# SRI RAMAKRISHNA MISSION VIDYALAYA
# POLYTECHNIC COLLEGE

(AN AUTONOMOUS & ISO 9001:2015 CERTIFIED INSTITUTION)

## REGULATIONS AND SYLLABUS

### [APPLICABLE TO STUDENTS ADMITTED FROM 2021 - 2022 ACADEMIC YEAR ONWARDS]
(R6 - SCHEME)

# DIPLOMA IN
# CIVIL ENGINEERING

# SRI RAMAKRISHNA MISSION VIDYALAYA POLYTECHNIC COLLEGE
( A N   A U T O N O M O U S   I N S T I T U T I O N )
## DEPARTMENT OF CIVIL ENGINEERING
# R6 - SCHEME
[Applicable to students admitted from 2021 - 2022 academic year onwards]

# R E G U L A T I O N S

### Description of the Course:
The Course for the full time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters. This curriculum for the diploma course is applicable for the candidates admitted from 2021 - 2022 academic year onwards.

### Eligibility for the Award of Diploma:
No candidate shall be eligible for the Diploma unless he has undergone the prescribed course of study in this College for a period of not less than three academic years when joined in first year and two years if joined under lateral entry scheme in the second year and passed the prescribed examination. The minimum and maximum period for completion of diploma course is as given below:

| Diploma Course | Minimum Period | Maximum Period |
|---|---|---|
| Full Time Regular | 3 Years | 6 Years |
| Full Time (Lateral Entry) | 2 Years | 5 Years |

**Age Limit:** No age limit

### Subjects of Study and Curriculum Outline:
The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical. The curriculum outline under R6-Scheme is given in Annexure - I.

### Autonomous Examination - Exam Pattern:
The Autonomous examinations for all the diploma courses are being conducted in the following pattern:

| Semester | Span of Study | Examination |
|---|---|---|
| I, III & V Sem | June - October | October |
| II, IV & VI Sem | December - April | April |

Autonomous Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester. The internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment and 75 marks are allotted for end semester external examinations.

### Continuous Internal Assessment:
### A. FOR THEORY SUBJECTS:
The internal assessment marks for a total of 25 marks, which are to be distributed as follows:

**i) Subject Attendance**                                                                 **05  Marks**
Award of marks for subject attendance to each subject Theory / Practical will be as per the range given below:

| | |
|---|---|
| 80%  -  83% | 1 mark |
| 84%  -  87% | 2 marks |
| 88%  -  91% | 3 marks |
| 92%  -  95% | 4 marks |
| 96%  -  100% | 5 marks |

**ii) Test** **10  Marks**

Two Tests each of 2 hours duration for a total of 50 marks are to be conducted. **05 marks**
Out of which the best one will be taken and the marks to be reduced to

The Test - III is to be the Model test of 3 hours duration for a total of 100 marks **05 marks**
covering all the five units and the question paper will be end semester
examination pattern. The marks obtained will be reduced to

**Total    10 marks**

| Test | Units | When to conduct | Marks | Duration |
|------|-------|-----------------|-------|----------|
| Test I | Unit - I & II | End of 6th week | 50 | 2 Hrs |
| Test II | Unit - III & IV | End of 12th week | 50 | 2 Hrs |
| Test III | Model  Examination: All the 5 units. (End sem. exam question pattern) | End of 16th week | 100 | 3 Hrs |

**iii) Assignment** **05 Marks**

For each subject three assignments are to be given each for 20 marks and the average marks scored should be reduced for 05 marks.

**iv) Seminar Presentation** **05 Marks**

The students have to select the topics either from the subjects or general subjects which will help to improve the grasping capacity as well as the capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present the seminar. (For Second Year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar individually).

The seminar presentation is mandatory for all theory subjects and carries 05 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2½ marks for the material submitted in writing and 2½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 05 marks.

All test papers, assignment papers and the seminar presentation written materials after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of end semester exam results.

**B. FOR PRACTICAL SUBJECTS:**

The internal assessment mark for a total of 25 marks which are to be distributed as follows:-

| | | | |
|---|---|---|---|
| a) | Attendance (Award of marks same as theory subjects) | 05 | Marks |
| b) | Procedure / observation and tabulation / Other practical related work | 10 | Marks |
| c) | Record writing | 10 | Marks |
| | | **TOTAL**  **25** | **Marks** |

➢ *All the experiments / exercises indicated in the syllabus should be completed and the same to be given for final semester examinations.*
➢ *The record for every exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 for each exercise as per the above allocation.*
➢ *At the end of the semester, the average marks of all the exercises should be calculated for 20 marks and the marks awarded for attendance is to be added to arrive at the internal assessment mark for practical. (20 + 5 = 25 marks)*
➢ *The students have to submit the duly signed bonafide record notebook / file during the end semester practical examinations.*
➢ *All the marks awarded for assignments, tests and attendance should be entered in the Personal Log Book of the staff, who is handling the subject. This is applicable to both theory and practical subjects.*

**Project Work and Internship:**

The students of all the branches have to do a project work in the final semester as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamil Nadu. The project work must be reviewed twice in the same semester. The project work is approved during the fifth semester by the properly constituted committee with guidelines. Proper record should be maintained for the two project reviews and preserved for one semester after the publication of end semester exams results.

### a) Internal assessment mark for Project Work & Internship:

| a) | Attendance (Award of marks same as theory pattern) | 05 | Marks |
|---|---|---|---|
| b) | Project Review - I | 10 | Marks |
| c) | Project Review - II | 10 | Marks |
| | TOTAL | **25** | **Marks** |

### b) Allocation of Marks for Project Work & Internship in Autonomous Examination:

| a) | Demonstration / Presentation | 25 | Marks |
|---|---|---|---|
| b) | Project Report | 25 | Marks |
| c) | Viva-Voce | 30 | Marks |
| d) | Internship Training Report | 20 | Marks |
| | TOTAL | **100** | **Marks** |

### c) Internship Report:

The internship training for a period of two weeks shall be undergone by every student at the end of IV / V semester during vacation. The certificate shall be produced along with the internship training report for evaluation. The evaluation of internship training shall be done along with final year "Project Work" for 20 marks. The internship shall be undertaken in any Industry / Government or Private certified agencies which are in Social Sector / Government Skill Centers / Institutions / Schemes. A neatly prepared PROJECT REPORT as per the format has to be submitted by the individual student during the end semester examination.

### END SEMESTER AUTONOMOUS EXAMINATIONS
### QUESTION PAPER PATTERN FOR FIRST YEAR SUBJECTS
*(General Question paper pattern for theory subjects, unless specified)*

**Time: 3 Hrs**            **Max. Marks: 100**

### PART – A (5 x 1 = 05 marks)

**Sl. No. : 1 to 5**
Five questions will be asked. 1 question from each unit. Answer all the FIVE questions. Each question carries 1 mark.

### PART – B (10 x 2 = 20 marks)

**Sl. No. : 6 to 20**
Fifteen questions will be asked. 3 questions from each unit. Answer any TEN questions. Each question carries 2 marks.

### PART – C (5 x 15 = 75 marks)

**Sl. No. : 21 to 25**
Five questions will be asked. 1 question from each unit. Each question carries 15 marks. In each question, answer either A or B. Questions A and B have two subdivisions (i) and (ii) carrying 8 marks and 7 marks.

### END SEMESTER AUTONOMOUS EXAMINATIONS
### QUESTION PAPER PATTERN FOR SECOND AND THIRD YEAR SUBJECTS
*(General Question paper pattern for theory subjects, unless specified)*

**Time: 3 Hrs**            *Max. Marks: 100*

### PART - A (10 x 3 = 30 marks)

**Sl. No. : 1 to 10**
Ten questions will be asked with at least two questions from each unit. All the Ten Questions are to be answered. Each question carries 3 marks.

## PART - B  (5 x 14 = 70 marks)

**Sl. No. : 11 to 15**

Five Questions will be asked with one question from each unit in *either - or* pattern. Students have to answer all the five questions. Each question carries 14 marks. (Based on the discretion of the question setter, he / she can ask two seven mark questions (with sub division (i) & sub division (ii)) instead of one 14 marks question, if required).

*Any tables required, should be mentioned in the question paper like Steam table, IS Code Book, Steel table, Design Data Book, Mollier chart, Psychometric Chart etc.,*

*Examination will be conducted for 100 marks and will be converted to 75 marks.

**Scheme of Examinations:**

The Scheme of examinations for subjects under R6-Scheme is given in Annexure - II.

**Requirements to appear for Examinations:**

A candidate will be permitted to appear for the end semester Autonomous Examinations, only if he secures a minimum of overall 80% attendance in the semester concerned and pay the required examination fees in time.

**Criteria for Pass:**

1.  No candidate shall be eligible for the award of Diploma unless he has undergone the prescribed course of study successfully and pass all the subjects prescribed in the curriculum.

2.  A candidate shall be declared to have passed the examination in a subject if he secures not less than 40% in theory subjects and 50% in practical subjects out of the total prescribed maximum marks including both the internal assessment and the end semester examinations marks put together, subject to the condition that he secures at least a minimum of 30 marks out of 75 marks in the theory examinations and a minimum of 35 marks out of 75 marks in the practical examinations.

**Condonation of Attendance:**

The minimum overall percentage of attendance required for a candidate to become eligible to write the Autonomous End Semester Examination is 80%. Under extraordinary circumstances, for genuine and valid reasons including medical reasons, the Principal may condone up to a maximum of 10% shortage to a candidate, subject to the condition that he satisfies all the other requirements to appear for the Autonomous Examinations.

Under no circumstances a candidate with attendance less than 70% shall be permitted to write the Autonomous Examinations. The condonement of 10% shortage shall not be done as a routine to all candidates, but only for genuine cases; it shall not be claimed as a matter of right by all candidates.

**Classification of successful candidates:**

Classification of candidates who will pass out the final examinations from April 2024 onwards (Joined in first year in 2021-2022) in R6-scheme is being done as specified below.

**First Class with Superlative Distinction:**

A candidate will be declared to have passed in *First Class with Superlative Distinction*, if he secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study of 3 / 2 years (3 years for regular entry / 2 years for lateral entry) without any break.

**First Class with Distinction:**

A candidate will be declared to have passed in *First Class with Distinction*, if he secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study of 3 / 2 years (3 years for regular entry / 2 years for lateral entry) without any break.

**First Class:**

A candidate will be declared to have passed in *First Class,* if he secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the

stipulated period of study 3 / 2 years (3 years for regular entry / 2 years for lateral entry) without any break.

**Second Class:**

All other successful candidates will be declared to have passed in *Second Class*.

**Duration of a period in the Class Time Table:**

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and lunch break in a day should be 7 hours corresponding to 7 periods of instruction (Theory & Practical).

**ANNEXURE - I**
**Subjects of Study and Curriculum Outline (R6 - Scheme)**

# FIRST SEMESTER

No. of weeks per semester: 16 weeks

| Subject Code | Subject | Hours per Week | | | |
|---|---|---|---|---|---|
| | | Theory | Drawing | Practical | Total |
| 6011 | Communicative English - I | 5 | | | 5 |
| 6012 | Engineering Mathematics - I | 5 | | | 5 |
| 6013 | Engineering Physics - I | 5 | | | 5 |
| 6014 | Engineering Chemistry - I | 5 | | | 5 |
| 6015 | Engineering Graphics - I | | 6 | | 6 |
| 6016 | Engineering Physics Practical - I | | | 2 | 2 |
| 6017 | Engineering Chemistry Practical - I | | | 2 | 2 |
| 6018 | Workshop Practical - I | | | 3 | 3 |
| 6001 | Communication Skill Practical | | | 2 | 2 |
| | **TOTAL** | **20** | **6** | **9** | **35** |

**Extra / Co-curricular Activities:**

| Sub. Code | Subject | Hrs / Week |
|---|---|---|
| 6003 | Physical Education | 2 |
| 6004 | Library | 1 |
| 6005 | Value Education | 1 |

# SECOND SEMESTER

No. of weeks per semester: 16 weeks

| Subject Code | Subject | Hours per Week | | | |
|---|---|---|---|---|---|
| | | Theory | Drawing | Practical | Total |
| 6021 | Communicative English - II | 4 | | | 4 |
| 6022 | Engineering Mathematics - II | 5 | | | 5 |
| 6023 | Engineering Physics - II | 5 | | | 5 |
| 6024 | Engineering Chemistry - II | 5 | | | 5 |
| 6025 | Engineering Graphics - II | | 5 | | 5 |
| 6026 | Engineering Physics Practical - II | | | 2 | 2 |
| 6027 | Engineering Chemistry Practical - II | | | 2 | 2 |
| 6028 | Basics of Industries and Workshop Practical - II | 2 | | 3 | 5 |
| 6002 | Computer Applications Practical | | | 2 | 2 |
| | **TOTAL** | **21** | **5** | **9** | **35** |

**Extra / Co-curricular Activities:**

| Sub. Code | Subject | Hrs / Week |
|---|---|---|
| 6003 | Physical Education | 2 |
| 6004 | Library | 1 |
| 6005 | Value Education | 1 |

# THIRD SEMESTER

No. of weeks per semester: 16 weeks

| SUB. CODE | SUBJECT | HOURS PER WEEK | | | |
|---|---|---|---|---|---|
| | | Theory | Drawing | Practical | Total |
| 6131 | Engineering Mechanics | 6 | - | - | 6 |
| 6132 | Construction Materials & Const. Practice | 5 | - | - | 5 |
| 6133 | Surveying | 6 | - | - | 6 |
| 6134 | Building Planning and Drawing | - | 6 | - | 6 |
| 6135 | Civil Engineering Drawing & CAD Practical-I | - | - | 4 | 4 |
| 6136 | Material Testing Practical- I | - | - | 4 | 4 |
| 6137 | Surveying Practice - I | - | - | 4 | 4 |
| | TOTAL | 17 | 06 | 12 | 35 |

**Extra / Co-curricular Activities:**

| SUB. CODE | SUBJECT | HRS / WEEK |
|---|---|---|
| 6003 | Physical Education | 2 |
| 6004 | Library | 1 |
| 6005 | Value Education | 1 |

# FOURTH SEMESTER

No. of weeks per semester: 16 weeks

| SUB. CODE | SUBJECT | HOURS PER WEEK | | | |
|---|---|---|---|---|---|
| | | Theory | Drawing | Practical | Total |
| 6141 | Theory of Structures | 7 | - | - | 7 |
| 6142 | Hydraulics | 6 | - | - | 6 |
| 6143 | Transportation Engineering | 6 | - | - | 6 |
| 6144 | Hydraulics Practical | - | - | 4 | 4 |
| 6145 | Material Testing Practical - II | - | - | 4 | 4 |
| 6146 | Construction Practice Practical | - | - | 4 | 4 |
| 6147 | Surveying Practice - II | - | - | 4 | 4 |
| | TOTAL | 19 | - | 16 | 35 |

**Extra / Co-curricular Activities:**

| SUB. CODE | SUBJECT | HRS / WEEK |
|---|---|---|
| 6003 | Physical Education | 2 |
| 6004 | Library | 1 |
| 6005 | Value Education | 1 |

# FIFTH SEMESTER

No. of weeks per semester: 16 weeks

| SUB. CODE | SUBJECT | HOURS PER WEEK | | | |
|---|---|---|---|---|---|
| | | Theory | Drawing | Practical | Total |
| 6151 | Structural Engineering | 6 | - | - | 6 |
| 6152 | Estimation, Costing and Valuation | 6 | - | - | 6 |
| 6153.1 | Advanced Construction Technology | | | | |
| 6153.2 | Remote Sensing and Geo-Informatics | 5 | - | - | 5 |
| 6153.3 | Geotechnical Engineering | | | | |
| 6154 | Civil Engineering Drawing and CAD Practical-II | - | - | 6 | 6 |
| 6155 | Computer Applications in Civil Engg. Practice | - | - | 4 | 4 |
| 6156.1 | Concrete Technology Practical | | | | |
| 6156.2 | Advanced Surveying and Basic GIS Practical | - | - | 4 | 4 |
| 6156.3 | Geotechnical Engineering Practical | | | | |
| 6157 | Entrepreneurship & Startups | - | - | 4 | 4 |
| | TOTAL | 17 | - | 18 | 35 |

**Extra / Co-curricular Activities:**

| SUB. CODE | SUBJECT | HRS / WEEK |
|---|---|---|
| 6003 | Physical Education | 2 |
| 6004 | Library | 1 |

# SIXTH SEMESTER

No. of weeks per semester: 16 weeks

| SUB. CODE | SUBJECT | HOURS PER WEEK | | | |
|---|---|---|---|---|---|
| | | Theory | Drawing | Practical | Total |
| 6161 | Construction Management | 6 | - | - | 6 |
| 6162 | Environmental Engg. and Pollution Control | 6 | - | - | 6 |
| 6163.1 | Earthquake Engineering | | | | |
| 6163.2 | Urban Planning and Development | 5 | - | - | 5 |
| 6163.3 | Water Resources Engineering | | | | |
| 6164 | Environmental Engineering Practical | - | - | 6 | 6 |
| 6165.1 | Structural Engineering Practical | | | | |
| 6165.2 | Estimation and Costing Practical | - | - | 6 | 6 |
| 6165.3 | Highway Engineering Practical | | | | |
| 6166 | Project Work and Internship | - | - | 6 | 6 |
| | **TOTAL** | **17** | **-** | **18** | **35** |

**Extra / Co-curricular Activities:**

| SUB. CODE | SUBJECT | HRS / WEEK |
|---|---|---|
| 6003 | Physical Education | 2 |
| 6004 | Library | 1 |

## ANNEXURE - II
## SCHEME OF EXAMINATIONS

| FIRST SEMESTER | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sub. Code | Name of the Subject | Periods / Week | Periods / Semester | Duration | Scheme of Examination | | | | |
| | | | | | Allocation of Marks | | | | |
| | | | | | Internal | External | | Total | Minimum |
| 6011 | Communicative English - I | 5 | 80 | 3 | 25 | 75 | | 100 | 40 |
| 6012 | Engineering Mathematics - I | 5 | 80 | 3 | 25 | 75 | | 100 | 40 |
| 6013 | Engineering Physics - I | 5 | 80 | 3 | 25 | 75 | | 100 | 40 |
| 6014 | Engineering Chemistry - I | 5 | 80 | 3 | 25 | 75 | | 100 | 40 |
| 6015 | Engineering Graphics - I | 6 | 96 | 3 | 25 | 75 | | 100 | 40 |
| 6016 | Engineering Physics Practical - I | 2 | 32 | 3 | 25 | 75 | | 100 | 50 |
| 6017 | Engineering Chemistry Practical - I | 2 | 32 | 3 | 25 | 75 | | 100 | 50 |
| 6018 | Workshop Practical - I | 3 | 45 | 3 | 25 | 75 | | 100 | 50 |
| 6001 | Communication Skill Practical | 2 | 32 | 3 | 25 | 75 | | 100 | 50 |
| **SECOND SEMESTER** | | | | | | | | | |
| 6021 | Communicative English - II | 4 | 64 | 3 | 25 | 75 | | 100 | 40 |
| 6022 | Engineering Mathematics - II | 5 | 80 | 3 | 25 | 75 | | 100 | 40 |
| 6023 | Engineering Physics - II | 5 | 80 | 3 | 25 | 75 | | 100 | 40 |
| 6024 | Engineering Chemistry - II | 5 | 80 | 3 | 25 | 75 | | 100 | 40 |
| 6025 | Engineering Graphics - II | 5 | 80 | 3 | 25 | 75 | | 100 | 40 |
| 6026 | Engineering Physics Practical - II | 2 | 32 | 3 | 25 | 75 | | 100 | 50 |
| 6027 | Engineering Chemistry Practical - II | 2 | 32 | 3 | 25 | 75 | | 100 | 50 |
| 6028 | Basics of Industries and Workshop Practical - II | 5 | 80 | 3 | 25 | 75 | | 100 | 50 |
| 6002 | Computer Applications Practical | 2 | 32 | 3 | 25 | 75 | | 100 | 50 |

## THIRD SEMESTER

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6131 | Engineering Mechanics | 6 | 96 | 3 | 25 | 75 | 100 | 40 |
| 6132 | Construction Materials and Const. Practice | 5 | 80 | 3 | 25 | 75 | 100 | 40 |
| 6133 | Surveying | 6 | 96 | 3 | 25 | 75 | 100 | 40 |
| 6134 | Building Planning and Drawing | 6 | 96 | 3 | 25 | 75 | 100 | 50 |
| 6135 | Civil Engineering Drawing & CAD Practical - I | 4 | 64 | 3 | 25 | 75 | 100 | 50 |
| 6136 | Material Testing Practical- I | 4 | 64 | 3 | 25 | 75 | 100 | 50 |
| 6137 | Surveying Practice - I | 4 | 64 | 3 | 25 | 75 | 100 | 50 |

## FOURTH SEMESTER

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6141 | Theory of Structures | 7 | 112 | 3 | 25 | 75 | 100 | 40 |
| 6142 | Hydraulics | 6 | 96 | 3 | 25 | 75 | 100 | 40 |
| 6143 | Transportation Engineering | 6 | 96 | 3 | 25 | 75 | 100 | 40 |
| 6144 | Hydraulics Practical | 4 | 64 | 3 | 25 | 75 | 100 | 50 |
| 6145 | Material Testing Practical - II | 4 | 64 | 3 | 25 | 75 | 100 | 50 |
| 6146 | Construction Practice Practical | 4 | 64 | 3 | 25 | 75 | 100 | 50 |
| 6147 | Surveying Practice - II | 4 | 64 | 3 | 25 | 75 | 100 | 50 |

## FIFTH SEMESTER

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6151 | Structural Engineering | 6 | 96 | 3 | 25 | 75 | 100 | 40 |
| 6152 | Estimation, Costing and Valuation | 6 | 96 | 3 | 25 | 75 | 100 | 40 |
| 6153.1 | Advanced Construction Technology | | | | | | | |
| 6153.2 | Remote Sensing and Geo informatics | 5 | 80 | 3 | 25 | 75 | 100 | 40 |
| 6153.3 | Geo Technical Engineering | | | | | | | |
| 6154 | Civil Engineering Drawing & CAD Practical - II | 6 | 96 | 3 | 25 | 75 | 100 | 50 |
| 6155 | Computer Applications in Civil Engg. Practice | 4 | 64 | 3 | 25 | 75 | 100 | 50 |
| 6156.1 | Concrete Technology Practical | | | | | | | |
| 6156.2 | Advanced Surveying & Basic GIS Practical | 4 | 64 | 3 | 25 | 75 | 100 | 50 |
| 6156.3 | Geotechnical Engineering Practical | | | | | | | |
| 6157 | Entrepreneurship and Startups | 4 | 64 | 3 | 25 | 75 | 100 | 50 |

## SIXTH SEMESTER

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6161 | Construction Management | 6 | 96 | 3 | 25 | 75 | 100 | 40 |
| 6162 | Environmental Engineering and Pollution Control | 6 | 96 | 3 | 25 | 75 | 100 | 40 |
| 6163.1 | Earthquake Engineering | | | | | | | |
| 6163.2 | Urban Planning and Development | 5 | 80 | 3 | 25 | 75 | 100 | 40 |
| 6163.3 | Water Resources Engineering | | | | | | | |
| 6164 | Environmental Engineering Practical | 6 | 96 | 3 | 25 | 75 | 100 | 50 |
| 6165.1 | Structural Engineering Practical | | | | | | | |
| 6165.2 | Estimation and Costing Practical | 6 | 96 | 3 | 25 | 75 | 100 | 50 |
| 6165.3 | Highway Engineering Practical | | | | | | | |
| 6166 | Project Work and Internship | 6 | 96 | 3 | 25 | 75 | 100 | 50 |

# FIRST SEMESTER
## 6011 COMMUNICATIVE ENGLISH - I

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| **6011 COMMUNICATIVE ENGLISH - I** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | | **Duration** |
| | 5 Hrs | 80 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | | |
| | | | 25 | 100 | 100 | | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|---|---|---|
| I | **Functional Grammar and Usage**<br>Parts of SpeechFunctional Units<br>Use of Main Verb & Auxiliary Verb<br>Application of Tense Forms (Simple Present, Present Continuous, Present Perfect, Simple Past, Past Continuous, Past Perfect, Simple Future, Future Continuous only)<br>Framing Yes / No QuestionsFraming Wh-Questions<br>Application of Active Voice and Passive Voice<br>Use of Prepositions<br>Articles | 17 |
| II | **Vocabulary Enrichment**<br>Synonyms and Antonyms<br>Word Conversion (selective 25 words)<br>Collocation – Noun with Verb, Adjective with Noun (Selective 25 Collocations)<br>Homophones (selective 25 homophones)One-word Substitution (Textual)<br>Idiomatic expressions for Daily Life (frequently used 25 expressions)<br>Frequently Used Phrasal verbs (selective 25 Phrasal verbs) | 15 |
| III | **Situational English**<br>Dialogue for Day to Day Situations Short Messages for e-Communication<br>Letter Writing for Academic Purpose (Leave Application, Requisition for Bonafide Certificate, Applying for TC)<br>Writing the Essentials<br>Comprehension<br>Framing questions based on the given situation | 15 |
| IV | **Creative English**<br>Review Writing (Book / Movie / TV Program)Visual Description<br>Advertisement Writing Word Cloud<br>Transforming Verbal Passage into Graphics | 15 |
| V | **English for Scholarly Presentation/ Fluency**<br>"A Snake in the Grass" by R.K. Narayan "Of Parents and Children" by Francis Bacon"On His Blindness" by John Milton<br>"When I Have Fears" by John Keats | 11 |

**Reference Books:**

## Glossaries

https://www.engineering-dictionary.com/ https://techterms.com/definition/ http://dictionary.tamilcube.com/
https://www.lexilogos.com/english/tamil_dictionary.htm

## Grammar

1. Just Enough English Grammar Illustrated, Gabriele Stobbe, McGraw-HillOsborne Media, 2008
2. Visual Guide to Grammar and Punctuation, DK Publishing, 2017
3. English Grammar in Use, Raymond Murphy, Cambridge University Press, 2019
4. Intermediate English Grammar, Raymond Murphy, Cambridge University Press,Second Edition.
5. Essential English Grammar, Raymond Murphy, Cambridge University Press,New edition.

