)
e. Rotary switch
f .Push Button Switches
g. 2 pin Sockets
h. 3pin /Power sockets
i. Ceiling Rose
j. Lamp Holders
(a) Identify line, neutral and earth terminals in power sockets and power plugs by physical observation and using Tester
k. Use of test lamp

4.2 Identify different wires and cables

a. Know the wire gauge
b. Specifications of electrical wires
c. VIR, PVC, TRS wires
d. Flexible wires and cables
e. Power cords

4.3 Study of earthling and earth pit

4.4 Study of different wiring systems

(a) Open conduit system
(b) Concealed conduit system

4.5 Use of Digital Multimeter to

a. Identify the Range selector

b. Selection of appropriate range to measure

i. AC Voltage
ii. DC Voltage (Battery)
iii. AC Current (Through a lamp/heater)
iv. Check continuity
v. Resistance

4.6 Connect a fuse in the main circuit

a. Know the metals suitable for fuse wire

b. Selecting a correct fuse wire rating for a given electrical load

4.7 Connect a low current (3A) MCB in the circuit and testing

4.8 Control the lamp using a switch

4.9 Control the fan with a switch and regulator

4.10 Connect a i) 2-pin socket ii) 2-pin socket with switch control

4.11 Control one lamp with 2 switches (Staircase wiring)

4.12 Know Power consumption of various Appliances like

1. Tungsten Lamp
2. CFL Lamp
3. Fan
4. Fluorescent lamps (Tube Lights)
5. Air cooler
6. Water heater
7. Geiser
8. Electric Iron

4.13 Estimate the total connected load

4.14 Study of inverter/UPS wiring

4.15 Electrical estimation and costing

4.16 Study of 3-phase system

5.0 Demonstration of modern surveying instruments like Electronic theodelite, EDM and the concept of GIS, GPS

COURSE CONTENT

1. Carpentry

a. Tools used in carpentry
b. Erection of Scaffolding Material
c. Position of Shuttering
d. Fixing of form work.

2. Bar Bending of steel reinforcement

Preparation of bar bending schedule

(a) Bar bending according to given bar bending schedule
(b) Method of bar bending for Earthquake resistant structures
(c) Field visit to automated bar bending

3. Plumbing exercises

a. Thread cutting on GI/PVC pipes
b. Assembling of pipe lines for toilet with two taps, shower and wash basin
c. Fixing of floor traps, gully traps, water closet, drain pipes
d. Laying stoneware/PVC pipes and construction of inspection chambers

4. Electrical Exercises

i. Identity various electrical accessories
ii. Identify line, neutral and earth terminals in power sockets and power plugs
iii. Measure the AC voltage between line and neutral using DMM
iv. Study of earthing and earth pit
v. Study of different wiring systems
    1. Open conduit system
    2. Concealed conduit system
vi. Measurement of the following using DMM
    1. AC Voltage
    2. DC Voltage (Battery)
    3. AC Current (Through a lamp/heater)
    4. Check continuity
    5. Resistance
vii. Connecting a fuse in the main circuit
viii. Controlling the lamp using a switch
ix. Controlling the fan with a switch and regulator
x. Connect a i) 2-pin socket ii) 2-pin socket with switch control
xi. Control one lamp with 2 switches (Staircase wiring)
xii. Study of inverter/UPS wiring
xiii. Electrical estimation and costing
xiv. Study of 3-phase system

5. Demonstration of modern surveying instruments like Electronic theodelite, EDM and the concept of GIS, GPS

VI SEMESTER

C-601 INDUSTRIAL TRAINING
(Practical Training)

VI SEMESTER

Scheme of evaluation:

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 iii) Log Book iv) Report	 30 30	
			4. Seminar	40	
Total :				**300**	

The industrial training shall carry 300 marks and pass marks are 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%attendence.

DIPLOMA IN CIVIL ENGINEERING (C-16)

VI SEMESTER

(INDUSTRIAL TRAINING)

Duration: 6 months

OBJECTIVES

Upon completion of practical training in an industry, the student will be able to

1.0 Know the organizational set up from top executive to workmen level
2.0 Know the aspects to be considered during preliminary projects in respect of Irrigation/Road/Rural water supply/Housing colony etc.,
3.0 Know the duties of different officers in the organization
4.0 Know about administrative sanction and technical sanction
5.0 Know various stages of construction
6.0 Knows inspection of form work, reinforcement grills etc.,
7.0 Know the methods of procurement of labour, material and equipment
8.0 Know tenders, contract and contract systems
9.0 Know the need & principles supervision of works
10.0 Know measurement book and muster roll
11.0 Know the preparation, checking and payment of bills
12.0 Know the requirements of a licensed surveyor/contractor/manufacturer of building material(s)

RULES AND REGULATIONS:

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 completes the industrial training

2. A candidate shall be assessed twice during the mid spell of industrial training and at the end of industrial training.
3. 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.
4. Each assessment should be as per the Assessment scheme listed

ASSESSMENT SCHEME

S. No.	Name of the Parameter	Max. Marks Allotted for each Parameter
1.	Attendance and punctuality	10
2.	General conduct during the period	10
3.	Ability to communicate & human relations	10
4.	Familiarity with materials, tools & machinery	10
5.	Attitude towards job	10
6.	Manual skills	10
7.	Comprehension & Observation	10
8.	Supervising ability	10
9.	Safety and Environmental consciousness	10
10.	Maintenance of dairy	10
	Total:	**100**

5. The remaining 100 marks are to be allotted as follows:

For maintenance of log book 30 marks

For the training report 30 marks,

For seminar / viva-voce 40 marks.

The assessment at the institute level (seminar / viva-voce) is to be done by the following three members individually and be averaged.

(1) Head of Section.
(2) External Examiner preferably from Industry
(3) Staff member who assessed the student during the Industrial Training.