### Enrichment of Study

1. Enrich Your Vocabulary: Vocabulary for General, Placement & Competitive Exams by Edin Brow

### Motivation

1. An Autobiography; Or, The Story of My Experiments with Truth, Mahatma Gandhi, Penguin Books, 2001
2. You Can Win, Shiv Khera, New Dawn Press, 2004
3. Chicken Soup for the Soul, Jack Canfield, Mark Victor Hansen, 2001
4. How to Win Friends and Influence People by Dale Carnegie

## QUESTION PAPER PATTERN

### Continuous Assessment Test - I:

Time: 2 Hrs.                                                                                        Max. Marks: 50

| Sl. No | Questions | Marks |
|--------|-----------|-------|
| 1 | Answer any TEN out of 15 questions | 10 x 5 = 50 |

### Continuous Assessment Test - II:

Time: 2 Hrs.                                                                                        Max. Marks: 50

| Sl. No | Questions | Marks |
|--------|-----------|-------|
| 1 | Answer any TEN questions | 10 x 5 = 50 |

### Model Examination / End semester Examination

Time: 3 Hrs.                                                                                        Max. Marks: 100

| Sl. No | Questions | Portions | Marks |
|--------|-----------|----------|-------|
| 1 | Answer any TEN out of 16 questions | Unit I & II - Grammar items | 10 x 4 = 40 |
| 2 | Answer any FOUR out of 6 questions | Unit III - Composition items | 4 x 5 = 20 |
| 3 | Answer any FOUR out of 5 questions | Unit IV - Composition items | 4 x 5 = 20 |
| 4 | Answer any FOUR out of 5 questions | Unit V - Prose & Poetry | 4 x 5 = 20 |
| | | **TOTAL** | **100** |

# 6012 ENGINEERING MATHEMATICS - I

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---------|-------------|--|-------------|--|--|--|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| 6012 ENGINEERING MATHEMATICS – I | 5 Hrs | 80 Hrs | Internal Assessment | External Exam* | Total | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|------|--------------------|-----|
| **I** | **ALGEBRA** **1.1 MATRICES AND DETERMINANTS** MATRICES : Definition, concept and types of matrices. DETERMINANTS: Determinant of a square matrix - 2nd and 3rd order determinants - singular and non-singular matrices - simple problems. | **4** |
| | **1.2 APPLICATIONS OF MATRICES AND DETERMINANTS** Co-factor, Adjoint of matrix, Inverse of matrix and rank of a matrix by determinant method - simple problems. Solution of simultaneous equations using Cramer's rule - simple problems. | **5** |
| | **1.3 BINOMIAL THEOREM** Introduction - Factorial, Permutation and Combinations - Values of nPr and nCr (Results only - not for examination). Statement of Binomial theorem for positive integral index - Expansion of Binomial - Finding general term - Middle term - Coefficient of xn and Term independent of x - Binomial theorem for rational index up to 3. Applications of Binomial theorem - simple problems. | **5** |

| | | |
|---|---|---|
| **II** | **COMPLEX NUMBERS**<br>**2.1 ALGEBRA OF COMPLEX NUMBERS**<br>Introduction - Complex numbers - Conjugates - Algebra of complex numbers (without geometrical proof), Properties of complex conjugates - Modulus and amplitude - Polar and Euler form of a complex number - simple problems.<br>Argand diagram - Collinear points, four points forming square, rectangle, rhombus and parallelogram only - simple problems. | **5** |
| | **2.2 DE MOIVRE'S THEOREM**<br>De Moivre's Theorem (statement and applications) - related simple problems. | **5** |
| | **2.3 ROOTS OF COMPLEX NUMBERS**<br>Finding the nth roots of unity - solving the equations of the form $X^n \pm 1 = 0$, where $n \leq 7$ - simple problems. | **5** |
| **III** | **TRIGONOMETRY**<br>**3.1 TRIGONOMETRIC IDENTITIES**<br>Trigonometric ratios of sum and difference of two angles - Multiple and sub-multiple angles - Functions of 3A angles - simple problems. | **7** |
| | **3.2 INVERSE TRIGONOMETRIC FUNCTIONS**<br>Sum and product identities - Inverse trigonometric functions - Principal value - Properties of inverse trigonometric functions - simple problems. | **8** |
| **IV** | **DIFFERENTIAL CALCULUS - I**<br>**4.1 LIMITS**<br>Definition of limits - Problems using the following results<br>$(i)\ \underset{x \to a}{Lt}\ \dfrac{x^n - a^n}{x - a} = na^{n-1}$  $(ii)\ \underset{\theta \to 0}{Lt}\ \dfrac{Sin\ \theta}{\theta} = 1$<br>$(iii)\ \underset{\theta \to 0}{Lt}\ \dfrac{\tan \theta}{\theta} = 1\ (\theta\ in\ radians)\,(\text{Re}\ sults\ only)$ | **5** |
| | **4.2 DIFFERENTIATION**<br>The derivative of a function - Differentiation of constant, $X^n, \sin x, \cos x, \tan x, \sec x, \cos ec x, \cot x, \log x, e^x, a^x, \sin^{-1} x,\ \cos^{-1} x,\ \tan^{-1} x,\ \cot^{-1} x, \sec^{-1} x$<br>$and \cos ec^{-1} x$ (Formulae only) - Differentiation rules: $u \pm v, uv, uvw, u/v$ - simple problems. | **5** |
| | **4.3 DIFFERENTIATION METHODS**<br>Chain rule - Differentiation of Implicit functions - Differentiation of parametric functions - simple problems. | **5** |
| **V** | **DIFFERENTIAL CALCULUS - II**<br>**5.1 SUCCESSIVE DIFFERENTIATION**<br>Successive differentiation up to second order (parametric form not included). Definition of differential equation, order and degree, formation of differential equation - simple problems. | **7** |
| | **5.2 PARTIAL DIFFERENTIATION**<br>Definition - Partial differentiation of two variables up to second order only - simple problems. | **7** |

**Reference Books:**
1. Higher Secondary +1 Mathematics volume I & II. Tamil Nadu Text Book Corporation.
2. Higher Secondary +2 Mathematics Volume I & II. Tamil Nadu Text Book Corporation.
3. Engineering Mathematics V. Sundaram, R. Balasubramanian.
4. Engineering Mathematics - I C.B.Gupta ,A.K.Malik, New age international Pub., 1$^{st}$ed, - 2008.
5. Differential Calculus S. Balachandra Rao, CK Shantha New age Publishers
6. Probability Theory and Stochastic Process B.Prabhakara Rao, TSR Murthy, BS Publishers.
7. Vectors and Geometry GS. Pandey, RR Sharma, New age international publishers.
8. Engineering Mathematics - I Guruprasad Samanta, New age int. publishers, 2$^{nd}$edition 2015

9. Engineering Mathematics Reena Garg, Khanna pub. house, New Delhi, Revised edn. -2018.
10. Engineering Mathematics Volume I P. Kandasamy and K. Thilagavathy, S. Chand & Co. Ltd.

<div align="center">

**QUESTION PAPER PATTERN: General Pattern**

# 6013 ENGINEERING PHYSICS - I

</div>

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6013 ENGINEERING PHYSICS - I** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 5 Hrs | 80 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|---|---|---|
| **I** | **SI UNITS AND STATICS** | |
| | **1.1 UNITS AND MEASUREMENTS** Unit - Definition - Fundamental Quantities - Definition - Seven fundamental quantities - SI units and symbols for the seven fundamental quantities - Dimensional formula for length, mass and time - Supplementary quantities - Plane angle and Solid angle - SI units and symbols for the supplementary quantities - Derived quantities - Definition - SI units, symbols and derivation of dimensional formula for the derived quantities (area, volume, density, velocity, momentum, acceleration, force, impulse, work or energy and power) - Uses of Dimensional formula - Different types of measurement systems - Conventions to be followed while writing SI units - Multiples and sub-multiples of units and their prefixes - Unit conversions (Horse power to Watt and Calorie to Joule) - Applications of the method of dimensional analysis. | 6 |
| | **1.2 STATICS** Scalar and vector quantities - Definition and examples - Concurrent forces and coplanar forces - Definition - Resolution of a vector into two perpendicular components - Resultant and equilibrant - Definition - Parallelogram law of forces - Statement - Expressions for magnitude and direction of the resultant of two forces acting at a point with an acute angle between them - Lami's theorem - Statement and explanation - Experimental verification of parallelogram law of forces and Lami's theorem - Simple problems based on expressions for magnitude and direction of resultant - Moment of a force - Clockwise and anti-clockwise moments - Principle of moments - Couple - Torque acting due to a couple - Experimental determination of mass of the given body using principle of moments. | 9 |
| **II** | **DYNAMICS - I** | |
| | **2.1 STRAIGHT LINE MOTION** Introduction - Distance - Displacement - Speed - Velocity - Acceleration - Acceleration due to gravity - Definitions - Difference between mass and weight - Newton's laws of motion - Fundamental Equations of motion for objects - in horizontal motion - Falling freely - Thrown vertically upwards. | 3 |
| | **2.2 PROJECTILE MOTION** Projectile motion - Angle of projection - Trajectory - Maximum height - Time of flight - Horizontal range - Definitions - Expressions for maximum height, time of flight and horizontal range - Condition for getting the maximum range of the projectile - Path of the projectile is a Parabola - Simple problems based on expressions for maximum height, time of flight and horizontal range - Examples of projectile motion. | 5 |

| | | |
|---|---|---|
| | **2.3 CIRCULAR MOTION**<br>Circular motion - Angular velocity - Period - Frequency - Definitions - Relation between linear velocity and angular velocity - Introduction to Degrees and radians - Relation between angular velocity, period and frequency - Normal acceleration - Centripetal force - Centrifugal force - Definitions - Expressions for normal acceleration and centripetal force - Banking of curved paths - Angle of banking - Definition - Expression for the angle of banking of a curved path - Simple harmonic motion - Amplitude, frequency and period - Definitions - Simple problems based on the expressions for centripetal force and angle of banking - Applications of centripetal force and centrifugal force. | **7** |
| **III** | **DYNAMICS - II** | |
| | **3.1 ROTATIONAL MOTION OF RIGID BODIES**<br>Rigid body - Definition - Moment of inertia of a particle about an axis - Moment of inertia of a rigid body about an axis - Radius of gyration - Definition - Expression for the kinetic energy of a rotating rigid body about an axis - Angular momentum - Definition - Expression for the angular momentum of a rotating rigid body about an axis - Law of conservation of angular momentum - Examples. | **5** |
| | **3.2 GRAVITATION**<br>Newton's laws of gravitation - Acceleration due to gravity on the surface of earth - Expression for variation of acceleration due to gravity with altitude. | **4** |
| | **3.3 SATELLITES**<br>Satellites - Natural and artificial - Escape velocity and orbital velocity - Definitions - Expression for escape velocity and orbital velocity - Polar and Geostationary satellites - Uses of artificial satellites - Simple problems based on escape velocity and orbital velocity. | **5** |
| **IV** | **PROPERTIES OF MATTER** | |
| | **4.1 ELASTICITY**<br>Elastic and plastic bodies - Definition - Stress - Strain - Definitions - Hooke's law - Statement - Types of strain - Elastic and plastic limit - Young's modulus - Bulk modulus - Rigidity modulus - Definitions - Uniform and non-uniform bending of beams - Experimental determination of the Young's modulus of the material of a beam by uniform bending method - Poisson's ratio - Simple problems based on stress, strain and Young's modulus - Applications of elasticity. | **4** |
| | **4.2 FLUID STATICS**<br>Introduction - Pressure - Definition - Pressure due to fluid column at rest - Pascal's law and its applications - Hydraulic lift and hydraulic brake - Buoyancy - Archimede's Principle - Law of floatation. | **3** |
| | **4.3 VISCOSITY**<br>Viscous force - Viscosity - Coefficient of viscosity - Definitions - SI unit and dimensional formula for coefficient of viscosity - Streamline flow - Turbulent flow - Critical velocity - Reynolds number - Definition - Experimental comparison of coefficient of viscosity of two low viscous liquids - Terminal velocity - Definition - Experimental determination of coefficient of viscosity of a highly viscous liquid by Stoke's method - Practical applications of viscosity - Practical applications of Stoke's law. | **4** |
| | **4.4 SURFACE TENSION**<br>Surface tension - Angle of contact - Definitions - Expression for surface tension of a liquid by capillary rise method - Experimental determination of surface tension of water by capillary rise method - Practical applications of capillarity - Simple problems based on expression for surface tension - Applications of surface tension. | **4** |
| **V** | **SOUND AND MAGNETISM** | |

| | | |
|---|---|---|
| **5.1 SOUND**<br>Wave motion - Introduction and definition - Audible range - Infrasonic - Ultrasonics - Progressive waves, longitudinal and transverse waves - Examples - Amplitude, Wave length, period and frequency of a wave - Definitions - Relation between wavelength, frequency and velocity of a wave - Stationary or standing waves - Vibrations - Free vibrations, forced vibrations and resonance - Definitions and examples - Laws of transverse vibration of a stretched string - Sonometer - Experimental determination of frequency of a tuning fork - Simple problems based on expression for frequency of vibration - Doppler effect - Definition and applications - Ultrasonic and its uses - SONAR. | | **6** |
| **5.2 ACOUSTICS OF BUILDINGS**<br>Acoustics of buildings - Echo - Reverberation - Reverberation time - Sabine's formula for reverberation time - Coefficient of sound absorption - Noise pollution. | | **3** |
| **5.3 MAGNETISM**<br>Pole strength - Definitions - Magnetic moment, intensity of magnetisation, magnetising field intensity, magnetic induction, Permeability, hysteresis, saturation, retentivity and coercivity - Definitions - Method of drawing hysteresis loop of a specimen using a solenoid - Uses of hysteresis loop - Simple problems based on intensity of magnetization - Types of magnetic materials and their applications. | | **5** |

**Reference Books:**

1. Fundamentals of Physics - Halliday & Resnick - Wiley India Pvt. Ltd. - Sixth Edition.
2. Physics for Higher Secondary - First & Second year - Volume I & II - Tamilnadu Textbook and Educational Services Corporation, 2018.
3. Engineering Physics - B.L.Theraja - S. Chand & Company Ltd. - Fourth Edition.
4. A text book of sound - R.L. Saighal - S. Chand Publishing - 2005.
5. A textbook of Applied Mechanics - R. S. Khurmi - S. Chand & Company Ltd. - Twelfth Edition.

**QUESTION PAPER PATTERN: General Pattern**

# 6014 ENGINEERING CHEMISTRY - I

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| 6014<br>ENGINEERING CHEMISTRY - I | Hrs / Week | Hrs / Sem | Marks | | | | Duration |
| | | | Internal Assessment | External Exam* | Total | | |
| | 5 Hrs | 80 Hrs | 25 | 100 | 100 | | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|---|---|---|
| **I** | **TECHNOLOGY OF WATER AND ACIDS AND BASES**<br>**1.1 TECHNOLOGY OF WATER**<br>Sources of water - Reasons for depletion of underground water - Rainwater harvesting (basic concepts) - Advantages - Hard water and soft water - Hardness of water - Carbonate and non-carbonate hardness - Disadvantages of hard water - Methods of expressing hardness - mg/lit and ppm - Simple problems - Softening of hard water - Ion-exchange method and Reverse osmosis method - Municipal water supply - Purification of drinking water (sedimentation, filtration and sterilization) - Disadvantages of using hard water in boilers - Scale formation - Corrosion of boiler metal - Caustic Embrittlement - Priming and foaming. | **9** |
| | **1.2 ACIDS AND BASES**<br>Theories of acids and bases - Arrhenius theory - Lowry-Bronsted theory - Lewis theory - Advantages of Lewis theory - pH and pOH - Definition - | **6** |

| | | |
|---|---|---|
| | Numerical problems - Indicator - Definition - Buffer solution - Definition - Types of buffer solution with examples - Application of pH in industries. | |
| II | **ATOMIC STRUCTURE AND CHEMICAL BONDING, NUCLEAR CHEMISTRY**<br>**2.1 ATOMIC STRUCTURE AND CHEMICAL BONDING** | |
| | Fundamental particles - Proton - Electron - Neutron - Atomic number - Mass number - Extra nuclear part - Filling up of electrons - Aufbau principle - s-p-d-f orbital's - Electronic configuration - Definition of atomic mass, molecular mass, equivalent mass, valency (definitions only) - Octet rule - Electrovalent bond - Sodium chloride formation - Covalent bond - Formation of ammonia. | 6 |
| | **2.2 NUCLEAR CHEMISTRY** | |
| | Natural radio activity - Definition - Alpha, beta, gamma rays - Comparison of alpha, beta, gamma particles - Atomic theory - Isotopes, Isobars and Isotones - Definition - Examples - Radioactive decay - Alpha and beta decay with example - Group displacement law - Half life period - Definition - Simple problems - Artificial radioactivity - Definition - Example - Nuclear fission and Nuclear fusion - Definition - Fission of U235 - Fusion reaction in the Sun - Nuclear reactor - Definition - Types of nuclear reactors - Components nuclear reactor - Reactor core, reflector, pressure vessel, shielding, heat exchanger and turbine - Application of radioactive isotopes. | 8 |
| III | **SOLUTION, COLLOIDS AND CATALYSIS**<br>**3.1 SOLUTION** | 4 |
| | Definition - Methods of expressing concentration of solutions - Percentage by mass, normality, molarity, molality, and mole fraction - Simple problems. | |
| | **3.2 COLLOIDS** | |
| | True solution and colloidal solution - Definition - Differences - Types of Colloids - Lyophilic and lyophobic colloids - Differences - Properties - Tyndall effect, Brownian movement, Electrophoresis and Coagulation - Industrial applications of colloids - Smoke precipitation by Cottrell's method - Purification of water - Cleansing action of soap - Tanning of leather and sewage disposal. | 6 |
| | **3.3 CATALYSIS** | |
| | Catalyst - Definition - Types of catalyst - Positive catalyst - Negative catalyst - Catalysis - Definition - Types of catalysis - Homogeneous and heterogeneous - Promoter - Catalyst poison - Definition - Characteristics of a catalyst - Industrial applications of catalysts. | 4 |
| IV | **ELECTROCHEMISTRY, ELECTROCHEMICAL CELL AND ENERGY SOURCES**<br>**4.1 ELECTROCHEMISTRY** | 5 |
| | Electrolyte - Definition - Strong and weak electrolytes – non-electrolytes - Examples - Electrolysis - Definition - Mechanism - Industrial application of electrolysis - Electroplating - Chrome plating - Preparation of surface process - Factors affecting the stability of the coating - Electroless plating - Definition - Advantages of electroless plating over electroplating - Applications of electroless plating. | |
| | **4.2 ELECTROCHEMICAL CELL** | |
| | Electrochemical cell - Definition - Single electrode potential - Definition - Galvanic cell - Formation of Daniel cell - Electrochemical series - Definition and significance - Concentration cell - Definition - Types of concentration cell - Electrode concentration cell and Electrolyte concentration cell. | 5 |
| | **4.3 ENERGY SOURCES** | |
| | Primary Battery - Definition and example - Construction, working and uses of dry cell - Secondary battery - Definition and example - Construction, working and uses of lead acid storage battery - Nickel Cadmium battery - Solar cell - Definition - Principle, construction, working and uses. | 5 |
| V | **GLASS, CERAMICS, ABRASIVES AND LUBRICANTS**<br>**5.1 GLASS** | 4 |
| | Composition of glass - Manufacture of glass (Soda lime glass - Annealing of glass - Varieties of glass - Optical glass, wind shield glass and photo chromatic glass. | |

| | | |
|---|---|---|
| **5.2 CERAMICS**<br>Ceramics - White pottery - Definition - Manufacture of white pottery - Uses - Definition of glazing - Purpose - Methods of glazing - Salt glazing - liquid glazing. | | 4 |
| **5.3 ABRASIVES**<br>Definition - Classification - Hardness in Moh's scale - Natural abrasives - Diamond, corundum, emery and garnet - Synthetic abrasives - Carborundum - Boron carbide - Manufacture - Properties and uses. | | 4 |
| **5.4 LUBRICANTS**<br>Definition - Characteristics of lubricant - Types of lubricants - Solid, semi-solid and liquid lubricants. | | 3 |

**Reference Books:**
1. Introduction to Engg. Chemistry, Shradha Sinha, SS Dara&Sudha Jain,S. ChandPublishers, 2004.
2. Engineering Chemistry, S S Dara, Sudha Jain & Shradha Sinha, S. Chand Publishers 2005.
3. A Textbook of Engineering Chemistry, Dr. Uday Kumar, 2013.
4. Chemistry - Higher Secondary - 1st and 2nd year, Vol. I & II, Tamil Nadu Text Book Corporation, 2018.
5. Engineering Chemistry Fundamentals & Applns. - Shikha Agarwal, Cambridge University Press, 2019.
6. Electrochemistry and Corrosion Science - Nestor Perez.

**QUESTION PAPER PATTERN: General Pattern**

# 6015 ENGINEERING GRAPHICS - I

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | | Duration |
| 6015<br>ENGINEERING GRAPHICS - I | 6 Hrs | 96 Hrs | Internal Assessment | External Exam* | Total | | |
| | | | 25 | 100 | 100 | | 3 Hrs |

 **\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**Note:** While practicing, usage of drawing instruments like drawing board, mini drafter, compass, divider, drawing clips, H, 2H and HB grade drawing pencils, eraser etc., are mandatory for class work and examinations. Size of drawing sheet recommended: A2 size (420 x 594 mm).Use both sides of drawing sheets for practice.

| Unit | Name of the Topics | Hrs |
|---|---|---|
| I | **DRAWING OFFICE PRACTICE AND DIMENSIONING**<br>**1.1 DRAWING OFFICE PRACTICE**<br>Importance of engineering drawing as a graphic communication - drawing practice as per BIS code - drawing instruments: drawing board, mini drafter, compass, divider, protractor, drawing sheets, drawing pencils, set squares etc., - title block - layout and folding of drawing sheets.<br>Lettering and numbering as per BIS - importance of legible lettering and numbering - single stroke letters - upper case and lower case letters - slanting / inclind letters - general procedures for lettering and numbering - height of letters - guidelines - practices.<br>Scales - full size scale, reducing scale & enlarging scales (Description only). | 6 |
| | **1.2 DIMENSIONING**<br>Dimensioning - need for dimensioning - dimensioning terms and notations as per BIS - dimension line, extension line and leader line - dimensioning systems - methods of placement of dimensions - uni-directional and aligned systems - important dimensioning rules - dimensioning of common features - diameters, radii, holes, chamfers - addition of letters and symbols - parallel, chain and progressive dimensioning - practice of dimensioning the given drawing as per BIS code (one view of the object). | 13 |

| II | **GEOMETRIC CONSTRUCTIONS AND CONSTRUCTION OF CONICS** **2.1 GEOMETRIC CONSTRUCTIONS** Bisect a straight line - bisect an arc - bisect an angle - divide a straight line into any number of equal parts - divide the circle into number of equal divisions - construct an arc touching 2 lines at any angle - construct an arc touching 2 arcs. | 6 |
|---|---|---|
| | **2.2 CONSTRUCTION OF CONICS** Conic sections - definition of locus, focus, directrix, axis, vertex and eccentricity - practical applications of ellipse, parabola and hyperbola. Ellipse: Construction of ellipse by concentric circle method, rectangular method when major and minor axis are given and eccentricity method when focus and directrix are given - exercises in practical applications. Parabola: Construction of parabola by rectangular method, parallelogram method when major and minor axis are given and eccentricity method when focus and directrix are given - exercises in practical applications. Hyperbola: Construction of hyperbola by eccentricity method when focus and directrix are given - exercises in practical applications. | 13 |
| III | **PROJECTION OF POINTS & STRAIGHT LINES AND CONSTRUCTION OF SPECIAL CURVES** **3.1 PROJECTION OF POINTS AND STRAIGHT LINES** Projection of points - position of a point on four quadrants and on the reference planes - system of notation - Place a point on four quadrants with different distances - exercises. Projection of straight lines - line in the first quadrant and on the reference planes - parallel to one plane and perpendicular to other plane - inclined to one plane and parallel to the other plane - inclined to both the planes - simple exercises. | 11 |
| | **3.2 CONSTRUCTION OF SPECIAL CURVES** Definition & construction of cycloid - epicycloid - hypocycloid - involute of a circle - Archimedean spiral for one revolution - helix - practical applications - exercises. | 8 |
| IV | **ORTHOGRAPHIC PROJECTIONS** **4.1 FIRST AND THIRD ANGLE PROJECTIONS : SIMPLE COMPONENTS** Introduction - projection terms - orthographic projection - planes of projection - principal orthographic views - designation of views - four quadrants - first angle projection - third angle projection - symbols and arrangement of views for first angle and third angle projections - comparison - Simple exercises in first angle projection with minimum two views of simple components (Without curves and circles). | 11 |
| | **4.2 FIRST ANGLE PROJECTIONS ONLY: ENGINEERING COMPONENTS** Draw the projections of the simple engineering components using first angle projection - exercises in drawing orthographic views - three views - front view, top view and right / left side views. (For Exam any two views can be asked.) | 21 |

**Reference Books:**
1. Bhatt N.D, "Engineering Drawing", Charotar Publishing House Pvt. Ltd.
2. Gill P.S, "Engineering drawing", S.K.Kataria & Sons.
3. Gopalakrishna.K.R., "Engineering Drawing", (Vol 1 & 2 combined), Subhas Publications.
4. Venugopal.K, Prabhu Raja V, "Engineering Graphics", New Age International Publishers.
5. Natarajan K V "A Text Book of Engineering Drawing and Graphics" Publisher: N Dhanalakshmi.
6. Shah M B, Rana B C, "Engineering Drawing", Pearson.
7. Basant Agrawal, Agrawal C M "Engineering Drawing", McGraw hill HED.
8. Parkinson A C, "First Year Engineering Drawing", Sir Isaac Pitman & Sons Ltd.
9. Thomas E. French, Charles J. Vierck, "The Fundamentals of Engineering Drawing", McGraw Hill.

## QUESTION PAPER PATTERN

### PART – A (4 x 5 = 20)

Note: Five questions will be asked (Sl. No: 1 to 5). Answer any four questions.
Each question carries five marks.
Minimum one question should be asked from each unit first chapter.

(Chapters: 1.1, 2.1, 3.1, 4.1)
### PART – B (4 x 20 = 80)
Note: Six questions will be asked (Sl. No: 6 to11). Answer any four questions.
Each question carries twenty marks.
Minimum one question should be asked from each unit second chapter. (Chapters: 1.2, 2.2, 3.2, 4.2)

**Internal Assessment Marks:**

| | |
|---|---|
| Class work assignment drawings | 10 |
| Average of two continuous assessment tests | 05 |
| Model examination | 05 |
| Attendance | 05 |
| **Total** | **25** |

## 6016 ENGINEERING PHYSICS PRACTICAL - I

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6016 ENGINEERING PHYSICS PRACTICAL - I** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | | | **Internal Assessment** | **External Exam\*** | **Total** | |
| | 2 Hrs | 32 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## LIST OF EXPERIMENTS WITH OBJECTIVES:

1. SCREW GAUGE - To measure the thickness of the given irregular glass plate using screw gauge and to determine the area of the glass plate using a graph sheet and to calculate the volume of the glass plate.

2. VERNIER CALIPER – To measure the length, inner diameter and outer diameter of the given hollow cylinder using Vernier caliper and to calculate the volume of the hollow cylinder.

3. VERIFICATION OF PARALLELOGRAM LAW OF FORCES - To verify Parallelogram law of forces using Concurrent forces apparatus.

4. VERIFICATION OF LAMI'S THEOREM - To verify Lami's theorem using Concurrent forces apparatus.

5. SIMPLE PENDULUM - To determine the acceleration due to gravity using simple pendulum apparatus.

6. TORSION PENDULUM - To determine the moment of inertia of the disc and rigidity modulus of the given wire using torsion pendulum.

7. STOKE'S METHOD - Determine the coefficient of viscosity of high viscous liquid

8. SURFACE TENSION - To determine the surface tension of water by capillary rise method.

9. DEFLECTION MAGNETOMETER - To compare the magnetic moments of the given two bar magnets using deflection magnetometer in tan A position by equal distance method.

10. SONOMETER - To determine the frequency of the given tuning fork using sonometer.

### QUESTION PAPER PATTERN
Answer any one of the above experiment chosen by random method. The marks will be awarded as per the scheme of valuation given below.

### SCHEME OF VALUATION

| S. No | Category | Marks |
|---|---|---|
| 1 | Formula and diagram | 20 |
| 2 | Tabulation | 10 |
| 3 | Observation | 40 |
| 4 | Calculation | 15 |

| 5 | Result | 10 |
|---|--------|-----|
| 6 | Viva voce | 05 |
| | Total | **100** |

# 6017 ENGINEERING CHEMISTRY PRACTICAL - I

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---------|-------------|------|-------------|------|------|-----------|
| **6017 ENGINEERING CHEMISTRY PRACTICAL - I** | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| | 2 Hrs | 32 Hrs | Internal Assessment | External Exam* | Total | 3 Hrs |
| | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## VOLUMETRIC ANALYSIS EXPERIMENTS:

### Acidimetry and Alkalimetry:
1. Estimation of sulphuric acid using a standard solution of hydrochloric acid and sodium hydroxide as link solution - phenolphthalein indicator.
2. Estimation of sodium hydroxide using standard solution of sodium carbonate using sulphuric acid as a link solution - methyl orange indicator.
3. Comparison of strength of two hydrochloric acid solutions using a link solution of sodium hydroxide - phenolphthalein indicator.
4. Comparison of strength of two sodium hydroxide solutions using Oxalic acid link solution phenolphthalein indicator.

### Permanganametry:
5. Estimation of Mohr's salt solution using standard solution of ferrous sulphate and link solution of potassium permanganate.
6. Estimation of ferrous sulphate using standard solution of Mohr's salt solution and link solution of potassium permanganate.
7. Comparison of two Mohr's salt solutions with a link solution of potassium permanganate.
8. Comparison of two potassium permanganate solutions with a link solution of ferrous sulphate.

## QUESTION PAPER PATTERN

Answer any one of the above experiment chosen by random method. The marks will be awarded as per the scheme of valuation given below.

## SCHEME OF VALUATION

| Sl. No | Category | Marks |
|--------|----------|-------|
| 1 | Short procedure | 10 |
| 2 | Titration I | 35 |
| 3 | Titration II | 35 |
| 4 | Calculations (3 x 5) | 15 |
| 5 | Viva Voce | 05 |
| | Total | 100 |

### Titration value accuracy for Titration I and II:

| Accuracy | Marks |
|----------|-------|
| ±0.2ml | **35** |
| Above ±0.2 ml to ±0.4 ml | **30** |
| Above ±0.4 ml to ±0.6 ml | **25** |
| Above ±0.6 ml | **10** |

# 6018 WORKSHOP PRACTICAL - I

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6018C WORKSHOP PRACTICAL - I (For DCE)** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | | | **Internal Assessment** | **External Exam\*** | **Total** | |
| | 3 Hrs | 48 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## I. BASICS OF CONSTRUCTION ENGINEERING PRACTICE

Introduction of tools in construction                                       04 Hrs

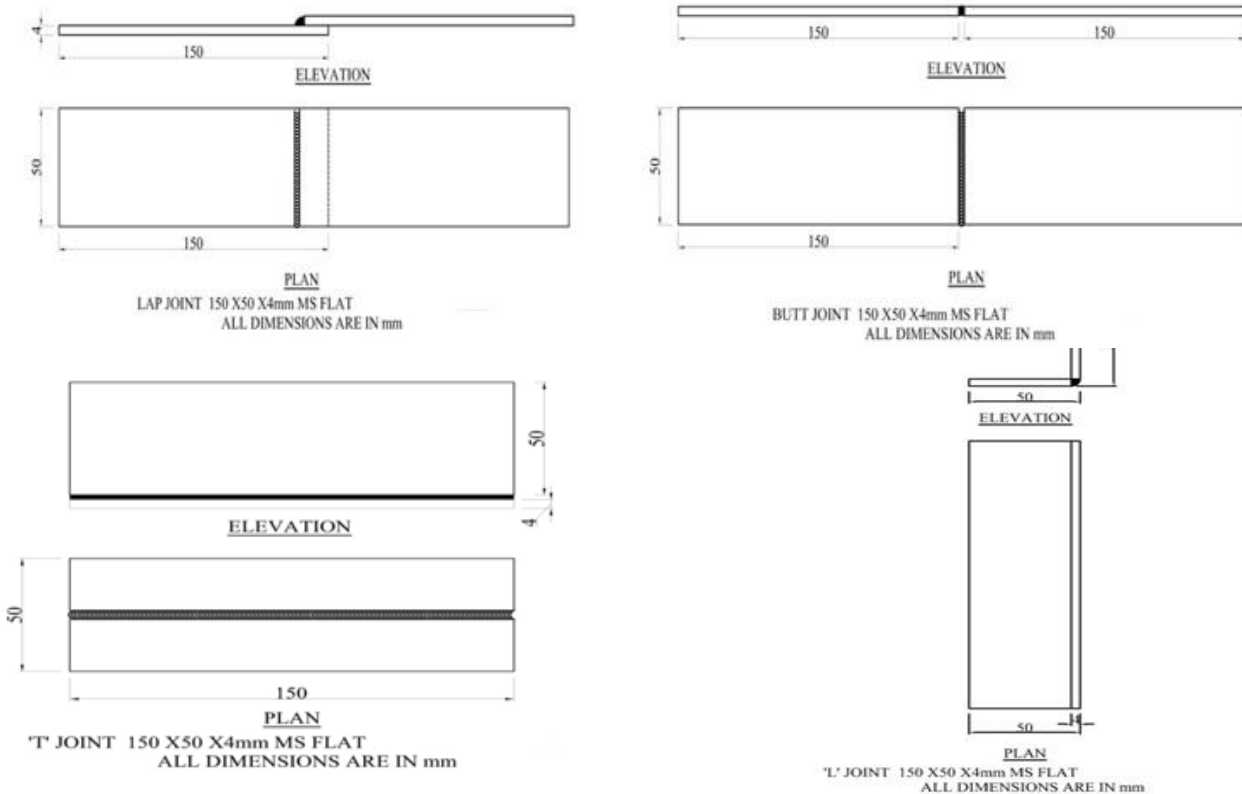Exercises:                                                                            12 Hrs

1. Measuring the area of the given building and measuring the volume of the given items in the existing building using measuring tape.
2. Arrangement of bricks using English bond in one brick thick wall, one and half brick thick wall for right angled corner Tee - junction.
3. Arrangement of bricks using English bond in one brick thick square pillars, one and half brick thick pillars.
4. Arrangement of bricks using stretcher bond in half brick wall.

## WELDING WORKSHOP

Introduction of Welding equipments                                      04 Hrs

**Exercises:**                                                                      **12 Hrs**

1. Lap – joint        2. Butt – joint      3. 'T'- joint      4. 'L'- joint



LAP JOINT 150 X50 X4mm MS FLAT
ALL DIMENSIONS ARE IN mm

BUTT JOINT 150 X50 X4mm MS FLAT
ALL DIMENSIONS ARE IN mm

'T' JOINT 150 X50 X4mm MS FLAT
ALL DIMENSIONS ARE IN mm

'L' JOINT 150 X50 X4mm MS FLAT
ALL DIMENSIONS ARE IN mm

## II. FITTING

Introduction of Fitting tools                                                 04 Hrs

**Exercises:**                                                                      **12 Hrs**

1. 'V' Mating    2. 'T' Mating    3. Dovetail Mating    4. Drilling & Tapping



'V'MATING

MATERIAL 80 X50 X3mm MS FLAT TOLERANCE ± 0.1mm
ALL DIMENSIONS ARE IN mm



'T'MATING

MATERIAL 80 X50 X3mm MS FLAT TOLERANCE ± 0.1mm
ALL DIMENSIONS ARE IN mm



DOVE TAIL MATING
1. FILING
2. MARKING AND PUNCHING
3. SAWING
4. FINISHING



DRILLING AND TAPPING
All dimensions are in 'mm'

Material: 80x50x10mm MS Flat, Tolerance: ±0.1 mm

**Raw material:** Use 3 mm thick MS flat for filing and 10 mm MS flat for drilling & tapping.

## QUESTION PAPER PATTERN

| | |
|---|---|
| Construction Engineering Practice Exercise | 50 marks |
| Welding or Fitting (Any one) Exercise | 45 marks |
| Viva voce | 05 marks |
| Total | 100 marks |

## 6001 COMMUNICATION SKILL PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| 6001 COMMUNICATION SKILL PRACTICAL | 2 Hrs | 32 Hrs | Internal Assessment | External Exam* | Total | 3 Hrs |
| | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|------|--------------------|-----|
| I | **LISTENING SKILL**<br>Listening to speeches by Great speakers / TV News (Assessmentthrough note taking)<br>Listening to short stories (Assessment by vocabulary check)<br>Listening to Indian / British / American English (Assessmentby cloze) | 10 |
| II | **READING SKILL**<br>Stress & Intonation<br>Tongue twisters / Tongue modulators frequently<br>Mispronounced words<br>Reading Newspaper - (Skimming & Scanning) | 6 |
| III | **SPEAKING SKILL**<br>Polite expressions (Greeting, Requesting, Thanking, Apologizing,Opinions, Suggestions)<br>Introducing Yourself / Friends / Family<br>Recite - quotes of Leaders / Scholars / Scientists<br>Face to face conversation | 10 |
| IV | **WRITING SKILL**<br>Thought fillers<br>Completing an Incomplete story<br>How to prepare PPT<br>Non-verbal communication | 6 |

Note:
1. The students should be given proper practice in all the exercises. All theexercises should be completed before the examinations.
2. The students should maintain a record note book. The record note book should be submitted during the semester practical examinations.

**PART A - LISTENING (No. of Exercises: 3, Duration: 45 min.)**

| Exercise | Particulars |
|----------|-------------|
| 1 | The examiner shall play either the audio of the speech of a Great speaker or that of TV news running from 3 to 5 min. The audio can be played twice. The candidates may be given 10 minutes to take notes as directed in the question paper. |
| 2 | A short story selected by the external examiner shall be played only once without transcript. The objective of this exercise is to test the listening ability of the candidate and therefore questions should be framed accordingly in the pattern of question and answer. The time to complete this exercise is 5 minutes. |
| 3 | Any one of the audios (British English, American English or Indian English) may be selected by the external examiner and the same shall be played only once. Maximum of 5 questions for filling in the blanks may be given and the candidates may be provided maximum of 10 minutes to answer the questions. |

This part shall be completed within45 min. including the time used for playinglistening audios.

**PART B - READING (No. of Exercises: 3, Duration: 45 min.)**

Each batch may be divided into two groups. Both examiners may engage all the students.

| Exercise | Particulars |
|----------|-------------|
| 1 | Readout the tongue twister. |
| 2 | A passage from newspaper can be given for reading. |
| 3 | Pronounce the words correctly. |

This part shall be completed within 45 minutes.

**PART C - SPEAKING (No. of Exercises: 4, Duration: 45 min.)**

Divide the students to make it convenient for conversations in English by a pair. Both examiners can handle.

| Exercise | Particulars |
|---|---|
| 1 | Polite expressions for the context provided. |
| 2 | Self-introduction for the interview. |
| 3 | Any five quotes can be recited from the given list of quotes of Leaders, Scholars and Scientists. |
| 4 | The candidates have to speak as directed by the concerned examiner. All the questions are mandatory. |

This part shall be completed within 45 minutes.

**PART D - WRITING (No. of Exercises: 3, Duration: 45 min.)**
All students should appear for this part.

| Exercise | Particulars |
|---|---|
| 1 | Five questions with blanks shall be asked based on a list of 25 frequently used thought fillers already trained during lab classes. |
| 2 | Shall consist of an unknown incomplete story providing scope for further development and application of imagination. (Minimum 3 lines for completion with suitable title and moral) |
| 3 | Questions can be taken from a list of fifteen important questions covering the core areas of non-verbal communication. (Five out of eight questions to be answered) |

This part shall be completed within 30 minutes.

### ALLOCATION OF MARKS

| | Description | Marks |
|---|---|---|
| A | Listening | 30 |
| B | Reading | 20 |
| C | Speaking | 30 |
| D | Writing | 20 |
| **Total** | | **100** |

**Guidelines for Conduct of Practical Classes and Writing Record Note:**
There are 13 experiments in total equally distributed to each skill as follows:

| Sl. No | Name of the exercise | Min. Exercises to be practiced / written in Record Note |
|---|---|---|
| **Listening Skill** | | |
| 1 | Listening to Speeches by Great Speakers/ TV News | Each One exercise |
| 2 | Listening to Short Stories | Minimum of two exercises |
| 3 | Listening to Indian / British / American English | Minimum of two exercises |
| **Reading Skill** | | |
| 4 | Reading Tongue Twisters | A list of 25 tongue twisters |
| 5 | Reading English Newspapers | Minimum 2 passages from any English Newspaper |
| 6 | Frequently mispronounced words | List of 25 words |
| **Speaking Skill** | | |
| 7 | Making Polite Expressions | Polite expressions - Greeting, Requesting, Thanking, Apologizing, Opinions, Suggestions |

| 8 | Introducing oneself / friends/family | Minimum two exercises for introducing oneself and introducing others |
|---|---|---|
| 9 | Reciting quotes | Quotes of Leaders / Scholars / Scientists (List of 25 quotes) |
| 10 | Face to face conversation | Minimum two exercises |
| **Writing Skill** | | |
| 11 | Use of Thought Fillers | A list of 25 frequently used thought fillers |
| 12 | Completing an Incomplete Story | Minimum of two exercises. (conclusion - minimum 3 lines, title & moral) |
| 13 | Non-Verbal Communication | A list of 10 questions and answers relating to non- verbal communication. |

***Notes:***
1. Each experiment shall be awarded 20 marks and the total marks secured in all experiments shall be averaged to 20 marks.
2. Attendance mark shall be calculated for 5 marks as per the given norms.
3. Total internal mark is 25 (Record 20 marks + Attendance 5 marks).
4. Observation note is not applicable for this practical.
5. Listening skill exercises: For each exercise under Listening Skill, minimum exercise should be provided for practice and should be recorded in the record note.(as per the tabular column)

Open sources available online on the sites such as
www.youtube.com,
www.letstalk.co.in,
http://www.bbc.co.uk/learningenglish/english/features/6-minute-english, and
https://esl-lab.com/, can be utilized for sessions on improving listening skill.

# SECOND SEMESTER
## 6021 COMMUNICATIVE ENGLISH - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| **6021 COMMUNICATIVE ENGLISH - II** | 4 Hrs | 64 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|---|---|---|
| I | **Functional Grammar and Usage**<br>Application of Modal Verbs<br>Negative Formation (No, Never, Nothing, Hardly, Seldom, No longer,None, Nowhere, Neither … nor)<br>Use of Subordinating ConjunctionsUse of Conditionals<br>Reported Speech (Dialogue to Indirect Speech)Punctuation<br>Synthesis of three or more sentences | 13 |
| II | **English for Enrichment**<br>The Language Game: Unscramble<br>Phrases (Noun Phrase, Verb Phrase, Prepositional Phrase, etc.)Cause and Effect<br>Writing Suitable Responses to the Given Questions<br>Giving Instructions<br>Character sketch | 11 |
| III | **Situational English**<br>Email for Official CommunicationSocial Media Language Reacting to | 11 |

| IV | **Creative English**<br>The Language Game: Word Puzzle GridNotice Writing for the Given Situations Slogan Writing<br>Technical Words<br>Infographics Comprehension<br>Story completion | 11 |
|---|---|---|
| V | **English for Scholarly Presentation / Fluency**<br>"The Lost Child" by Mulk Raj Anand "My Vision for India" by Abdul Kalam "From Lover's Gift" by Rabindranath Tagore"The Flower" by Tennyson | 11 |

(Row above IV: Situations Correction of Sentences Proverbs for Everyday Situations)

**Reference Books:**

**Glossaries**

https://www.engineering-dictionary.com/ https://techterms.com/definition/ http://dictionary.tamilcube.com/ https://www.lexilogos.com/english/tamil_dictionary.htm

**Grammar**
1. Just Enough English Grammar Illustrated, Gabriele Stobbe, McGraw-HillOsborne Media, 2008
2. Visual Guide to Grammar and Punctuation, DK Publishing, 2017
3. English Grammar in Use, Raymond Murphy, Cambridge University Press, 2019
4. Intermediate English Grammar, Raymond Murphy, Cambridge University Press,Second Edition.
5. Essential English Grammar, Raymond Murphy, Cambridge University Press,New edition.

**Enrichment of Study**
1. Enrich Your Vocabulary: Vocabulary for General, Placement & Competitive Exams by Edin Brow

**Motivation**
1. An Autobiography; Or, The Story of My Experiments with Truth, Mahatma Gandhi, Penguin Books, 2001
2. You Can Win, Shiv Khera, New Dawn Press, 2004
3. Chicken Soup for the Soul, Jack Canfield, Mark Victor Hansen, 2001
4. How to Win Friends and Influence People by Dale Carnegie

## QUESTION PAPER PATTERN

**Continuous Assessment Test - I:**

Time: 2 Hrs.　　　　Max. Marks: 50

| Sl. No | Questions | Marks |
|---|---|---|
| 1 | Answer any TEN out of 15 questions | 10 x 5 = 50 |

**Continuous Assessment Test - II:**

Time: 2 Hrs.　　　　Max. Marks: 50

| Sl. No | Questions | Marks |
|---|---|---|
| 1 | Answer any TEN questions | 10 x 5 = 50 |

**Model Examination / Autonomous Examination**

Time: 3 Hrs.　　　　Max. Marks: 100

| Sl. No | Questions | Portions | Marks |
|---|---|---|---|
| 1 | Answer any TEN out of 12 questions | Unit I & II - Grammar items | 10 x 4 = 40 |
| 2 | Answer any FOUR out of 6 questions | Unit III - Composition items | 4 x 5 = 20 |
| 3 | Answer any FOUR out of 6 questions | Unit IV - Composition items | 4 x 5 = 20 |
| 4 | Answer any FOUR out of 6 questions | Unit V - Prose & Poetry | 4 x 5 = 20 |
| | | **TOTAL** | **100** |

# 6022 ENGINEERING MATHEMATICS - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6022 ENGINEERING MATHEMATICS - II** | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| | | | Internal Assessment | External Exam* | Total | |
| | 5 Hrs | 80 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|---|---|---|
| **I** | **ANALYTICAL GEOMETRY** | |
| | **1.1 ANALYTICAL GEOMETRY** Circles - General equation of a circle - Family of circles - Concentric circles - Orthogonal circles (condition only) - contact of circles - simple problems. | 6 |
| | **1.2 CONICS** Definition of a conic, Focus, Directrix and Eccentricity - General equation of a conic $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$.(Statement only) - Condition for conic <br> (i) For circle $a = b$ and $h = 0$ <br> (ii) For pair of straight line : $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0$ <br> (iii) For parabola $\quad : h^2 - ab = 0$ <br> (iv) For ellipse $\quad : h^2 - ab < 0$ and <br> (v) For hyperbola $\quad : h^2 - ab > 0 \quad$ - simple problems. | 8 |
| **II** | **VECTOR ALGEBRA - I** | |
| | **2.1 VECTOR – INTRODUCTION** Definition of vector - types, addition, subtraction and scalar multiplication of vector, properties of addition and subtraction - Position vector - Resolution of vector in three dimensions - Distance between two points - Direction cosines and direction ratios - simple problems. | 7 |
| | **2.2 PRODUCT OF TWO VECTORS** Scalar product - Vector product - condition for parallel and perpendicular vectors - properties - angle between two vectors - Unit vector perpendicular to two vectors - Application of Scalar and Vector product - simple problems. | 7 |
| **III** | **INTEGRAL CALCULUS - I** | |
| | **3.1 INTEGRATION - DECOMPOSITON METHOD** Historical approach for integration - Anti derivative - Definition of the integral as an anti-derivative - Fundamental rules for integration - Integration using decomposition method - simple problems based on Engineering applications. | 5 |
| | **3.2 METHODS OF INTEGRATION - INTEGRATION BY SUBSTITUION** Integrals of the form $\int [f(x)]^n f'(x) dx$, Where $n \neq -1$ $\int \frac{f'(x)}{f(x)} dx$ and $\int F[f(x)] f'(x) dx$ - simple problems. | 5 |
| | **3.3 STANDARD INTEGRALS** Integrals of the form, $\int \frac{dx}{a^2 \pm x^2}$, $\int \frac{dx}{x^2 - a^2}$, $\int \frac{dx}{\sqrt{a^2 - x^2}}$, $\int \sqrt{a^2 - x^2} dx$, $\int \sqrt{x^2 \pm a^2} dx$ - simple problems. | 5 |
| **IV** | **INTEGRAL CALCULUS - II** | |
| | **4.1 METHODS OF INTEGRATION - INTEGRATION BY PARTS** | 4 |

| | | Hrs |
|---|---|---|
| | Integrals of the form $\int x\sin nx\,dx, \int x\cos nx\,dx, \int xe^{nx}dx, \int x^n \log x\,dx,$ and $\int \log x\,dx$ - simple problems. | 5 |
| | **4.2 BERNOULLI'S FORMULA**<br>Evaluation for the integrals $\int x^m \sin nx\,dx, \int x^m \cos nx\,dx, \int x^m e^{nx}dx,$ where $m \le 3$ using Bernoulli's formula - simple problems. | |
| | **4.3 DEFINITE INTEGRALS**<br>Definition of definite integral - Properties of definite integrals - simple problems. | 6 |
| **V** | **APPLICATIONS OF INTEGRATION**<br>**5.1 AREA AND VOLUME**<br>Area and volume - Area of circle - Volume of sphere & cone - simple problems. | 5 |
| | **5.2 FIRST ORDER DIFFERENTIAL EQUATIONS**<br>Solution of first order variable separable type differential equations - Solution of linear type differential equations - simple problems. | 5 |
| | **5.3 SECOND ORDER DIFFERENTIAL EQUATIONS**<br>Solution of second order differential equations with constant co-efficients<br>$(i)\ a\dfrac{d^2y}{dx^2} + b\dfrac{dy}{dx} + cy = 0$<br>$(ii)\ a\dfrac{d^2y}{dx^2} + b\dfrac{dy}{dx} + cy = f(x),\ where\ f(x) = e^{ax}$ - simple problems. | 5 |

**Reference Books:**

1. Higher Secondary +1 Mathematics volume I & II. Tamil Nadu Text Book Corporation.
2. Higher Secondary +2 Mathematics Volume I & II. Tamil Nadu Text Book Corporation.
3. Engineering Mathematics V. Sundaram, R. Balasubramanian.
4. Engineering Mathematics - I C.B.Gupta ,A.K.Malik, New age international Pub., 1st ed, - 2008.
5. Differential Calculus S. Balachandra Rao, CK Shantha New age Publishers
6. Probability Theory and Stochastic Process B.Prabhakara Rao, TSR Murthy, BS Publishers.
7. Vectors and Geometry GS. Pandey, RR Sharma, New age international publishers.
8. Engineering Mathematics - I Guruprasad Samanta, New age int. publishers, 2nd edition 2015
9. Engineering Mathematics Reena Garg, Khanna pub. house, New Delhi, Revised edn. -2018.
10. Engineering Mathematics Volume I P. Kandasamy and K. Thilagavathy, S. Chand & Co. Ltd.

**QUESTION PAPER PATTERN: General Pattern**

# 6023 ENGINEERING PHYSICS - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6023 ENGINEERING PHYSICS - II** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 5 Hrs | 80 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|---|---|---|
| **I** | **HEAT**<br>**1.1 TRANSFER OF HEAT**<br>Concept of Heat and temperature - Celsius, Fahrenheit and Kelvin scales of temperature - Conduction, convection and radiation - Definitions and explanations - Good and poor thermal conductors - Examples - Coefficient of thermal conductivity - Definition and its SI unit - Properties of thermal radiation - Heat conversions. | 5 |
| | **1.2 KINETIC THEORY OF GASES**<br>Postulates of kinetic theory of gases - Mean square velocity and Root Mean Square (RMS) velocity of molecules - Definitions and expressions - Expression for the pressure of a gas on the basis of postulates of kinetic theory of gases - | 5 |

| | | |
|---|---|---|
| | Relation between pressure and kinetic energy of the gas - Relation between kinetic energy and absolute temperature of the gas - Simple problems based on the expression for the pressure of a gas.<br>**1.3 SPECIFIC HEAT CAPACITY**<br>Specific heat capacity of a substance (solids and liquids) - Definition - Specific heat capacity of a gas at constant pressure - Specific heat capacity of a gas at constant volume - Ratio of specific heat capacities - Explanation for $C_p$ is greater than $C_v$ - Derivation of Mayer's relation - Calculation of Universal gas constant R from the gas equation (PV = RT) - Simple problems based on Mayer's relation. | **5** |
| II | **THERMODYNAMICS, LIQUEFACTION OF GASES AND NON-CONVENTIONAL ENERGY**<br>**2.1 THERMODYNAMICS**<br>Concept of internal energy - First law of thermodynamics - Statement - Concept of indicator diagram (PV Diagram) - Isothermal and adiabatic change - Explanation - Equation for isothermal and adiabatic change (No derivation) - Simple problems based on equations P1V1 = P2V2 and $P_1V_1^\gamma = P_2V_2^\gamma$ - Second law of thermodynamics - Clausius statement and Kelvin's statement - Working of Carnot engine with PV diagram - Efficiency of Carnot engine - Applications of heat and thermodynamics. | **6** |
| | **2.2 LIQUEFACTION OF GASES**<br>Difference between gas & vapour - Critical temperature, critical pressure & critical volume - Definitions - Principle used in Cascade process - Cascade process of liquefaction of oxygen - Disadvantages of Cascade process - Joule Thomson effect - Temperature of inversion - Liquefaction of air by Linde's process. | **4** |
| | **2.3 NON-CONVENTIONAL ENERGY**<br>Introduction - Non-renewable and Renewable (Alternate) energy sources - Examples - Solar energy - Wind energy - Tidal energy – Advantages and disadvantages of renewable energy. | **4** |
| III | **LIGHT**<br>**3.1 OPTICS**<br>Reflection - Laws of reflection - Refraction - Laws of refraction - Refractive index of a medium - Definitions - Derivation of refractive index of glass prism using minimum deviation - Spectrometer - Experimental determination of refractive index using spectrometer - Phenomenon of total internal reflection - Applications of total internal reflection - Fiber optics - Introduction - Optical Fiber Cable as a wave guide - Advantages of OFC - Problems based on refractive index. | **6** |
| | **3.2 LASER**<br>LASER - Characteristics of LASER - Principle of LASER - Spontaneous emission - Stimulated emission - Population inversion - Ruby Laser - Construction and working - Uses of LASER. | **4** |
| | **3.3 REMOTE SENSING**<br>Introduction - Active and passive remote sensing - Explanation and examples - Components of remote sensing - Data acquisition and data analysis - Reference data - RADAR - Principle and working with block diagram. | **4** |
| IV | **ELECTRICITY**<br>**4.1 ELECTRICAL CIRCUITS**<br>Ohm's law - Laws of resistances - Resistivity, conductivity, super conductivity and Meissner effect - Definitions - Kirchhoff's current and voltage laws - Condition for balancing the Wheatstone's bridge - Simple problems based on expression for resistivity - Capacitance of a capacitor - Definition - 'farad' - Definition - Expressions for effective capacitance when capacitors are connected in series and in parallel - Simple problems based on effective capacitance of capacitors connected in series and in parallel - Applications of capacitors. | **5** |
| | **4.2 EFFECTS OF CURRENT**<br>Joule's law of heating - Experimental determination of specific heat capacity of a liquid using Joule's calorimeter - Faraday's laws on electrolysis - Electro chemical equivalent (e.c.e) of an element - Definition - Experimental determination of e.c.e. | **4** |

| | | |
|---|---|---|
| of copper - Simple problems based on expressions for e.c.e - Applications of heating effect of electric current.<br><br>**4.3 ELECTROMAGNETIC INDUCTION**<br>Introduction - Magnetic flux - Faraday's experiments on electromagnetic induction - Lenz's law - Fleming's right hand rule - Self induction and mutual induction (definitions) - Applications of electromagnetic induction.<br><br>**4.4 MEASURING INSTRUMENTS**<br>Expression for the force acting on a current carrying straight conductor placed in a uniform magnetic field - Fleming's Left Hand rule - Expression for the torque experienced by a rectangular current carrying coil placed inside a uniform magnetic field - Working of a moving coil galvanometer and its merits - Conversion of galvanometer into an ammeter and voltmeter - Simple problems based on conversion of galvanometer into ammeter and voltmeter. | | **2**<br><br><br><br>**4** |
| **V** | **ELECTRONICS**<br>**5.1 SEMICONDUCTORS**<br>Introduction - Energy bands in solids - Energy band diagram of good conductors, insulators and semiconductors - Concept of Fermi level - Types of semiconductors - Intrinsic semiconductors - Concept of holes - Doping - Extrinsic semiconductors - P type and N type semiconductors.<br><br>**5.2 DIODES AND TRANSISTORS**<br>PN junction diode - Forward bias and reverse bias - Rectification action of diode - Working of full wave bridge rectifier using PN junction diodes - PNP and NPN transistors - Three different configurations - Working of NPN and PNP transistor in common base configuration.<br><br>**5.3 DIGITAL ELECTRONICS**<br>Digital electronics - Introduction - Logic levels - Basic logic gates - OR, AND, NOT gates - Universal logic gates - NAND and NOR gates - Symbolic representation, Boolean expression and truth table for all the above logic gates - Integrated circuits - Levels of integration - SSI, MSI, LSI and VLSI - Advantages of ICs - Applications of transistors, gates and ICs. | **5**<br><br><br><br>**5**<br><br><br><br>**5** |

### Reference Books:

1. Fundamentals of Physics - Halliday & Resnick - Wiley India Pvt. Ltd. - Sixth Edition
2. Fundamentals of Magnetism and Electricity - D.N. Vasudeva - S. Chand Publishing - 5th Ed.
3. Physics for Higher Secondary - First & Second year - Volume I & II - Tamilnadu Textbook and Educational Services Corporation 2018
4. Non-conventional energy sources - G.D. Rai - Khanna Publishers - Sixth Edition
5. Textbook of Remote Sensing and Geographical Information Systems - M. Anji Reddy - BS Publications - Fourth Edition.

**QUESTION PAPER PATTERN: General Pattern**

# 6024 ENGINEERING CHEMISTRY - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| 6024 ENGINEERING CHEMISTRY - II | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| | | | Internal Assessment | External Exam* | Total | |
| | 5 Hrs | 80 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|---|---|---|
| **I** | **ENVIRONMENTAL CHEMISTRY**<br>**1.1 AIR POLLUTION**<br>Pollution and air pollution – Definition - Air pollutants ($SO_2$, $H_2S$, HF, CO and dust) - Harmful effects - Formation of acid rain - Harmful effects - Green house effect - Causes - Global warming - Harmful effects - Ozone layer - Importance - Causes for depletion of ozone layer (No equations) - Harmful effects of Ozone | **6** |

| | | |
|---|---|---|
| | layer depletion - Control of air pollution. | 5 |
| | **1.2 WATER POLLUTION** | |
| | Causes of water pollution - (Sewage, Effluents, Algae and Micro-organisms) - Sewage - Definition - Problems and disposal of sewage - Industrial effluents - Harmful effects of heavy metal ions (Lead, Cadmium, Zinc and Copper) - Treatment of effluents - Eutrophication - Definition and harmful effects. | 3 |
| | **1.3 SOLID WASTE MANAGEMENT** | |
| | Solid waste - Definition - Problems - Types of solid waste - Methods of disposal - Land fill and incineration. Recycling - Definition - Examples - Advantages of recycling (Basic concepts). | |
| | **1.4 GREEN CHEMISTRY** | 1 |
| | Definition - Goals of Green Chemistry (Basic concepts) | |
| II | **POLYMER CHEMISTRY** | |
| | **2.1 PLASTICS** | 8 |
| | Plastics - Definition - Types of polymerization - Addition polymerization - Formation of polythene - Condensation polymerization - Formation of Bakelite - Types of plastics - Thermoplastics and thermosetting plastics – Differences - Mechanical properties of plastics - Advantages of plastics over traditional materials (wood and metal) - Specific uses of some plastics (Bakelite, PVC, Nylon & Urea-formaldehyde) - Polymers in surgery - Biomaterials - Definition - Biomedical uses of polyurethane, PVC, Polypropylene and Polyethylene. | |
| | **2.2 RUBBER** | |
| | Rubber - Definition - Preparation of natural rubber from latex - Defects of natural rubber - Compounding of rubber - Ingredients and their functions - Vulcanization of rubber - Definition and purpose - Synthetic rubber - Buna-S, Thiokal, Neoprene - Reclaimed rubber - Definition - Process - Properties and uses. | 6 |
| III | **FUELS, ROCKET PROPELLANTS AND REFRACTORY** | |
| | **3.1 FUELS** | 6 |
| | Fuel - Definition - Calorific value of fuels - Classification - Solid fuels - Wood - Coal - Varieties of coal - Composition - Specific uses - Liquid fuels - Refining of petroleum - Fractional distillation - Cracking (concept only) - Liquid hydrogen - Gaseous fuels - Preparation, composition and specific uses of producer gas and water gas - Composition and uses of LPG - Advantages of gaseous fuels - comparison of solid, liquid and gaseous fuels. | |
| | **3.2 ROCKET PROPELLANTS** | |
| | Definition - Characteristics - Classification of propellants - brief account of solid and liquid propellants with example. | 4 |
| | **3.3 REFRACTORY** | |
| | Definition - Requirements of a good refractory - Classification - Acidic, basic and neutral refractory - Examples and uses - Uses of fire clay bricks, Alumina bricks and Silica bricks. | 4 |
| IV | **METALLURGY, EXTRACTION OF METALS, ALLOYS, LIME AND CEMENT** | |
| | **4.1 METALLURGY** | 5 |
| | General principles of metallurgy - Minerals, ores, gangue, flux, slag - Metallurgical processes - Concentration of the ore (gravity separation, froth floatation process and magnetic separation) - Chemical methods of purifying ore (roasting, calcination, smelting ) - Refining - Electrolytic refining, Van Arkel method, Distillation method. | |
| | **4.2 EXTRACTION OF METALS** | 2 |
| | Extraction and uses of tungsten and titanium. | |
| | **4.3 ALLOYS** | 4 |
| | Definition - Purpose of alloying - Types - Ferrous alloys - Composition and uses of Stainless steel, Chromium steel and Vanadium steel - Non-ferrous alloys - Composition and uses of Brass, Dutch metal (German silver), Bronze (Gunmetal), Nickel alloys (Nichrome), Aluminium alloys (Duralumin). | |
| | **4.4 LIME AND CEMENT** | 4 |
| | Lime - raw materials used for lime - Manufacture of hydraulic lime by continuous | |

| | | |
|---|---|---|
| | vertical kiln process - properties - slaking, plasticity and setting. Cement - Definition - Manufacture of portland cement - Wet process - Setting of cement (No equation). | |
| V | **CORROSION AND PREVENTION OF CORROSION**<br>**5.1 CORROSION**<br>Definition - Types of corrosion - Theories of corrosion - Galvanic cell formation theory - Differential aeration theory - Factors influencing the rate of corrosion. | **5** |
| | **5.2 METHODS OF PREVENTION OF CORROSION**<br>Control of environment - Alloying - Surface coatings - Metal coatings - Electroplating, galvanization and tinning - Inorganic coating - Anodisation and phosphate coating - Cathodic protection - Sacrificial anode method and impressed voltage method. | **5** |
| | **5.3 ORGANIC COATINGS**<br>Paint - Definition - Components of paints - Varnish - Definition - Types - Preparation of oil varnish - Differences between paint and varnish - Special paints - Luminescent paint, fire retardant paint, aluminium paint and distemper. | **5** |

**Reference Books:**
1. Introduction to Engineering Chemistry, Shradha Sinha , S S Dara & SudhaJain, S.Chand Publishers, 2004.
2. Engineering Chemistry, S S Dara, Sudha Jain & Shradha Sinha, S.Chand Publishers,2005.
3. A Textbook of Engineering Chemistry, Dr. Uday Kumar, 2013.
4. Chemistry - Higher Secondary - I & II year, Vol. I & II, Tamil Nadu Text Book Corporation 2018.
5. Engineering Chemistry Fundamentals and Applications, Shikha  Agarwal, Cambridge University Press, 2019.
6. Electrochemistry and Corrosion Science, Nestor Perez.
7. Indian Minerals Year book 2011.

**QUESTION PAPER PATTERN: General Pattern**

# 6025 ENGINEERING GRAPHICS - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| 6025<br>ENGINEERING  GRAPHICS –<br>II | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| | 5 Hrs | 80 Hrs | Internal Assessment | External Exam* | Total | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**Note:** While practicing, usage of drawing instruments like drawing board, mini drafter, compass, divider, drawing clips / cello tape, H, 2H and HB grade drawing pencils, eraser etc., are mandatory for class work and examinations. Size of drawing sheet recommended: A2 size (420 x 594 mm). Use both sides of drawing sheets for practice.

| Unit | Name of the Topics | Hrs |
|---|---|---|
| I | **CONSTRUCTION OF POLYGONS AND PROJECTION OF PLANES**<br>**1.1 CONSTRUCTION OF POLYGONS**<br>Construction of regular polygon: triangle, square, pentagon and  hexagon - various positions - side of the polygon is parallel, perpendicular and inclined to principal planes. | **6** |
| | **1.2 PROJECTION OF PLANES**<br>Projection of planes - rectangle, square, hexagon and circle – plane parallel to HP and perpendicular to VP - plane parallel to VP and perpendicular to HP - plane perpendicular to both HP and VP - plane parallel to both the planes - simple exercises. | **9** |
| II | **PROJECTION OF SOLIDS AND SECTION OF SOLIDS**<br>**2.1 PROJECTION OF SOLIDS IN SIMPLE POSITIONS**<br>Introduction - important terms - classification of solids - triangular and hexagonal | **6** |

| | | |
|---|---|---|
| | prisms and pyramids - solids of revolution - cylinder & cone - projection of solids in simple positions - axis parallel to one plane & perpendicular to other plane.<br>**2.2 PROJECTION AND SECTION OF SOLIDS**<br>**2.2.1 PROJECTION OF SOLIDS**<br>Position of solid - axis inclined to one plane and parallel to other plane - axis parallel to both planes - simple exercises.<br>**2.2.2 SECTION OF SOLIDS**<br>Need for section view - cutting plane - cutting plane line - representation as per BIS code - Hatching line - true section - section of simple solids - triangular and hexagonal prisms and pyramids, cylinder, cone - position of solids - axis perpendicular to one plane and parallel to other plane - position of cutting planes - cutting plane perpendicular to one plane and parallel to another plane - cutting plane perpendicular to one plane and inclined to another plane - true shape - exercises. | **14** |
| III | **DEVELOPMENT OF SURFACES**<br>**3.1 DEVELOPMENT OF REGULAR SOLIDS**<br>Need for preparing development drawing with reference to sheet metal work - procedure for preparing development drawing of prism, pyramid, cylinder and cone - exercises in rectangular, square and hexagonal prisms and pyramids - exercises in regular cylinder and cone. | **6** |
| | **3.2 DEVELOPMENT OF COMPONENTS**<br>Cutting plane - cutting plane line - development of truncated prism and cylinder - frustum of pyramid and cone - development of simple engineering components such as elbow, ducts, lamp shade and funnel. | **9** |
| IV | **MISSING VIEWS AND ISOMETRIC PROJECTIONS**<br>**4.1 MISSING VIEWS**<br>Reading a drawing - missing views - visualization - possible view problems - Drawing a missing view or third view (Draw missing view only) - simple exercises. | **9** |
| | **4.2 ISOMETRIC PROJECTIONS**<br>Introduction - isometric view - isometric projection - methods of drawing an isometric view - box method - construction of arcs and circles - four centre method for drawing ellipse - construction of isometric drawing of components from the given orthographic views - simple exercises. | **14** |

**Reference Books:**
1. Bhatt N.D, "Engineering Drawing", Charotar Publishing House Pvt. Ltd.
2. Gill P.S, "Engineering drawing", S.K.Kataria & Sons.
3. Gopalakrishna.K.R., "Engineering Drawing", (Vol 1 & 2 combined), Subhas Publications.
4. Venugopal.K, Prabhu Raja V, "Engineering Graphics", New Age International Publishers.
5. Natarajan K V "A Text Book of Engineering Drawing and Graphics" Publisher: N Dhanalakshmi.
6. Shah M B, Rana B C, "Engineering Drawing", Pearson.
7. Basant Agrawal, Agrawal C M "Engineering Drawing", McGraw hill HED.
8. Parkinson A C, "First Year Engineering Drawing", Sir Isaac Pitman & Sons Ltd.
9. Thomas E. French, Charles J. Vierck, "The Fundamentals of Engineering Drawing", McGraw Hill.

## QUESTION PAPER PATTERN

### PART – A (4x5 = 20)

Note: Five questions will be asked (Sl. No: 1 to 5). Answer any four questions.
Each question carries five marks.
Minimum one question should be asked from each unit first chapter.
(Chapters: 1.1, 2.1, 3.1, 4.1)

### PART – B (4x20 = 80)

Note: Six questions will be asked (Sl. No: 6 to11). Answer any four questions.
Each question carries twenty marks.
Minimum one question should be asked from each unit second chapter. (Chapters: 1.2, 2.2, 3.2, 4.2)

**INTERNAL ASSESSMENT**

| | |
|---|---|
| Class work assignment drawings | 10 |
| Average of two continuous assessment tests | 05 |
| Model examination | 05 |
| Attendance | 05 |
| **Total** | **25** |

## 6026 ENGINEERING PHYSICS PRACTICAL - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| **6026 ENGINEERING PHYSICS PRACTICAL - II** | 2 Hrs | 32 Hrs | **Internal Assessment** | **External Exam*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**LIST OF EXPERIMENTS WITH OBJECTIVES:**

1. SOLAR CELL - To study the VI characteristics of the given solar cell.

2.  REFRACTIVE INDEX- To determine the refractive index of water using travelling microscope

3. LAWS OF RESISTANCES - To verify the laws of resistances using Ohm's law.

4. METRE BRIDGE - To determine the unknown resistance of the given wire using metre bridge.

5. POTENTIOMETER-        To compare the emfs of the given two cells.

6. JOULE'S CALORIMETER - To determine the specific heat capacity of water using Joule's calorimeter.

7. TANGENT GALVANOMETER -   To determine the value of the horizontal component of the earth's magnetic field using tangent galvanometer.

8. PN JUNCTION DIODE -  To study the voltage-current characteristics of the given PN junction diode in forward bias and to find its dynamic forward resistance.

9. TRANSISTOR CHARACTERISTICS -    To study the transfer characteristics of the given NPN transistor in common emitter configuration and to find its current gain.

10. LOGIC GATES -  To find the output conditions for different combinations of the input for NOT gate and 2 inputs AND, OR, NAND & NOR logic gates using IC chips.

**QUESTION PAPER PATTERN**

Answer any one of the above experiment chosen by random method. The marks will be awarded as per the scheme of valuation given below.

**SCHEME OF VALUATION**

| S. No | Category | Marks |
|---|---|---|
| 1 | Formula and diagram | 20 |
| 2 | Tabulation | 10 |
| 3 | Observation | 40 |
| 4 | Calculation | 15 |
| 5 | Result | 10 |
| 6 | Viva voce | 05 |
| | Total | **100** |

## 6027 ENGINEERING CHEMISTRY PRACTICAL - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | EXAMINATION |
|---|---|---|

| 6027 ENGINEERING CHEMISTRY PRACTICAL - II | Hrs / Week | Hrs / Sem | Marks | | | Duration |
|---|---|---|---|---|---|---|
| | | | Internal Assessment | External Exam* | Total | |
| | 2 Hrs | 32 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## QUALITATIVE ANALYSIS;

**ACID RADICALS**: 1. Carbonate   2. Chloride    3. Nitrate   4. Sulphate

**BASIC RADICALS**:

| S.No | Radicals |
|---|---|
| 1 | Lead |
| 2 | Copper |
| 3 | Aluminium |
| 4 | Zinc |
| 5 | Barium |
| 6 | Calcium |
| 7 | Magnesium |
| 8 | Ammonium |

## ANALYSIS OF INORGANIC SIMPLE SALT:

Analysis of eight inorganic simple salts containing any one acid radical and basic radical without omitting any of the above mentioned radicals

### QUESTION PAPER PATTERN

Answer any one of the above Inorganic simple salt chosen by random method. The marks will be awarded as per the scheme of evaluation.

### SCHEME OF VALUATION

| Description | Marks |
|---|---|
| Identification procedure of acid radical with systematic procedure | **45** |
| Identification procedure of basic radical with systematic procedure | **45** |
| Viva voce | **10** |
| **Total** | **100** |
| **Without systematic procedure** | |
| Identification of acid radical with confirmatory test only | **45** |
| Identification of basic radical with confirmatory test only | **45** |
| Mere spotting of acid radical and basic radical (5+5) | **10** |
| Writing systematic procedure without correct radicals | **20** |

# 6028 BASICS OF INDUSTRIES AND WORKSHOP PRACTICAL - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| **6028 BASICS OF INDUSTRIES AND WORKSHOP PRACTICAL - II** | Theory *: 2 Practical: 3 | 80 Hrs | **Internal Assessment** | **External Exam\*\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\*  Theory Portion common for all branches.**
**\*\* Examination will be conducted for 100 marks (45 Marks Theory and 55 Marks Practical) and the marks obtained will be converted into 75 marks.**

**Topics and Allocation of Hours:**

| Unit | Name of the Topics | Hrs |
|------|--------------------|-----|
| **A: THEORY PORTION** | | |
| I | BASICS OF INDUSTRIES | 6 |
| II | INDUSTRIAL SAFETY MEASURES AND MAINTENANCE | 6 |
| III | QUALITY AND STANDARDS | 6 |
| IV | BASICS OF ENGINEERING | 8 |
| V | INDUSTRY 4.0 | 6 |
| **B: PRACTICAL PORTION** | | 48 |
| | **Total** | **80** |

## BASICS OF INDUSTRIES:

| Unit | Name of the Topics | Hrs |
|------|--------------------|-----|
| **I** | **BASICS OF INDUSTRIES**<br>Industry - Need of Industrialization - Classification - Factors influences the location of the Industries - Types of Industries: Small scale, Medium scale and Large scale industries - Procedure to start up an Industry.<br>Manufacturing Industry - Overviews - Global manufacture.<br>Engineering Industry: Introduction - Engineering materials – Products of various engineering sectors. | 6 |
| **II** | **INDUSTRIAL SAFETY MEASURES AND MAINTENANCE**<br>Industrial safety - Importance - Safety activities - Safety equipment - Health and safety procedure - Personnel protective devices - Safe working practices - Structural collapse - Safety signs.<br>Accident - Causes - Prevention of accidents - Electric shock- Safety precautions against electric shock - Significance of first aid.<br>Plant Maintenance: Introduction - Objectives - Importance.<br>Maintenance practices: Breakdown maintenance - Preventive maintenance - Scheduled maintenance - Predictive maintenance -Standard data for maintenance.  TPM: Introduction - Objectives - Steps of TPM process. | 6 |
| **III** | **QUALITY AND STANDARDS**<br>Definition of quality - Quality control - Quality assurance - Modern management techniques - Just In Time (JIT) - Total Quality Management (TQM) - Introduction - PDSA cycle - Kaizen - TQM Tools -Bench marking - Quality circle - Zero Defect Concept - 5S principle - Sort, Set in order, Shine, Standardise and Sustain - Necessity of 5S - Six Sigma - Essential  elements - Methodologies - Six sigma belt - SWOT analysis.<br>BIS for construction - National Building Code - ISO standards - ISI Standards - Intellectual property rights - Engineering Ethics -.Brief description only. | 6 |
| **IV** | **BASICS OF ENGINEERING**<br>Tolerance - Limits - Deviation - Allowance - Definitions only - Types of tolerances: Unilateral, Bilateral - Fits - Types of fits.<br>Types of structures - List of materials used for building construction - Requirements of water for construction. Mortar: Types and its properties. Concrete: Constituents – Requirements - Types of grouting materials - Types of roofing - Types of foundation - requirements of good foundation - Standard sizes of doors  and windows. Weathering course: Purpose - Materials required.  Earthquake: Types of earth quake and its remedial measures. Rain water harvesting - Types - Importance.<br>EMF - Current - Potential difference - Electric power - Definitions only. Wiring - Types of wires - Internal wiring - Cleat wiring - Surface conduit wiring - Concealed conduit. | 8 |

| V | **INDUSTRY 4.0**<br>Industrial revolution - Definition – History - Industry 4.0 - Definition - Design principles and goals - Industry 4.0 technologies - Big data - Cloud computing - Internet of Things (IoT) - Simulation - Autonomous robots - Augmented reality - Cyber security - System integration - Additive manufacturing.<br>Evolution of Industry 4.0 - Global readiness - Global trend - Initiative by Industries and Government - Importance of Industry 4.0. | **6** |

**Reference Books:**
1. Industrial Organisation and Engineering Economics - "T.R.Banga, S.C. Sharma"-Khanna Publishers
2. Industrial Engineering and Management "O.P. Khana" - Dhanbat Rai Publications.
3. Machine Drawing - K.L.Narayana, P.Kannaiah, K.Venkata reddy - New Age International Publishers.
4. Elements of Civil Engineering - Bhavikatti
5. A Text Book of Electrical Technology - B.L. Theraja, A.K. Theraja - S.Chand & Company Ltd.
6. Testing, Commissioning, Operation and Maintenance of Electrical Equipments - S.Rao - Khanna Publishers.
7. A Course in Electrical Power by Soni & Gupta - Dhanbat Rai & Sons, New Delhi.

**INTERNAL ASSESSMENT**

| | |
|---|---|
| Assignment (Theory portion)* | 10 marks |
| Practical (Observation (5) and Record work (5)) | 10 marks |
| Attendance | 05 marks |
| **Total** | **25 marks** |

**Note: Three assignments will be given and the marks will be converted to 10 marks.**
- ➢ First assignment - Unit I & II
- ➢ Second assignment - Unit III & IV
- ➢ Third assignment - All Units

Each assignment should have five two marks questions and two five marks questions.

## *END SEMESTER EXAMINATION*

**Note:**
1. The students should maintain theory assignment, observation note book / manual and record notebook. The assignment and record note book should be submitted during the Practical Examinations.
2. The question paper consists of theory and practical portions. All students should write the answers for theory portions (45 Marks) and practical portion (55 Marks).
3. For theory portions:
   Ten questions (2 from each unit) will be asked for 2 marks each. (10 x 2 = 20)
   Five questions (2 from each unit) will be asked for 5 marks each. (5 x 5 = 25)

# 6028C WORKSHOP PRACTICAL - II

## I. PLUMBING
Introduction of Plumbing tools                                              04 Hrs

**Exercises:**                                                            **12 Hrs**
1. Cutting, bending and external threading of GI pipes using Die.
2. Install a sink & tap using different PVC pipe accessories such as bend, tee, socket and valve.
3. Install a washbasin & tap using different PVC pipe accessories such as bend, tee, socket & valve.
4. To Repair and replace all kinds of leaks.

## II. CARPENTRY
Introduction of Carpentry tools                                            04 Hrs

**Exercises:** **12 Hrs**
1. Planning & check up
2. Cross lap joint
3. Mortise and Tenon joint
4. Dovetail joint

CROSS HALF LAP JOINT

42
20
42
125
10
20
125
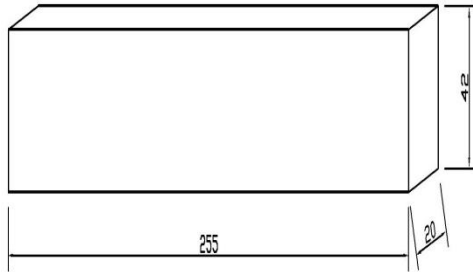
PLANNING AND CHECKING

All dimensions are in 'mm', Size :261h×45x25 mm

All dimensions are in 'mm',

42
255
20
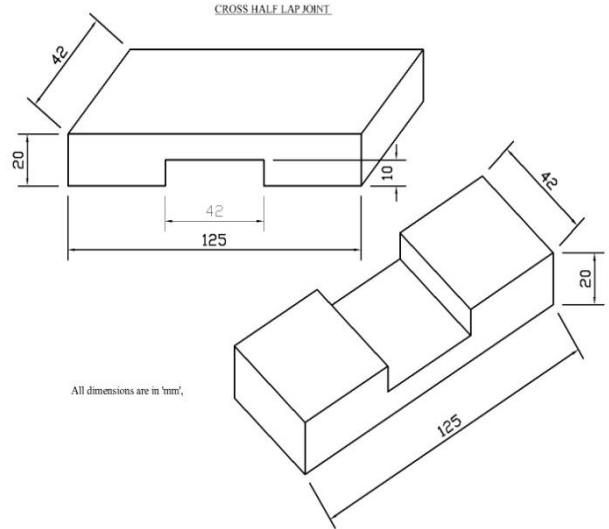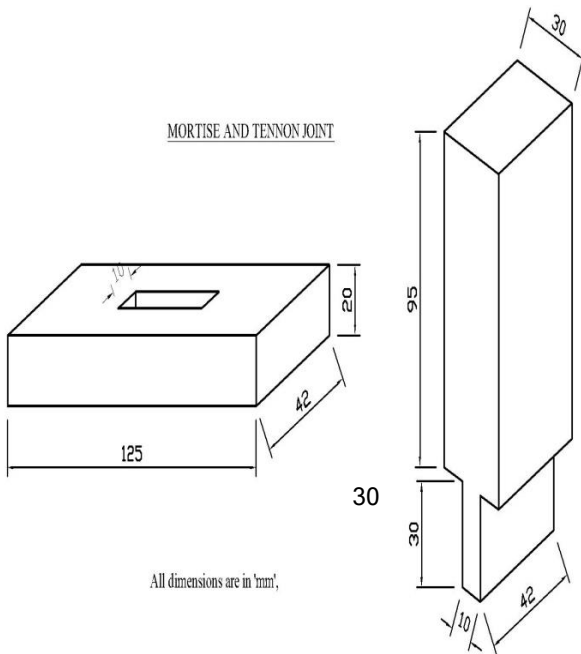
MORTISE AND TENNON JOINT

30
95
20
125
42
30
30
42
10

All dimensions are in 'mm',
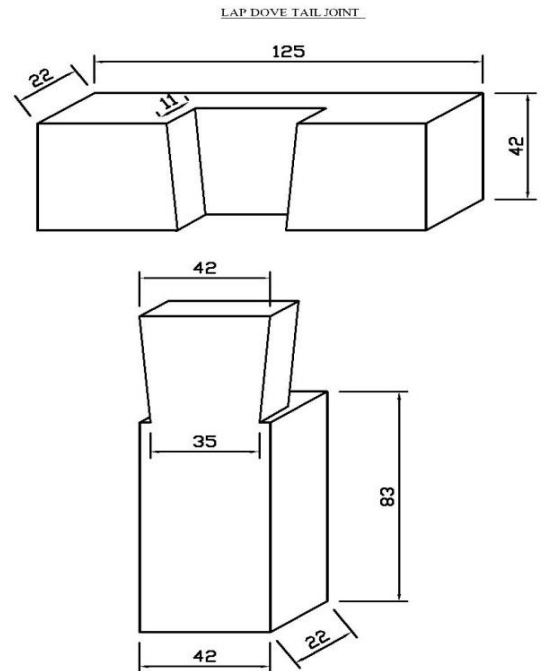
LAP DOVE TAIL JOINT

125
22
11
42
42
35
83
42
22

### III. WIRING
Introduction to Wiring Tools **04 Hrs**

**Exercises:** **12 Hrs**
1. One LED lamp controlled by one switch.
2. Two LED lamps controlled by one-way switch in series connection.
3. Two LED lamps controlled by one-way switch in parallel connection.
4. Draw the circuit and execute the Stair case wiring.

### QUESTION PAPER PATTERN

| | | |
|---|---|---|
| A. Theory Question and Answer (5 x 9 = 45 Marks) | | 45 Marks |
| B. Plumbing Exercise | | 30 marks |
| C. Carpentry or Wiring (Any one) Exercise | | 20 marks |
| Viva voce | | 05 marks |
| | Total | 100 marks |

# 6002 COMPUTER APPLICATIONS PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6002 COMPUTER APPLICATIONS PRACTICAL** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | | | **Internal Assessment** | **External Exam\*** | **Total** | |
| | 2 Hrs | 32 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

| Unit | Name of the Topics | Hrs |
|---|---|---|
| I | **Basics of Computer:** Computer basics - Hardware & software - General understanding of various computer hardware components - CPU - Memory - Display - Keyboard - Mouse - HDD & Other peripheral devices - Types of software - Application software & system software. | 5 |
| II | **Word Processing:** Creating new document - Opening an existing document - Edit & save a document - Typing a text - Deleting a text - Inserting a text - Finding a text - Replacing a text - Copying & moving a text - Selecting font & font size - Justifying texts - Bold - Italic - Underline - Strike - Double strike - Coloring text - Spell check - Ruler - Formatting page - Line spacing - Margins - Page size - Page border - Page color - Page columns - Watermark - Page break - Section break - Portrait - Landscape - Inserting symbols, equations & shapes - Text Box - Word art - Hyperlink - Inserting pictures - Picture arrangement - Align objects - Bullets & numbering - Working with tables - Header & footer - Table of contents - Inserting page number - Changing character width & line spacing - Printing the document - Print preview - Shortcuts for various activities in word - Exercises. | 9 |
| III | **Spread sheet:** Creating a new worksheet - Opening an existing worksheet - Editing and saving a worksheet - Creating, renaming and deleting worksheets in a workbook - Types of data like numeric, text etc. - Entering in a cell - Manipulation of a cell, row and column (deleting, inserting, finding, replacing, copying and moving) - Justifying in a cell, Merging cells and columns - Addition, subtraction and using formula - Selecting font and font sizes - Using and manipulating tables, inserting / deleting of rows and columns – Sorting columns- Using header and footer, Inserting page number - Border and shading of cells, rows and columns - Formatting page, margins, page size, portrait and landscape - Selecting area for printing - Printing of a worksheet and workbooks - Using print preview - Copy / moving text between two different worksheets and workbooks - Using chart wizard - Creation of different types of charts - Protect sheet using password - Shortcuts for various activities in spreadsheet - Exercises. | 9 |
| IV | **Presentations:** Creating new presentations - Opening presentations - Saving presentation - Inserting new slides - Slide layout - Slide design - Presentation view - Adding text - Font formatting - Paragraph formatting - Inserting clipart & pictures - Inserting and manipulating smart art - Running a slide show - Insert slide number - Slide header & footer - Applying slide animation - Custom animation - Inserting shapes - Insert Video & sound - Insert action - Hyperlinks - Charts - Tables - Page setup - Print preview - Printing - Shortcuts of various activities in presentations - Exercises. | 9 |

| | |
|---|---|
| Theory & Instruction Classes | 08 Hours |
| Practical Experiments | 20 Hours |

| Revision / Repetition | 04 Hours |
|---|---|
| **Total** | **32 Hours** |

## EXERCISES

### EXERCISE 1    (WORD PROCESSING)

Prepare a report from the given printed document of minimum 250 words. (Use text formatting tools, header & footer, page number, line spacing, font & images)

- **Page Setup:** Set Margin: Left - 1.5, Right - 1.5, Top - 1.5 & Bottom - 1.5 / Orientation: Portrait / Paper Size: A4 / No. of Columns: 2.
- **Page Background Settings**: Watermark / Page Color / Page Borders
- **Text & Paragraph Settings:** Title: Font size: 16 - Centered - Bold - Suitable font - Heading: Font size: 14 - Left aligned - Underlined - Set the suitable font face - Body text: Font size: 12 - Justified - 1.5 Line spacing - Set the suitable font face.
- **Header & Footer:** Header - Seminar name, Name of the student, Reg. No. & Branch Footer - Page No., Date and Time
- **Insert:** Picture / Clipart / Shapes / Table.
- **Minimum No. of words:** 250 words

### EXERCISE 2    (WORD PROCESSING)

Create a resume for placement from the given printed template with your personal details. Publish a copy of the resume as PDF.

- **Page Setup:** Margin: Left - 0.5, Right - 0.5, Top - 0.5 & Bottom - 0.5 / Orientation:  Portrait / Paper size: A4 / No. of columns: As per resume format.
- **Page Borders:** Insert page border if required.
- **Font & Paragraph:** Heading: Font size: 12 - Bold - Underlined - Set the suitable font - Face body text - Font size: 12 - Justified - 1 Line spacing - Set the suitable font - Insert bullets & numberings wherever required.
- **Insert:** Photo for your resume / tables.
- **Save as PDF:** Publish a copy of the resume as PDF using any PDF converting tools.

### EXERCISE 3        (WORD PROCESSING)

Create a standard covering letter and use mail merge to generate the customized letters for applying to a job in various organizations. Also, create a database and generate labels for the applying organizations.

- **Page Setup:** Margin: Left - 1.5, Right - 1.5, Top - 1.5 & Bottom - 1.5 / Orientation: Portrait / Paper Size: A4
- **Page Background:** Add page border for the letter.
- **Font & Paragraph:** Title: Font size: 16 - Centered - Bold - Suitable font - Heading: Font size: 14 - Left Aligned - Underlined - Set the suitable font face , Body text: Font size: 12 - Justified - 1.5 Line spacing - Set the suitable font face.
- **Mailings:** Select recipients and add a new List of HR database. Start mail merge through step by step mail merge wizard

### EXERCISE 4 (SPREAD SHEET)

Create a worksheet for the given relational data (minimum ten records) and show the data in the Line chart, Bar chart and Pie chart.

- **10 Records:** Add text to the sheet to the various fields require to analyze the data in chart.
- **Font & Alignment:** Font face - Font size - Font color.
- **Formulae:** Use formulae for the selected data for calculation.
- **Insert:** Charts - Line chart, Bar chart & Pie chart.

### EXERCISE 5 (SPREAD SHEET)

Create a worksheet for the given data with various functions like sum, average, count, min, max & logical functions [IF, AND].

- **Data:** Create a worksheet and insert the various records to the cells.
- **Formatting:** Set the font using font name, font size and with various alignment tools.

- **Formulas and Functions:** Use some functions like sum, average, count, min, max and logical functions. [IF, AND]

## EXERCISE 6 (SPREAD SHEET)

Create a worksheet for the given data and analysis the data with various filters and conditional formatting.

- **Data**
- **Formatting** Text: Font Face - Font Size - Font Color - Alignment
- **Functions**
- **Conditional Formatting**
- **Filters**

## EXERCISE 7 (PRESENTATION)

Create a presentation of minimum 10 slides from engineering related topic.

- **Design & Layout:** Add a suitable Theme and Layout according to the content of all 10 slides.

- **Header & Footer:** Header: Insert the title & author; Footer: Insert the date & slide number
- **Font & Paragraph:** Font Face - Font Size - Font Color - Alignment - Bullets & Numberings
- **Insert:** Images & Tables

## EXERCISE 8 (PRESENTATION)

Create a presentation of 10 slides about your college with Slide & Custom Animation, Shapes, Header & Footer, Slide number, Video, Audio, Picture, Tables and Hyperlink between slides.

- **Design & Layout:** Add a suitable Theme and Layout according to the content of all 10 slides.
- **Header & Footer:** Header: Insert the Title & Author; Footer : Insert the Date & Slide Number
- **Font & Paragraph:** Font Face - Font Size - Font Color - Alignment - Bullets & Numberings
- **Insert:** Video / Audio / Tables / Shapes
- **Hyperlink:** Use hyperlink to link between slides.
- **Animation:** Custom Animation for individual Objects / Slide Transition to all slides.

**Note:**
1. The student should be given proper training in all the exercises. All the exercises should be completed before examination.
2. The student should maintain observation note book / manual and record notebook. The record note book should be submitted during the Practical Examinations. Individual output for every exercise should be kept in the record note book.
3. During examination, the students are allowed to select any one exercise by lot. All exercises should be given for examination.

### ALLOCATION OF MARKS

| | Description | Marks |
|---|---|---|
| 1 | Aim & Procedure | 20 |
| 2 | Execution | 50 |
| 3 | Output printout / Handout | 20 |
| 4 | Viva voce | 10 |
| | **Total** | **100** |

# THIRD SEMESTER

## 6131 - ENGINEERING MECHANICS

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | EXAMINATION |
|---|---|---|

| 6131 ENGINEERING MECHANICS | Hrs / Week | Hrs / Sem | Marks | | | Duration |
|---|---|---|---|---|---|---|
| | | | Internal Assessment | External Exam* | Total | |
| | 6 Hrs | 96 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## UNIT - I
## STATICS OF STRUCTURES
### Chapter 1.1: Statics of Particles in Two Dimensions                    10 Hrs

Mechanics - statics - force - force system - types of force systems - principle of transmissibility of force - principle of superposition of force - resolution of force -composition of force - method of finding the resultant - parallelogram law, triangle law and polygon law - simple problems - equilibrium of coplanar concurrent forces - simple problems.

### Chapter 1.2: Statics of Rigid Bodies in Two Dimensions                    9 Hrs

Rigid body - moment of a force - type of moment - Varignon's theorem of moments - couple - properties of couple - types of couple - coplanar non concurrent force - simple problems - equilibrium of coplanar non-concurrent forces - support reaction - types - loading - types - concentrated load, uniformly distributed load and uniformly varying load - simple problems in finding reaction in beams, trusses and frames.

## UNIT - II
## SIMPLE STRESSES AND STRAINS
### Chapter 2.1: Introduction to Stresses and Strains                    10 Hrs

Definitions of axial force - types of axial forces on structural members - study of strength of material - mechanical properties of engineering materials - rigidity, elasticity, plasticity, compressibility, hardness, toughness, stiffness, brittleness, ductility, malleability, creep, fatigue, tenacity, durability - definitions of stress and strain - types of stresses - tensile, compressive and shear stresses - types of strains - tensile, compressive and shear strains - complementary shear stress - diagonal tensile / compressive stresses due to shear - elongation and contraction - longitudinal and lateral strains - Poisson's ratio - volumetric strain - simple problems in computation of stress, strain, Poisson's ratio, change in dimensions and volume - Hooke's law - elastic constants - definitions of: Young's modulus of elasticity - shear modulus (or) modulus of rigidity - bulk modulus - relationship between elastic constants (description only) - simple problems - Young's modulus values of few important engineering materials.

### Chapter 2.2: Application of Stress & Strain in Engineering Field                    9 Hrs

Behaviour of ductile and brittle materials under direct loads - load extension curve (or) stress strain curve of a ductile material - limit of proportionality, elastic limit, yield stress, ultimate stress, breaking stress, actual / nominal stresses - working stress - factor of safety - percentage elongation - percentage reduction in area - significance of percentage elongation and reduction in area of cross section - deformation of prismatic and stepped bars due to uniaxial load - deformation of prismatic bars due to its self weight - numerical problems -  composite sections - examples of composite sections in engineering field - advantages - assumptions made - principles of analysis of composite sections - modular ratio - equivalent area (description only) - stresses in the materials - simple problems on axially loaded composite sections like RCC / encased columns.

## UNIT - III
## ANALYSIS OF STRUCTURES
### Chapter 3.1: Analysis Trusses                    10 Hrs

Frame / Truss, pin joint, nodes, - nature of forces in the frame members - determinate and indeterminate frames - classification of frames - perfect and imperfect frames - deficient / instable and redundant frames - formulation of a perfect frame - common types of trusses - support conditions - designation of force - nature of force in the frame member - definitions of rafters, ties, struts, slings - analysis of frames - assumptions - methods of analysis - method of joints and method of sections - simple problems on analysis of cantilever and simply supported perfect frames with vertical and horizontal nodal loads by method of joints and  method of sections - identification of members with nil force in a determinate truss - graphical method of analysis of plane frames - steps to be followed with nodal loads (step by step procedure)

### Chapter: 3.2: Shear Force and Bending Moment in Beams                    9 Hrs

Definitions of Shear Force (SF) and Bending Moment (BM) - conventional signs used for SF and BM - SF and BM of general cases of determinate beams - SF and BM diagrams for cantilevers, simply supported beams and overhanging beams - position of maximum BM - Point of contra-flexure - derivation of relation between intensity of load, SF and BM - simple numerical problems on SF and BM (determinate beams with concentrated loads, UDL and couple only).

## UNIT - IV
## GEOMETRICAL PROPERTIES OF SECTIONS
### Chapter 4.1: Centroid                                               8 Hrs
Geometrical properties - definitions and examples of symmetrical, anti symmetrical, asymmetrical shapes - definitions of centre of gravity and centroid - centroid of symmetrical shapes (solid / hollow - square, rectangular, circular and I sections) - centroid of asymmetrical shapes (triangular, semi circular, quadrant, trapezoidal, parabolic sections) - centroid of anti-symmetric shapes (S and Z sections) - built up structural sections - simple problems.

### Chapter: 4.2: Moment of Inertia                                     8 Hrs
Definitions of: inertia, Moment of Inertia (MI), polar moment of inertia, radius of gyration, section modulus, polar modulus - parallel and perpendicular axes theorems - derivation of expressions for MI / polar MI, section modulus and radius of gyration of regular geometrical plane sections (rectangle, circle and triangle) - MI about centroidal axis / base, section modulus, radius of gyration of symmetric, asymmetric, anti symmetric and built up sections - simple numerical problems.

## UNIT - V
## STRESSES IN BEAMS AND SHAFTS
### Chapter 5.1: Stresses in Beams due to Bending                        8 Hrs
Types of bending stresses - neutral axis(NA) - theory of simple bending - assumptions - moment of resistance - derivation of flexure / bending equation $\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$ - bending stress distribution - curvature of beam - position of NA and centroidal axis - stiffness equation - flexural rigidity - strength equation - significance of section modulus - simple numerical problems.

### Chapter: 5.2: Stresses in Shafts due to Torsion                      8 Hrs
Definitions of: shaft, couple, torque (or) twisting moment - types of shafts (one end fixed and the other rotating, both ends rotating at different speeds) - theory of pure torsion - assumptions - derivation of torsion equation, - $\frac{T}{I_p} = \frac{\tau_{max}}{R} = \frac{G\theta}{L}$ - shear stress distribution in circular section due to torsion - strength and stiffness of shafts - torsional rigidity - torsional modulus - comparative analysis of hollow and solid shafts - power transmitted by a shaft - simple numerical problems.

### REFERENCE BOOKS:
1. Elements of Engineering Mechanics, Sanchayan Mukherjee, PHI Learning Pvt Ltd.
2. Mechanics of Structures - Vol 1, S.B.Junnarkar.
3. Strength of Materials, R. S. Khurmi, S.Chand & Co., Ram Nagar, New Delhi.
4. Strength of Materials, S. Ramamrutham, Dhanpat Rai (2003), New Delhi.
5. Strength of Materials, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi.
6. Analysis of Structures - Vol 1, Vazirani & Ratwani, Khanna Publishers, 2003.

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory)**

# 6132 - CONSTRUCTION MATERIALS AND CONSTRUCTION PRACTICE

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| 6132 CONSTRUCTION MATERIALS AND CONSTRUCTION PRACTICE | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| | | | Internal Assessment | External Exam* | Total | |
| | 5 Hrs | 80 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**UNIT - I**
**BASIC BUILDING MATERIALS**
**Chapter 1.1: Introduction** **2 Hrs**
Physical properties of materials - density, bulk density, specific gravity, porosity, water absorption, permeability, chemical resistance, fire resistance, weathering resistance, thermal conductivity, durability.

**Chapter 1.2: Rocks and Stones** **2 Hrs**
Rocks - classification of rocks - geological, physical and chemical classification - uses of stones - requirements of a good building stone - natural stones and artificial stones for flooring - examples.

**Chapter 1.3: Bricks** **3 Hrs**
Definition - brick earth - composition of good brick earth - manufacturing process - classification of bricks - properties of bricks - special types of bricks and their uses - compressive strength of bricks - tests on bricks (names only) - grades and corresponding requirements of bricks as per BIS.

**Chapter: 1.4: Lime, Cement and Pozzolanas** **3 Hrs**
Sources of lime - classification lime - fat, hydraulic and poor lime - uses of lime, pozzolanic materials - surki, fly ash, ground blast furnace slag, rice husk ash - advantages of addition of pozzolanas.
Cement - definition - composition of ordinary Portland cement(OPC) - functions of cement ingredients - different types of cements - grades of cement (33,43 and 53) - storage of cement - tests on cement - objects of each test - test requirements / BIS specifications of OPC - admixtures - definition - types and uses.

**Chapter: 1.5: Sand and Water** **2 Hrs**
Sand - definition - sand for mortar - types - river sand - 'M' sand - requirements of sand.
Water - general - requirement of water used in construction works - use of brackish or sea water in construction - permissible limits of toxic materials in construction water as per BIS - effects of sulphates and chlorides in ground water - minimum pH value.

**Chapter: 1.6: Glass and Ceramic Products** **3 Hrs**
Definition - constituents of glass - classification of glass - functions and utility - types of glass - sizes and thickness - uses in buildings.
Ceramic products - definition - earthenware , stoneware, porcelain, terracotta, glazing, tiles - types of tiles - clay terracing tiles - thermal care tiles - glazed ceramic tiles - fully vitrified tiles - roof tiles - special requirements for floor, wall and roof tiles - sanitary appliances

**UNIT - II**
**BUILDING MATERIALS AND FINISHES**
**Chapter: 2.1: Mortar and Concrete** **3 Hrs**
Definition - properties and uses of mortar - 'M' sand for mortar - types of mortar - cement and lime mortar - mix ratio of cement mortars for different works.
Concrete - definition - constituents of concrete and their requirements - uses of concrete - types of concrete: lime concrete, cement concrete and light weight concrete - self compacting concrete and ready mixed concrete.

**Chapter: 2.2: Damp Proofing Materials** **2 Hrs**
Materials used for damp proofing - properties and functions of various types of water proofing materials commonly available - chemicals used for grouting / coating porous concrete surfaces - admixtures for cement mortar and cement concrete - functions of admixtures - accelerators, retarders, air repelling chemicals.

**Chapter: 2.3: Paints and Varnishes** **2 Hrs**
Definition - functions of paint - types of paints and their uses - oil, enamel, emulsion, distemper, cement, aluminium, bituminous and plastic paints.
Varnishes - definition - characteristics of a good varnish - ingredients of varnish - types of varnish and their uses - oil, turpentine, spirit and water varnish.

**Chapter: 2.4 Timber and Timber Products** **2 Hrs**
Types of timber - teak, sal, rosewood, mango, and jack - defects in timber - seasoning of timber - objectives - timber products - veneers, ply woods, particle board, fiber board, hard board, block board, laminated board - uses.

Bamboo - uses, advantages and disadvantages - preservation against termites.

**Chapter: 2.5: Metals and Plastics**                                **3 Hrs**

Types of metals used in construction - cast iron, steel, aluminum, galvanized iron(GI), stainless steel - market forms of steel - steel for reinforced concrete - steel for pre-stressed concrete - hot rolled steel sections - cold formed light gauge section, plastics - characteristics and uses of plastics - types - thermoplastics and thermosetting plastics - various plastic products - pipes, taps, tubs, basins, doors, windows, water tanks, partitions - sizes, capacity and uses - advantages and disadvantages of plastics products - UPVC pipes and fittings, asbestos - uses of asbestos.

**Chapter: 2.6: Roof Coverings**                                    **3 Hrs**

Definition - objectives and uses - mangalore tiles - asbestos cement sheets (AC) - Fibre Reinforced Plastic (FRP) sheets - Galvanized Iron (GI) sheets - polycarbonate sheets - shell roof - RCC roof - advantages - types.

**UNIT - III**

**SUBSTRUCTURE AND MASONRY**

**Chapter 3.1: Introduction**                                    **2 Hrs**

Permanent and temporary structures - life of structures - sub structure - super structure - load bearing structure and framed structure - concept and advantages.

**Chapter: 3.2: Foundation**                                    **3 Hrs**

Definition - objectives of foundation - bearing capacity of soil - definition - maximum/ultimate and safe bearing capacity - bearing capacity of different types of soils - factors affecting bearing capacity - requirements of a good foundation - types of foundations - shallow foundation: spread foundation, isolated footing, combined footing, continuous footing, raft foundation - deep foundation, pile, stone columns - types of piles: bearing pile, friction pile, under reamed pile - causes of failure of foundation - remedial measures - foundations for cost effective structures.

**Chapter 3.3: Stone Masonry**                                  **3 Hrs**

Definition - common terms used: natural bed, sill, corbel, course, cornice, coping, weathering, throat, spalls, quoins, string course, lacing course, through stone, plinth, jambs - classification of stone masonry - rubble masonry: coursed, un coursed and random rubble masonry - ashlar masonry - points to be considered in the construction of stone masonry - tools used - trowel, square, sprit level, plumb bob, chisel line and pins, spall hammer, punch, pitching tool.

**Chapter: 3.4: Brick Masonry**                                  **3 Hrs**

Definition - common terms used - header, stretcher, bed joint, lap, perpend, closer, king, queen & bevelled, bat - permissible loads in brick masonry - bond - types - header, stretcher, English bond & Flemish bond - one brick thick and one and a half brick thick - 'T' junction in English bond - points to be considered in the construction of brick masonry - cavity bond masonry - defects in brick masonry - maintenance of brick masonry - reinforced brick masonry - purpose - its advantage with respect to strength and earthquake resistance.

**Chapter 3.5: Partitions**                                      **2 Hrs**

Definitions - requirements of good partition walls - types - brick, concrete, glass, aluminum frame with glass sheet, timber, straw board, wood wool, asbestos cement board and plastic board partitions.

**Chapter 3.6: Hollow Block and Solid Block Construction**                **2  Hrs**

Hollow blocks - advantages of hollow blocks - load bearing and non load bearing hollow blocks - open cavity blocks - face shells, web, gross area, nominal dimensions of blocks, minimum thickness of face shells and web, grades of hollow concrete blocks - materials used, admixtures added - mixing, moulding, placing and compacting, curing, drying - physical requirements - use of light weight aggregates - hollow concrete (hollow block) masonry - construction of walls - advantages of hollow concretes masonry - construction using solid block - types - materials used.

**UNIT - IV**

**SUPERSTRUCTURE, JOINERIES AND EXTERNAL FINISHES**

**Chapter 4.1: Water Proofing and Damp Proofing**                      **2 Hrs**

Dampness - causes of dampness - effects of dampness - damp proof courses (DPC) - method of mixing - bad effects of excessive admixtures in RCC - water proofing coats

for sump / over head tank walls - methods of grouting.

**Chapter 4.2: Doors, Windows and Ventilators**          **3 Hrs**

Standard sizes of doors and windows - location of doors and windows - different materials used - doors - component parts - types - framed and panelled - glazed, flush, louvered, collapsible, rolling shutter and sliding doors - windows - types - casement, glazed, bay, corner - pivoted circular and dormer windows - ventilators - definition - purpose - types - mosquito proof - ventilator combined with windows / doors.

**Chapter 4.3: Stairs**          **1 Hrs**

Definition - terms used - location of stair - types - straight, dog legged, open well, bifurcated and spiral stairs - moving stairs (escalators) - lift - components - uses and advantage of lifts over stairs.

**Chapter: 4.4: Floors and Flooring**          **3 Hrs**

Floors - definition - types - timber, composite, RCC floors - flooring - definition - materials used - selection of flooring - types - construction methods (as per CPWD / PWD Specifications) - mosaic, granolithic, tiled, granite, marble, pre cast concrete flooring, plastic and PVC tile flooring - carpet tile and rubber flooring.

**Chapter 4.5: Roof**          **3 Hrs**

Definition - types of roof - flat roof - RCC roof - pitched roof - tile roof - shell roof - technical terms - steel roof truss - types: king post, raised chord, Howe truss, fan, fink, north light and modified north light trusses - lintel cum sunshade - construction

**Chapter: 4.6: Weathering Coarse**          **2 Hrs**

Weathering course - purpose - materials required - brick jelly concrete preparation - laying procedure - preparation of mortar with damp proof materials for laying pressed clay tiles - pointing and finishing of laid clay tiles - use of thermal resistant weathering tiles.

**UNIT - V**

**POINTING, PLASTERING, PAINTING AND FORM WORK**

**Chapter 5.1: Pointing**          **3 Hrs**

Objectives - mortar for pointing - methods of pointing (as per CPWD / PWD Specifications) - types of pointing - flush, recessed, weathered, keyed or grooved pointing.

**Chapter: 5.2: Plastering**          **3 Hrs**

Definitions - objectives - cement mortars for plastering - requirements of good plaster - methods of plastering - defects in plastering - stucco plastering - acoustic plastering, granite plastering, silicon plastering, barium plastering, asbestos marble plastering - faced finishing (structural) sand faced - pebble dash - wall paper finishing - wall tiling.

**Chapter: 5.3: White Washing, Colour Washing, Distempering, Painting & Varnishing**   **3 Hrs**

White washing - preparation of surface - application of white wash - colour washing - distempering - preparation of surfaces - application of distemper - painting and varnishing - preparation of surface - application of painting and varnishing.

**Chapter: 5.4: Anti-Termite Treatment**          **1 Hrs**

Definition - objectives and uses - methods of termite treatment.

**Chapter: 5.5: Form Work, Scaffolding, Shoring and Underpinning**      **4 Hrs**

Definition - materials used - requirements of a good form work - form work for column, RC beams and RC slab.

Scaffolding - definition - component parts - types - single, double and steel scaffolding, shoring - definition - types - raking, flying and dead shores - underpinning - definition - purpose - types - pit methods - pile method.

**REFERENCE BOOKS:**
1. Building Materials, P.C.Varghese, Prentice-Hall of India (P) Ltd., I Edition, 2011.
2. Building Materials, S.C.Rangwala Charotar Publishing House, VII Edition, 1982.
3. Building Construction, Dr. B.C. Punmia, Laxmi publications (p)Ltd New Delhi.

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6133 - SURVEYING

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | | Duration |
| **6133 SURVEYING** | 6 Hrs | 96 Hrs | **Internal Assessment** | **External Exam*** | **Total** | | |
| | | | 25 | 100 | 100 | | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## UNIT - 1
## INTRODUCTION TO SURVEYING - CHAIN ANDCOMPASS SURVEYING
**Chapter 1.1 Introduction to Surveying** 2 Hrs
Definition - objectives and uses of surveying - classification of surveying - principles of surveying.

**Chapter 1.2 Chain Surveying** 8 Hrs
Introduction - Instruments used for chaining- chains and tapes - types - definitions of terms commonly used in chain surveying: survey station, base line, check line and tie line - ranging: direct and indirect ranging - offsets: definition, types, instruments used and procedure for taking an offset - errors in chaining, obstacles in chaining - types, tape corrections and its necessity-simple numerical problems.

**Chapter 1.3 Compass Surveying** 8 Hrs
Angular measurements - necessity instruments used prismatic compass - construction details, functions and temporary adjustment - types of meridians - types of bearings - whole circle and reduced bearings, fore and back bearings- computation of included angles from bearings - computation of bearings from included angles - problems - local attraction (concepts only), compass traversing, dip and declination, errors in compass surveying.

## UNIT - II
## LEVELLING
**Chapter 2.1 Methodological Terms** 6 Hrs
Levelling - definition - level parts, functions, accessories - types of levels **:** dumpy level, quick setting level, automatic and laser level, leveling staff **-** types component parts of levelling instrument - definitions of terms used **:** level surface, horizontal and vertical surfaces, datum, bench marks, reduced level, rise, fall, line of collimation, axis of telescope, axis of bubble tube, station, back sight, fore sight, intermediate sight, change point, height of instrument, focusingand parallax - temporary adjustment of a level - balancing - back sight and foresight.

**Chapter 2.2 Principle and Methods of Levelling** 8 Hrs
Principle of levelling - simple levelling - levelling field book - reduction of levels, height of collimation and rise and fall method - comparison of methods - problems on reduction of levels - missing entry calculations: problems.

**Chapter 2.3 Profile Levelling** 4 Hrs
Longitudinal levelling - cross sectional levelling (definition only) - reciprocal levelling - definition, use and problems on difference in elevation - curvature and refraction - effects, correction and problems, errors in levelling, permanent adjustment of dumpy level.

## UNIT - III
## THEODOLITE SURVEYING AND CURVES
**Chapter 3.1 Rational Terms** 6 Hrs
Introduction - types of theodolites: transit and nontransit theodolite, vernier and micrometer theodolites, electronic theodolite (principles and description only) - component parts of a transit theodolite - functions - technical terms used in theodolite surveying - temporary adjustments.

**Chapter 3.2 Measurementof Horizontal and Vertical angle** 6 Hrs
Measurementof horizontal angle by method of repetition and reiteration - measurement of vertical & deflection angles - reading bearing of a line - theodolite traversing - methods - field checksin closed traverse - latitude and departure - consecutive & independent coordinates- problems on computation of area of closed traverse-omitted measurements- problems.

### Chapter 3.3 Curves        **6 Hrs**

Curves - designation of curves, definition of terms used in curves - method of setting out of curves (descriptions only) - setting out of curves by Rankine's method - simple problems.

## UNIT - IV
## CONTOURING AND TACHEOMETRIC SURVEYING

### Chapter 4.1 Contouring        **8 Hrs**

Definition - contour - contouring - characteristics of contours - methods of contouring - direct and indirect methods - interpolation of contours - different methods - contour gradient - uses of contour maps.

### Chapter 4.2 Tacheometric Surveying    **10 Hrs**

Introduction - Instruments used in tachometry - systems of tachometry: stadia and tangential tachometry - principles - fixed hair method of tachometry - distance and elevationformulae - analytic lens (Formula only) - advantages and uses - simple problems, direct reading tachometers - determination of constants of a tachometer - problems - tachometric traversing - tacheometric contouring.

## UNIT - V
## MODERN SURVEYING

### Chapter 5.1 Total Station        **8 Hrs**

Introduction - Application of total station - component parts of a total station - accessories used - summary of total stationcharacteristics - features of total station - electronic display and data reading - field procedure for co-ordinate measurement - instrument preparation, setting and measurement (distance, angle, bearing, and curve etc.).

### Chapter 5.2 Global Positioning System (GPS)   **6 Hrs**

Introduction - Maps - types of maps - various satellites usedby GPS - differential GPS (base and rover) - fundamentals of GPS - application of GPS - GPS receivers - hand held GPS receiver - function field procedure - observation and processing applications in civil engineering.

### Chapter 5.3 Drone Survey        **3 Hrs**

Drone survey - Unmanned Aerial Vehicle - types and uses of drone surveying.

### REFERENCE BOOKS::

1.  Surveying and Levelling Part 1 & 2", Kanetkar.T.P. & S.V.Kulkarni, "Puna vidyarthi griha, Prakashan, 23rd edition, 2008.
2.  "Fundamentals of Surveying", S. K. Roy, PHI Learning Private Limited, Edition 2010. Learning Material Development Project - NITTTR, Taramani, Chennai, CD programme   on GPS and GIS.
3.  Surveying Volume II & III", Punmia.B.C, Ashok Jain & Arun K. Jain," Laxmi, Publications Private     Limited, 15 edition, 2011.
4.  "Surveying", Mimi Das Saikia, Bhargab Mohan Das & Madan Mohan Das, PHI Learning Private Limited, Edition 2010.
5.  Advanced Surveying, (Total Station, GIS, Remote Sensing), Sathesh Gopi, R.Sathikumar & N.Madhu, Pearson Education, Chennai, 2007.
6.  Remote sensing and Geographical information system, M.Anji Reddy, B.S Publications, Edition 2006.
7.  Principles of GIS for Land Resources Assessment, Burrough P A, Oxford Publication, 2000.

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

## 6134 - BUILDING PLANNING AND DRAWING

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6134 BUILDING PLANNING AND DRAWING** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 6 Hrs | 96 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## UNIT - I Introduction

### Chapter 1.1    Conventions and Symbols:                                    3 **Hrs**
General - conventions - title block - scales - line work - lettering - symbols - abbreviations.

### Chapter 1.2 Building Bye-Laws and Procedure for Submission of Drawings      9 Hrs
Objects of bye-laws - importance of bye- laws - function of local authority - setbacks - plot coverage - number of floors - height of building - built up area - Floor Space Index (FSI) - views and details necessary for the preparation of civil engineering drawing - site plan - necessity for approval of plans local body - layout plan and key plan - requirements for submission of drawing for approval. Rules and bye- laws of sanctioning authorities for construction work.

## UNIT - II
## Planning of Building
### Chapter 2.1 Planning of Residential Buildings                              6 Hrs
Types of residential buildings - usual requirements, types of rooms - minimum size requirement for each type of rooms - furniture arrangement in each room - position of stairs/lifts - position of doors / windows house drainage and sanitary fittings - sump/water tanks - plumbing pipes - preparation of line drawing for given requirements with dimensions(not to scale).

### Chapter 2.2 Planning of Industrial Structures                             3 Hrs
Planning aspects - requirements of industrial units - sheets for pitched roof coverings - rolling shutters - ramps - stores - public toilets/bath rooms - dining / resting halls - ventilation and lighting - preparation of line drawing for given  requirement with  measurements (not to scale).

### Chapter 2.3 Planning of Public Buildings                                  3 Hrs
Types of public buildings - miscellaneous  public buildings - general requirements of public buildings - landscape architecture - preparation of line plan with dimensions for the given requirements.

## UNIT - III
## Basic Drawings                                                              12 Hrs

Standard symbols used in Civil Engineering drawing - Draw the elevation of
a) Fully paneled double leaf door.              b) Fully paneled single leaf door.
c) Flush door (internal and external lippings).    d) Fully paneled window with grill.
e) Partly glazed and partly paneled window.     f) Lean-to-roof.
g) King post roof truss - Steel roof truss.
h) Rain water harvesting - recharging into the ground.
               i. Shallow well system      ii. Percolation pit system.

## UNIT - IV
## Building Drawings                                                          53 Hrs

Preparation of plan, section and elevation of buildings with specifications for the given line drawing to suitable scale:
1.   A reading room with RCC flat roof.
2.   A house with single bed room and attached bathroom with RCC flat roof.
3.   A residential building with two bed rooms with RCC flat roof
4.   A house with single bed and hall with partly tiled and partly RCC flat roof.
5.   A two roomed house with RCC slope roof with gable ends.
6.   A house with fully tiled roof with hips and valleys.
7.   A small workshop with north light steel roof truss (6 to 10 m span) over RCC columns.
8.   Single story steel framed residential building.
9.   A primary health center for rural area with RCC roof.
10. A village Library building with RCC flat roof.
11. A small restaurant building with RCC flat roof.
12. A single storeyed school building with RCC flat roof.
13. A bank building with RCC flat roof.
Note: For calculating assignment marks a minimum of 10 drawing plates shall be considered.

### REFERENCE BOOKS:
1.   National Building Code (NBC-SP 7).
2.   TamilNadu District Municipal building rules and by-laws.
3.   Building Planning and Drawing,Dr N. Kumaraswamy and A. Kameswara Rao."

4. Building Planning and Construction Companion,G. Vaidhyanathan, I. Kulasekaran, G. sathish Kumar.
5. A Guide to Civil Engg Drawing V.R.Thothathri.

## END SEMESTER AUTONOMOUS EXAMINATIONS
## QUESTION PAPER PATTERN

**Time: 3 Hrs**                                                                 **Max. Marks: 100**

### PART - A  (20 marks)

**Sl. No. :1 to 2**

Two questions will be asked from Unit I and Unit II with at least one question from each unit. Two Questions are to be answered. Each question carries 4 marks.

**Sl. No. :3**

One question will be asked from Unit III is to be answered and it carries 12 marks.

### PART - B  (80 marks)

**Sl. No. :4**

One Question will be asked from Unit IV. Students have to prepare plan, section and elevation of the building with specification for the given line drawing with suitable scale. This part carries 80 marks.

# 6135 - CIVIL ENGINEERING DRAWING AND CAD PRACTICAL - I

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6135 CIVIL ENGINEERING DRAWING AND CAD PRACTICAL - I** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 4Hrs | 64 Hrs | **Internal Assessment** | **External Exam*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## LIST OF EXPERIMENTS

**Introduction of CAD software for preparation of drawings                          02 Hrs**

1. Definition of various commands used in CAD software.
2. Preparation of drawing using CAD software - Simple exercises for familiarizing the drawing commands in CAD software.

### PART - A                                                                          24 Hrs

**Draw the given drawings in Computer using available software**

3. Section of semicircular arch
4. Elevation of door, partly paneled and partly glazed
5. Preparation of plan showing arrangement of furniture's / fixtures and other features with standard sizes for the followings (each room to be drawn separately-features and furniture's may be  pasted from the blocks available in the  packages).
      (i) Living   (ii) Bed Room  (iii) Kitchen   (iv) Toilet
6. Steel Structures: cross section of I, Channel, T, Angle & Tubular section, compound Beams.
7. Section of load bearing wall from parapet to foundation showing all the details across the section. (single storey).

### PART - B                                                                          38 Hrs

**Draw the building drawing using available CAD software**

1. Plan, section and elevation of single bed roomed building (RCC Roof)
2. Plan, section and elevation of double bed roomed building (RCC Roof)
3. Plan, section and elevation of a primary school building.
4. Plan, section and elevation of a hospital building.
5. Plan, section and elevation of a workshop with steel columns, steel roof truss and metal sheet roofing of about 300 m$^2$ area.

6. Single storey steel framed residential building.
7. Preparation of approval drawing to be submitted to Corporation or Municipality showing required details in one sheet such as
   a) Site Plan (Land boundary, building boundary, car parking, passage, sanitarylayout, septic tank location etc.).
   b) GF plan, FF plan, section and elevation(line diagram is enough).
   c) Key plan
   d) Septic tank plan and section (line diagram).
   e) Rain water harvesting pit (with all detail).
   f) Typical foundation details (Column foundation or spread footing).
   g) Title block showing - joinery details, specification, area statement, colour index, title of the property, space for owner's signature and licensed surveyor's signature with address.
8. Conversion of FMB sketches into digital map using CAD software

## AUTONOMOUS EXAMINATION

Note 1: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART - A and one exercise from PART - B. All the exercises should be given in the question paper and students are allowed to select by a lot. All students should submit record notebook for the examination.
Note **2:** Line plan with specifications / data will be given in the question paper.

### DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---------|----------------------|-------|
| **Part - A** | | |
| 1 | Procedure / Preparation | 10 |
| 2 | Commands used | 10 |
| 3 | Printout | 20 |
| **Part - B** | | |
| 4 | Procedure / Preparation | 15 |
| 5 | Commands used | 25 |
| 6 | Printout and accuracy | 10 |
| 7 | Viva-voce | 10 |
| **Total** | | **100** |

## 6136 - MATERIAL TESTING PRACTICAL - I

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---------|-------------|---|-------------|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| **6136 MATERIAL TESTING PRACTICAL- I** | 4 Hrs | 64 Hrs | Internal Assessment | External Exam* | Total | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

### EXERCISES
### PART - A                                                          32 Hrs

1. Tension test on mild and deformed steel specimens.
2. Deflection test on simply supported beams of (a) wood (b) steel to find Young's modulus.
3. Torsion test on mild steel bars to determine the modulus of rigidity.
    4. Determination of the fineness of cement by sieve analysis.

5. Determination of normal consistency of cement by Vicat's apparatus.
6. Initial and final setting time of cement with Vicat's apparatus.
7. Determination of soundness test on cement.
8. Compression test on helical spring.

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**PART - B**        **28 Hrs**
</div>

1. Finding Brinell's and Rockwell's hardness numbers of the following materials.
      (a) Mild steel         (b) Brass     (c) Aluminum
2. Compression test on wooden cubes.
3. Double shear test on MS bar.
4. Impact test on mild steel by performing Izod / Charpy tests
5. Compression test on bricks / solid blocks.
6. Water absorption test on Bricks / pressed tiles.
7. Flexure test on tiles.

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**PART - C**        **04 Hrs**
</div>

8. Demonstration of strain gauges, strain indicators and strain recording instruments.

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## AUTONOMOUS EXAMINATION
</div>

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART - A and one exercise from PART - B. All the exercises should be given in the question paper and students are allowed to select by a lot. All students should submit record notebook for the examination.

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## DETAILED ALLOCATION OF MARKS
</div>

| Sl. No. | Performance Indicator | Marks |
|---|---|---|
| | **Part - A** | |
| 1 | Procedure Writing | 10 |
| 2 | Observation and Tabulation | 20 |
| 3 | Calculations | 10 |
| 4 | Sketch/Graph | 05 |
| 5 | Accuracy of Result | 05 |
| | **Part - B** | |
| 1 | Procedure Writing | 05 |
| 2 | Observation and Tabulation | 15 |
| 3 | Calculations | 10 |
| 4 | Sketch/Graph | 05 |
| 5 | Accuracy of Result | 05 |
| 7 | Viva-voce | 10 |
| | **Total** | **100** |

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## 6137 - SURVEYING PRACTICE - I
</div>

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| **6137 SURVEYING PRACTICE- I** | 4 Hrs | 64 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

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## EXERCISES
</div>

## PART - A                                                                24 Hrs

**CHAIN AND COMPASS SURVEYING**
1. Study of chains and its accessories.
2. Determination of area of a plot using chains (one base line and at least two offset on either side of a chain line).
3. Traverse around a building and plot the existing building using chain survey.
4. Study of Prismatic compass, setting up over a station and observe bearings of lines.
5. Running closed traverse and finding the included angles Use Chain / Tape and Compass. Minimum 5 points.
6. Determination of distance between two points when their base is accessible. Use Chain / Tape and Compass.
7. Determination of distance between two points when their base is inaccessible. Use Chain / Tape and Compass.

**GLOBAL POSITIONING SYSTEM (GPS)**                                         8 Hrs
1. Reading of various Maps like Taluk map, District Map and Topo sheets.
2. Study of Hand held GPS.
3. Measurement of Latitude, Longitude and Altitude using hand held GPS.
4. Selection and marking of routings (Way points) using hand held GPS.
5. Study of FMB sketches and plotting the boundry on ground.

## PART - B                                                                32 Hrs

**LEVELLING**
1. Study of a Level - Temporary adjustment, taking readings and booking in a field book.
2. Fly leveling Reduction by Height of Collimation method - Minimum 6 points with two change points (Minimum Two exercises).
3. Fly leveling Reduction by Rise and Fall method - Minimum 6 points with two change points (Minimum Two exercises).
4. Fly levelling covering minimum 6 points with 2 inverted readings (Minimum Two exercises).
5. Check levelling and reduction of levels (Minimum Two exercises).

## AUTONOMOUS EXAMINATION

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART - A and one exercise from PART - B. All the exercises should be given in the question paper and students are allowed to select by a lot. All students should submit record notebook for the examination.

## DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks | |
|---|---|---|---|
| | **Part - A** | **(i)** | **(ii)** |
| 1 | Procedure, Handling Instruments /Tools | 5 | 3 |
| 2 | Field works, Observation and Tabulation | 15 | 10 |
| 3 | Calculations and Check / drawings. | 10 | --- |
| 4 | Accuracy of result | 5 | 2 |
| | **Part - B** | | |
| 1 | Procedure, Handling Instruments /Tools | 5 | |
| 2 | Field works, Observation and Tabulation | 15 | |
| 3 | Calculations and Check / drawings. | 15 | |
| 4 | Accuracy of result | 5 | |
| 7 | Viva-voce | 10 | |
| | **Total** | **100** | |

# FOURTH SEMESTER

## 6141 - THEORY OF STRUCTURES

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6141 THEORY OF STRUCTURES** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | | | **Internal Assessment** | **External Exam\*** | **Total** | |
| | 7 Hrs | 112 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## UNIT - I
## SLOPE AND DEFLECTION OF BEAMS AND PROPPED CANTILEVERS
### Chapter 1.1 Slope and Deflection of Beams                                11 Hrs
Deflected shapes / elastic curves of beams with different support conditions - definition of slope and deflection - flexural rigidity and stiffness of beams - Mohr's theorems - area moment method for slope and deflection of beams - derivation of expressions for maximum  slope and deflection of standard cases by area moment method for cantilever and simply supported beams  subjected to symmetrical UDL and point loads - simple numerical problems on determination of slopes and deflections at salient points of cantilevers and simply supported beams from first principles only.
### Chapter 1.2 Propped Cantilevers                                10 Hrs
Statically determinate and indeterminate structures - stable and unstable structures - examples - degree of indeterminacy - concept of analysis of indeterminate beams - definition of prop - types of props - prop reaction from deflection consideration - SF and BM diagrams by area moment method for UDL throughout the span, central and non-central concentrated loads - propped cantilever with overhang - point of contraflexure - simple problems.

## UNIT - II
## FIXED BEAMS AND CONTINUOUS BEAMS
### Chapter 2.1 Fixed Beams - Area Moment Method                                10 Hrs
 Introduction to fixed beam - advantages - degree of indeterminacy of fixed beam - sagging and hogging bending moments - determination of fixed end (support) moments (FEM) by area moment method - derivation of expressions for standard cases - fixed beams subjected to symmetrical & unsymmetrical concentrated loads and UDL - drawing SF & BM diagrams for fixed beams with supports at the same level (sinking of supports or supports at different levels are not included) - points of contraflexure - simple problems - determination of slope and deflection of fixed beams subjected to only symmetrical loads by area moment method - simple problems.
### Chapter 2.2 Continuous Beams - Theorem of Three Moments Method          11 Hrs
 Introduction to continuous beams - degree of indeterminacy of continuous beams with respect to number of spans and types of supports - simple / partially fixed / fixed supports of beams - general methods of analysis of indeterminate structures - Clapeyron's theorem of three moments - application of Clapeyron's theorem of three moments for the following cases - two span beams both ends with simply supported or fixed ends - two span beams with one end fixed and the other end simply supported - two span beams with one end simply supported or fixed  and other end overhanging - determination of reactions at supports - application of three moment equations to three span continuous beams and propped cantilevers - simple problems - sketching of SFD and BMD for all the above cases.

## UNIT - III
## CONTINUOUS BEAMS AND PORTAL FRAMES
### Chapter 3.1 Continuous Beams - Moment Distribution Method                10 Hrs
 Introduction to carry over factor, stiffness factor and distribution factor - stiffness ratio or relative stiffness - concept of distribution of unbalanced moments at joints - sign conventions - application of moment distribution method to continuous beams of two/three spans and to propped cantilever (maximum three cycles of distribution) - finding support reactions simple problems - sketching SFD and BMD for two / three span beams.

**Chapter 3.2 Portal Frames - Moment Distribution Method**       **11 Hrs**

Definition of frames - types - bays and storey - sketches of single / multi storey frames, single / multi bay frames - portal frame (single storey, single bay frame) - sway and non sway frames - analysis of non sway (symmetrical) portal frames for joint moments by moment distribution method and drawing BMD only - deflected shapes of portal frames under different loading / support conditions - analysis of sway portal frames by moment distribution method (introduction only).

**UNIT - IV**

**COLUMNS AND STRUTS AND COMBINED BENDING AND DIRECT STRESSES**

**Chapter 4.1 Columns and Struts**       **10 Hrs**

Columns and struts - definition - short and long columns - end conditions - equivalent length / effective length - slenderness ratio - axially loaded short column - axially loaded long column - Euler's theory of long columns - derivation of expression for critical load of columns with hinged ends - expressions for other standard cases of end conditions - simple problems - derivation of Rankine's formula for crippling load of columns - factor of safety - safe load on columns - simple problems

**Chapter 4.2 Combined Bending and Direct Stresses**       **11 Hrs**

Direct and indirect stresses - combination of stresses - eccentric loads on columns - effects of eccentric loads / moments on short columns - combined direct and bending stresses - maximum and minimum stresses in sections - simple problems - conditions for no tension - limit of eccentricity - middle third rule - core or kern for square, rectangular and circular sections - chimneys subjected to uniform wind pressure - combined stresses in chimneys due to self weight and wind load - chimneys of hollow square and hollow circular cross sections only - simple problems.

**UNIT - V**

**MASONRY DAMS AND EARTH PRESSURE AND RETAINING WALLS**

**Chapter 5.1 Masonry Dams**       **10 Hrs**

Gravity dams - derivation of expression for maximum and minimum stresses at base - stress distribution diagrams - simple problems - factors affecting stability of masonry dams - factor of safety - simple problems on stability of dams - minimum base width and maximum height of dam for no tension at base - elementary profile of a dam - minimum base width of elementary profile for no tension - middle third rule.

**Chapter 5.2 Earth Pressure and Retaining Walls**       **11 Hrs**

Definition - angle of repose /angle of internal friction of soil - state of equilibrium of soil - active and passive earth pressures - Rankine's theory of earth pressure - assumptions - lateral earth pressure with level back fill / level surcharge (angular surcharge not required) - earth pressure due to submerged soils - (soil retained on vertical back of wall only) - maximum and minimum stresses at base of trapezoidal gravity walls - stress distribution diagrams - simple problems - stability of earth retaining walls - simple problems to check the stability of walls - minimum base width for no tension.

**REFERENCE BOOKS::**
1. Mechanics of structures (Vol.II) S.B. Junnarkar, Charator, Publishing, 22nd Edition,97
2. Analysis of structures, V.N. Vazirani & M.M. Ratwani.
3. Elementary Theory of Structures, R.L. Jindal.
4. Strength of Materials Madhan Mohan Dass., PHI Learning Pvt. Ltd., New Delhi
5. Structural Analysis, Madhan Mohan Dass, PHI Learning Pvt. Ltd., New Delhi.

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6142 - HYDRAULICS

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| 6142 HYDRAULICS | 6 Hrs | 96 Hrs | Internal Assessment | External Exam* | Total | 3 Hrs |
| | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## UNIT - I
## HYDROSTATICS
### Chapter 1.1 INTRODUCTION                                    6 Hrs

Hydraulics - definition - properties of fluids - mass, force, weight, specific volume, specific gravity, specific weight, density, relative density, compressibility, viscosity, cohesion, adhesion, capillarity and surface tension - dimensions and units for area, volume, specific volume, velocity, acceleration, density, discharge, force, pressure and power.

### Chapter 1.2 MEASUREMENT OF PRESSURE                        8 Hrs

Pressure of liquid at a point - intensity of pressure - pressure head of liquid - conversion from intensity of pressure to pressure head and vice-versa - formula and simple problems - types of pressures - static pressure, atmospheric pressure, gauge pressure, vacuum pressure and absolute pressure-simple problems - measurement of pressure -simple mercury barometer - pressure measuring devices - piezometer tube - simple u-tube manometer - differential manometer - micrometer - simple problems.

### Chapter 1.3   HYDROSTATIC PRESSURES ON SURFACES            5 Hrs

Pressure on plane surfaces - horizontal, vertical and inclined surfaces - total pressure - centre of pressure - depth of centre of pressure - resultant pressure - simple problems on practical application - sluice gates, lock gates and dams - descriptions.

## UNIT II
## KINEMATICS AND DYNAMICS OF FLUIDS
### Chapter 2.1   Flow of Fluids                                7 Hrs

Types of flow - Laminar and turbulent flow - Steady and unsteady flow - Uniform and Non-uniform flow - Equation for continuity of flow (law of conservation of mass) - Energy possessed by a fluid body - Potential energy and Potential Head - Pressure energy and Pressure Head - Kinetic Energy and Kinetic Head - Total Energy and Total Head -Bernoulli's theorem - (equations only) - Problems on Practical applications of Bernoulli's theorem - Venturimeter - Orificemeter - Simple problems.

### Chapter 2.2   Flow Through Orifices and Mouthpieces         7 Hrs

Definitions - types of orifices - vena contracta and its significance - hydraulic coefficients Cd, Cv and Cc - formula - simple problems - large orifice - definition - discharge formula - simple problems - practical applications of orifices - types of mouthpieces - external and internal mouthpieces - discharge formula - simple problems.

### Chapter 2.3   Flows Through Pipes                           5 Hrs

Definition of pipe - losses of head in pipes - major losses - minor losses - sudden  enlargement, sudden contraction, obstruction in pipes (formula only) - simple problems -energy / head losses of flowing fluid due to friction - Darcy's equation - Chezy's equation - problems - transmission of power through pipes - efficiency - pipes in parallel connected to reservoir - discharge formula - simple problems.

## UNIT III
## FLOW THROUGH NOTCHES AND WEIRS
### Chapter 3.1 Flow Through Notches                            8 Hrs

Definitions - types of notches - rectangular, triangular and trapezoidal notches - derivation of equations for discharge - simple problems - comparison of V - notch and rectangular notch.

**Chapter 3.2   Flow Through Weirs**                                    **9 Hrs**

Definitions - classification of weirs - discharge over a rectangular weir and trapezoidal weir - derivation - simple problems - end contractions of a weir - Franci's and Bazin's formula - simple problems - Cippoletti weir - problems - narrow crested weir - sharp crested weir with free over fall - broad crested weir - drowned or submerged weirs - suppressed weir - stepped weir - simple problems - definition of terms - crest of sill, nappe or vein, free discharge - velocity of approach - spillways and siphon spillway - definition.

**UNIT IV**

**FLOW THROUGH OPEN CHANNELS**

**Chapter 4.1 Flow through Open Channels**                              **17 Hrs**

Definition - classification - rectangular and trapezoidal channels - discharge - Chezy's formula, Bazin's formula and Manning's formula - Hydraulic mean depth - Problems- conditions of rectangular / trapezoidal sections - specific energy, critical depth - conditions of maximum discharge and maximum velocity - simple problems - flow in a venturiflume -uniform flow in channels - flow through a sluice gate - types of channels - typical cross - sections of irrigation canals - methods of measurements of velocities - channel losses - lining of canals - advantages of lining of canals - types of lining - cement concrete lining with sketches - soil cement lining with sketches - LDPE lining.

**UNIT V**

**GROUND WATER AND PUMPS**

**Chapter 5.1 Ground Water**                                            **7 Hrs**

Aquifer - water table - exploring the availability of ground water - taping of ground water - open well - bore well - types of well construction - yield of a open well - equation - specific capacity or specific yield of a well - test for yield of well - methods of rain water harvesting - sanitary protections - no problems.

**Chapter 5.2 Pumps**                                                   **10 Hrs**

Pumps - definition - difference between a pump and a turbine - classification of pumps-positive displacement pumps and roto-dynamic pressure pumps - characteristics of modern pumps-maximum recommended suction, lift and power consumed - reciprocating pump - construction detail and working principle - types - single acting and double acting - slip - air vessels - discharge and efficiency - simple problems - centrifugal pump - advantages and disadvantages over a reciprocating pump - layout - construction details - priming of centrifugal pump - working of the pump - classification - functions of foot valve, delivery valve and non-return valve - fundamental equation of centrifugal pump - characteristics of a centrifugal pump - discharge, power and efficiency - simple problems - specifications of centrifugal pumps and their sections - hand pump - jet pump - deep well pump - plunger pumps - piping system. computation of power required for pumps, other types of pumps (description only) - selection and choice of pump.

**REFERENCE BOOKS::**

1.  Hydraulics, Fluid Mechanics and Hydraulic Machines-Metropolitan Dr. Jagadish Lal,Book Company- New Delhi.
2.  Fluid Mechanics - P.N. Modi & S.M. Sethi Standard Publishers -New Delhi.
3.  Mechanics and Hydraulics Machines- S. Ramamirtham-Hydraulics,Fluid Dhanpat Rai&SonsNew Delhi.
4.  Fluid Mechanics, K.L.Kumar - Eurasa Publshing House -New Delhi
5.  Fluid Mechanics, R.K. Bansal - Lakshmi Publications
6.  Fluid Mechanics, Prof. S. Nagarathinam - Khanna Publishers -New Delhi
7.  Fluid Mechanics and Hydraulics Machines, K.R. Arora - Hydraulics, - Standard Publishers.
8.  Fluid Mechanics and Machinery B C S Rao, Tata-McGraw-Hill Pvt. Ltd., New Delhi

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6143 - TRANSPORTATION ENGINEERING

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6143 TRANSPORTATION ENGINEERING** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 6 Hrs | 96 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | 3 Hrs |
| | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## UNIT I
## HIGHWAY ENGINEERING
### Chapter 1.1   Introduction                                                3 Hrs
General - development of roads in India - modes of transportation - Nagpur plan - Ribbon development - advantages of roads - importance of roads in India - requirements of an ideal road - Indian road congress - objects of highway planning - classifications of highways.

### Chapter 1.2 Sub Grade Soil                                              3 Hrs
Significance - soil mass as a three phase system - grain size classification - Atterberg limits - definition and description - classification of soils - compaction - Standard Proctor Compaction Test - shear strength definition - importance - direct shear test.

### Chapter 1.3   Highway Pavements and Geometrical Design of Highways       4 Hrs
Objectives - types of pavement - flexible and rigid pavements - comparative study of flexible and rigid pavements - factors affecting the design of pavements - other types of pavements (Names only).

Geometrical Design **-** general - road structure - right of way - land width - width of formation - road camber - superelevation - sight distances - road gradient - road curves - horizontal curves - vertical curves - types -widening of pavement on horizontal curves.

### Chapter 1.4   Traffic Engineering                                        3 Hrs
Objectives - Traffic surveys - road accidents - causes of road accidents - preventive measures - parking - methods of parking - road junctions - grade intersections and grade separators - traffic signals - advantages - types of road signs - expressways.

### Chapter 1.5 Highway Drainage                                            3 Hrs
Introduction and importance of highway drainage system - causes of moisture variation in sub-grade soil - surface drainage system - different types of road side drain - cross drainage structures - different types of energy dissipating structures - sub-surface drainage system - drainage of infiltrated water - control of seepage flow - lowering of water table - control of capillary rise.

### Chapter 1.6 Road Arboriculture and Lighting Introduction                2 Hrs
Objects of arboriculture - selection of trees - location of trees - highway lighting - benefits.

## UNIT II
## HIGHWAY ALIGNMENT AND TYPES OF ROADS
### Chapter 2.1 Introduction                                                4 Hrs
Definition - principles for ideal highway alignment - factors affecting highway alignment - surveys - engineering surveys - reconnaissance, preliminary and location surveys - project report and drawings - highway re-alignment projects.

### Chapter 2.2 Road Machineries                                            3Hrs
Excavating equipments - tractor, bull dozer, grader, scraper, JCB - compaction equipments - road roller - types and description - equipments for bituminous road (Names only).

### Chapter 2.3 Low Cost Roads                                              3 Hrs
General - classifications - earthen road, gravel road, water bound macadam roads - construction with sketches - advantages and disadvantages - maintenance - soil stabilization - methods.

### Chapter 2.4 Bituminous Roads                                            2 Hrs
General - advantages and disadvantages - bituminous materials used - types of bituminous roads - surface dressing - types - bituminous concrete - maintenance of bituminous roads.

### Chapter 2.5 Cement Concrete Roads                                       3 Hrs
General - Advantages and disadvantages - methods of construction of cement concrete roads with sketches - construction procedure for concrete roads.

**Chapter 2.6 Hill Roads**       **3 Hrs**

Factors considered in alignment - formation of hill roads - hair pin bends - retaining & breast walls.

**UNIT III**

**RAILWAY ENGINEERING**

**Chapter 3.1 Introduction**       **3 Hrs**

Introduction - history of railways - classifications of Indian Railways - rail gauges - types - uniformity in gauges - loading gauge -construction gauge.

**Chapter 3.2 Rails**       **4 Hrs**

General - functions of rails - requirements of an ideal rail - types of rail sections - length of rails - welding of rails - wear of rails - coning of wheels - hogged rails - bending of rails - creep of rails - causes and prevention of creep.

**Chapter 3.3 Sleepers and Ballast**       **4 Hrs**

Functions of sleepers - types of sleepers - requirements of sleepers - materials for sleepers - sleeper density - ballast - functions of ballast - requirements of ballast - materials used as ballast.

**Chapter 3.4 Rail Fastenings and Plate Laying**       **5 Hrs**

Rail joints - types - rail fastenings - fish plates - fish bolts - spikes - chairs and keys - bearing plates - blocks - elastic fastenings - anchors and anti-creepers - plate laying - methods of plate laying - PQRS method of relaying.

**Chapter 3.5 Maintenance of track**       **2 Hrs**

Necessity - maintenance of track, bridges and rolling stock.

**UNIT IV**

**RAILWAY TRACK**

**Chapter 4.1 Introduction**       **5 Hrs**

Definition of station - purpose of railway station - types of stations - wayside, junction and terminal stations - platforms - passenger and goods platforms - definition of yard - types of yard - passenger yard, goods yard, marshalling yard and locomotive yards - level crossings - station equipments - general - engine shed - ash pits - examination pits - drop pits - water columns - triangles - turn table - traversers - scotch block - buffer stops - fouling marks - derailing switch - sand hump - weigh bridges.

**Chapter 4.2 Points and Crossings**       **3 Hrs**

Purpose - some definitions - turnouts - right hand and left hand turnouts - sleepers laid for points and crossings - types of switches - crossings - types of crossings.

**Chapter 4.3 Signalling**       **3 Hrs**

General - objects of signalling - types of signalling - based on function and location - special signals - control of movement of trains - different methods - following train system - absolute block system - automatic signalling - pilot guard system - centralized traffic control system.

**Chapter 4.4 Interlocking**       **2 Hrs**

Definition - principles of interlocking - methods of interlocking - tappets and locks system - key system - route relay system - improvements in interlocking and signalling.

**Chapter 4.5 Level Crossing**       **3 Hrs**

Introduction - accident scenario over Indian Railways - level crossings and its vulnerability - Safety Information Management System (SIMS) - policy on level crossings - proliferation of new level crossings restricted on Indian railways - elimination of the existing level crossings - road over bridges - merger or diversion - conclusion.

**Chapter 4.6 Rapid Transport**       **2 Hrs**

General - underground railways - advantages - tube railways - its features.

**BRIDGE ENGINEERING**

**UNIT V**

**Chapter 5.1 Introduction**       **4 Hrs**

Bridge definition - components of bridge - IRC loadings - selection of type of bridge - scour - afflux - economic span - waterway - factors governing the ideal site for bridge - alignment of bridge - factors to be considered in alignment.

**Chapter 5.2 Substructure**       **3 Hrs**

Functions of foundation - types of foundations - selection of foundations - control of ground water for foundation - caisson foundation - coffer dam - types.

## Chapter 5.3 Classification of Bridges                                        3 Hrs
Classification according to IRC loadings, materials, bridge floor, type of superstructure - culverts and cause ways - classifications with sketches - conditions to construct causeways.

## Chapter 5.4 Superstructure                                                   4 Hrs
Types - description - simple bridge - types according to bridge floor - continuous bridge - cantilever bridge - balanced cantilever bridge - arch bridge - bow-string girder type bridge - rigid frame bridge - suspension bridge - continuous steel bridges - steel arched bridges - abutments - types - piers - types - wing walls - types.

## Chapter 5.5 Bridge Bearings                                                  3 Hrs
Definition - purpose - importance of bearings - types of bearings - elastomeric bearings.

### REFERENCE BOOKS::

1. Highway Engineering, RANGWALA, Charotor Publishing House Pvt. Ltd., Edition 2010.
2. Railway Engineering, RANGWALA, Charotor Publishing House Pvt. Ltd., Edition 2010.
3. Bridge Engineering , RANGWALA, Charotor Publishing House Pvt. Ltd., Edition 2009.
4. A Text Book of Transportation Engineering, S P Chandola,S Chand & Company Ltd.,
5. Principles of Transportation & Highway Engineering" G V RAO, Tata McGraw-Hill Company Ltd.,

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6144 - HYDRAULICS PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | | Duration |
| **6144 HYDRAULICS PRACTICAL** | 4 Hrs | 64 Hrs | **Internal Assessment** | **External Exam** | **Total** | | 3 Hrs |
| | | | 25 | 100 | 100 | | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

### LIST OF EXPERIMENTS
**Flow of fluids**                                                              **64 Hrs**
  1. Verification of Bernoulli's theorem.
  2. Flow through venturimeter - Determination of co-efficient of discharge.
  3. Flow through orificemeter - Determination of co-efficient of discharge.

**Flow through orifice:**
  4. Determination of co-efficient of discharge by variable head method.
  5. Determination of co-efficient of discharge by constant head method.

**Flow through external cylindrical mouth piece:**
  6. Determination of co-efficient of discharge by variable head method.
  7. Determination of co-efficient of discharge by constant head method.

**Flow through pipes:**
  8. Determination of friction factor for the given GI pipe / PVC pipe.

**Flow through notch:**
  9. Determination of co-efficient of discharge for Rectangular Notch / V-Notch.

**Pumps:**
  10. Reciprocating pump - To draw characteristic curves and determine the efficiency.
  11. Centrifugal pump - To draw characteristic curves and determine the efficiency.
  12. Study of working principle of a Pelton Wheel.

### REFERENCE BOOKS::
1. Hydraulic Lab Manual Compiled,  T.T.T.I. - Chennai - 113.
2. Experimental Hydraulic, Ghosh and Talapohia - Khanna Publishers, New Delhi.

## AUTONOMOUS EXAMINATION

Note: All the exercises should be given in the question paper and  students  are allowed to select one question by lot. All students should  submit record notebook for the examination.

### DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---------|----------------------|-------|
| 1 | Procedure Writing | 10 |
| 2 | Observation and Tabulation | 35 |
| 3 | Calculations | 25 |
| 4 | Sketch/Graph | 15 |
| 5 | Accuracy of Result | 05 |
| 6 | Viva-voce | 10 |
| **Total** | | **100** |

## 6145 - MATERIAL TESTING PRACTICAL - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---------|-------------|---------|-------------|-------------|-------|----------|
| **61405 MATERIAL TESTING PRACTICAL - II** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 4 Hrs | 64 Hrs | **Internal Assessment** | **External Exam** | **Total** | 3 Hrs |
| | | | 25 | 100 | 100 | |

 **\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

### LIST OF EXPERIMENTS
**PART – A (Geotechnical Engineering)**                                        **30 Hrs**
1. Determination of voids ratio and porosity of sand.
2. Determination of liquid limit and plastic limit of the given soil.
3. Determination of bulk density and specific gravity of fine aggregates.
4. Determination of bulk density and specific gravity of coarse aggregates.
5. Proctor's compaction test on clay.
6. Direct shear test on sand.
7. Field density of soil by core cutter method / sand replacement method

**PART – B (Highway Engineering)**                                        **34 Hrs**
8. Attrition test on aggregate.
9. Abrasion test on aggregate.
10. Aggregate crushing value test.
11. Aggregate impact value test.
12. Determination water absorption test on coarse aggregate.
13. Softening point test of bitumen.
14. Penetration test of bitumen.
15. Ductility test of bitumen.

## AUTONOMOUS EXAMINATION

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from  PART - A  and  one exercise from PART - B. All the exercises should be given in the question paper and  students  are allowed to select by a lot. All students should  submit record notebook for the examination.

### DETAILED ALLOCATION OF MARKS

| S.No | Description | Part - A | Part - B |
|------|-------------|----------|----------|
| 1. | Procedure Writing | 05 | 05 |
| 2. | Observation and Tabulation | 20 | 20 |
| 3. | Calculations | 10 | 10 |

| | | | |
|---|---|---|---|
| 4. | Sketch/Graph | 05 | 05 |
| 5. | Accuracy of Result | 05 | 05 |
| | Viva-voce | 10 | |
| | **TOTAL** | **100** | |

# 6146 - CONSTRUCTION PRACTICE PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6146 CONSTRUCTION PRACTICE PRACTICAL** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | | | **Internal Assessment** | **ExternalExam** | **Total** | |
| | 4 Hrs | 64 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

# LIST OF EXPERIMENTS

## PART A　　　　　　　　　　　　　　　　30 Hrs

1.  Identify various sizes of available coarse aggregates from a sample of 10 kg and prepare report (60,40, 20,10 mm).
2.  Identify the available construction materials on the basis of theirsources.
3.  Identify the grain distribution pattern in given sample of teak wood and draw the various patterns. (along and perpendicular to the grains)
4.  Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples.
5.  Select first class, second class and third class bricks from the stake of bricks and prepare report on the basis of its properties.
6.  Measure dimension of 10 bricks and find average dimension and weight. Perform field tests - dropping, striking and scratching by nail and correlate the results obtained.
7.  Apply the relevant termite chemical on given damaged sample of timber.
8.  Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of 1m x 1m using suitable brush / rollers adopting safe practices.
9.  Prepare mortar using cement and sand / fly ash or granite/marble polishing waste in the proportion 1:6 or 1:3.

## PART　B　　　　　　　　　　　　　　　　34 Hrs

10. Construct one brick wall using one brick wall and connect a partition wall using stretcher bond.
11. Make a formwork for lintel.
12. Make a formwork for column.
13. Make a formwork for staircase.
14. Construction of small room of size 2m x 2m with dummy mortar up to sill level.
15. Straightening, cutting, hooking & bending and arrangement of Steelreinforcement bars.
　　(a) Singly reinforced beam (b) Lintel and Sunshade (c) Column and footing.

## AUTONOMOUS EXAMINATION

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from  PART - A  and  one exercise from PART - B. All the exercises should be given in the question paper and  students  are allowed to select by a lot. All students should  submit record notebook for the examination.

## DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---------|----------------------|-------|
| **Part - A** | | |
| 1 | Procedure Writing | 10 |
| 2 | Observation and Tabulation | 30 |
| 3 | Calculations | 10 |
| 4 | Sketch/Graph | 05 |
| 5 | Accuracy of Result | 05 |
| **Part - B** | | |
| 1 | Procedure Writing | 10 |
| 2 | Observation and Tabulation | 10 |
| 3 | Calculations | 05 |
| 4 | Accuracy of Result | 05 |
| 5 | Viva-voce | 10 |
| **Total** | | **100** |

# 6147 - SURVEYING PRACTICE- II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---------|-------------|---------|-------------|---------------|-------|----------|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| **6147 SURVEYING PRACTICE- II** | 4 Hrs | 64 Hrs | Internal Assessment | ExternalExam | Total | 3 Hrs |
| | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## LIST OF EXPERIMENTS
### PART A:                                                           28 Hrs
**THEODOLITE SURVEYING**

1. Study of a Theodolite - Temporary adjustments, Reading horizontal angles.
2. Measurement of horizontal angle by:
   i. Repetition method .        ii. Reiteration method
3. Determination of distance between two points when their bases are accessible, using theodolite - measuring horizontal angles by repetition method and distances from a theodolite Station.
4. Determination of distance between two points when their bases are inaccessible, using theodolite - measuring horizontal angles by reiteration method from a baseline.
5. Measurements of vertical angles to different points.
6. Determination of elevation of an object when the base is accessible.
7. Determination of elevation of an object when the base is inaccessible by :
   a. Single plane method      b. Double plane method.
8. Run a closed theodolite traverse for measuring length, included angles and bearing at initial station and plot the traverse.

### PART  B:                                                          16 Hrs
**TACHEOMETRIC SURVEYING**

9. Determination of constants of a tachometer.
10. Determination of distance and elevation of points by stadia tachometry.
11. Determination of gradient between two points (with different elevations) by stadia tachometry.
12. Determination of distance and elevation of points by tangential tachometry.

### PART C:                                                           20 Hrs

**TOTAL STATION**

13. Study of Total Station General commands used - Instrument preparation and setting Reading distances and angles.
14. Measurement of distances and co-ordinates of given points, using Total station.
15. Measurement of altitude of given elevated points, using Total Station.
16. Run closed traverse using Total Station and plotting the traverse.
17. Determination of area of a field / land / college campus etc. using Total station.

**<u>SURVEY CAMP</u> : ( Outside / Inside the Campus)     Duration: 7 days**

The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in Survey camp. The camp must involve work on a large area of not less than 10 acres outside / Inside the campus. At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plotting. Three working days and one Saturday will be used for the Camp work during the 14<sup>th</sup> week.

**20 marks to be allotted for Survey file in the Board Examination for the works carried out by the students in survey camp:**
  i. LS and CS for a road / canal alignment
  ii. Radial Tachometric contouring
  iii. Contouring by block levels
  iv. Curve setting by deflection angle
  v. Theodolite / Tachometric traverse (Balancing the traverse by Bowditch rule)
  vi. Total Station (Closed Traverse) - Plotting & Finding the area of the given field.

<u>**AUTONOMOUS EXAMINATION**</u>

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from  PART - A or PART - B and  another exercise from PART - C. All the exercises should be given in the question paper and  students  are allowed to select by a lot. All students should  submit record notebook for the examination.

<u>**DETAILED ALLOCATION OF MARKS**</u>

| Sl. No. | Performance Indicator | Marks |
|---------|-----------------------|-------|
| **Part - A / B** | | |
| 1 | Procedure Writing | 05 |
| 2 | Observation and Tabulation | 15 |
| 3 | Calculations | 10 |
| 4 | Sketch/Graph | 05 |
| 5 | Accuracy of Result | 05 |
| **Part - C** | | |
| 1 | Procedure Writing | 05 |
| 2 | Observation and Tabulation | 10 |
| 3 | Calculations | 05 |
| 4 | Sketch/Graph | 05 |
| 5 | Accuracy of Result | 05 |
| | Survey Camp | 20 |
| 7 | Viva-voce | 10 |
| **Total** | | **100** |

# FIFTH SEMESTER

## 6151 - STRUCTURAL ENGINEERING

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | | Duration |
| **6151 STRUCTURAL ENGINEERING** | 6 Hrs | 96 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | | |
| | | | 25 | 100 | 100 | | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## UNIT - I
## REINFORCED CEMENT CONCRETE STRUCTURES
### Chapter 1.1: Introduction to Working Stress Method and Limit State Method     10 Hrs

Reinforced Cement Concrete (RCC) - materials used in RCC and their basic requirements - purpose of providing reinforcement - different types and grades of cement and steel - characteristic strength and grades of concrete - behaviour of RC members in bending - modular ratio and equivalent area of RC sections - different types of loads on structures as per IS: 875-1987 - different methods of design

Working Stress Method: Assumptions made in the WSM - singly reinforced rectangular sections - strain and stress distribution due to bending - actual and critical neutral axes - under / over reinforced sections - balanced sections - lever arm - moment of resistance of singly reinforced rectangular sections

Limit State Method: Concept - advantages - different limit states - characteristic strength and design strength of materials - characteristic loads and design loads - partial safety factors for loads and material strength - limit state of collapse in flexure - assumptions - stress strain curves for concrete and steel - stress block - maximum strain in concrete - limiting values of neutral axis of singly reinforced section for different grades of steel - design stress in tension and compression steel - moment of resistance of singly and doubly reinforced rectangular sections - simple problems.

### Chapter 1.2: Design of Rectangular Beams for Flexure by LSM     9 Hrs

Design requirements - effective spans of cantilever and simply supported beams - breadth and depth requirements of beams - control of deflection - minimum depth requirement for stiffness - minimum concrete cover to reinforcement steel for durability and fire resistance - minimum and maximum areas / spacing for main reinforcement and side face reinforcement as per IS:456-2000 - development length - anchorage values of bends and hooks - curtailment of reinforcements - design bending moments - design of singly and doubly reinforced rectangular beams (cantilevers and simply supported beams carrying point loads and UDL only) - simple problems - practice on using design aids, SP16 (Design steps only).

## UNIT - II
## DESIGN OF T-BEAMS AND LINTELS FOR FLEXURE BY LSM & DESIGN OF CONTINUOUS BEAMS FOR FLEXURE AND SHEAR BY LSM
### Chapter 2.1: Design of T-Beams and Lintels for Flexure by LSM     9 Hrs

Cross sections of Tee and L-beams - effective width of flange - neutral axis and MR of singly reinforced T-sections - design of singly reinforced T-beams / L-beams for flexure - simple problems on cantilevers (Inverted-T) and simply supported T- beams and problems on cantilever (inverted T-Beam) - loads on isolated lintels over openings of masonry walls - design BM for isolated lintels carrying rectangular / triangular loads - design of lintel - simple problems.

### Chapter 2.2: Design of Continuous Beams for Flexure and Shear by LSM     8 Hrs

Methods of analysis of continuous beams - effective span - arrangement of loading for critical bending moments - BM coefficients specified by IS:456-2000 - design of rectangular continuous beams (singly and doubly reinforced) using BM coefficients (equal spans & UDL only) for sagging and hogging moments - limit state of collapse in shear - design shear strength of concrete - design shear strengths of vertical / inclined stirrups and bent up bars -

principle of shear design - critical sections for shear - SF coefficients specified by IS:456-2000 - nominal shear stress - minimum shear reinforcement - design of vertical stirrups, inclined stirrups and bent up bars for rectangular beams using limit state method simple problems - practice on use of design aids (design steps only).

## UNIT - III
## DESIGN OF ONE WAY SLABS AND STAIR CASES BY LSM & DESIGN OF TWO WAY SLABS BY LSM

**Chapter 3.1: Design of One Way Slabs and Staircases by LSM**　　　　　**9 Hrs**

Classification of slab - effective spans - loads (DL and IL) on floor / roof slabs and stairs (IS:875-1987) - strength and stiffness requirements - minimum and maximum permitted size, spacing and area of main and secondary reinforcements as per IS:456-2000 - cover requirement to reinforcements in slabs - design of cantilever / simply supported one way slabs and sunshades by limit state method - design of continuous slabs using BM coefficients - check for shear and stiffness - curtailment of tension reinforcement - anchoring of reinforcement - practice in designing slabs using design aids (design steps only) Types of stairs according to structural behavior - requirements of stairs - planning a staircase - effective span of stairs - effective breadth of flight slab - distribution of loads on flights - design of cantilever steps - design of doglegged and open well stairs spanning parallel to the flight. Planning of open well staircase.

**Chapter: 3.2: Design of Two Way Slabs by LSM**　　　　　**8 Hrs**

Introduction - effective spans - thickness of slab for strength and stiffness requirements - middle and edge strips - BM coefficients as per IS:456-2000 - design BMs for simply supported, restrained and continuous slabs - tension and torsion reinforcement requirement - design of two way slab using BM coefficients - curtailment of reinforcement - check for stiffness only.

## UNIT - IV
## DESIGN OF COLUMNS BY LSM & DESIGN OF COLUMN FOOTINGS

**Chapter 4.1: Design of Columns by LSM**　　　　　**9 Hrs**

Limit state of collapse in compression - assumptions - limiting strength of short axially loaded compression members - effective length of compression members - slenderness limits for columns - classification of columns - minimum eccentricity for column loads - longitudinal and transverse reinforcement requirements as per IS:456-2000 - cover requirement - design of axially loaded short columns with lateral ties / helical reinforcement - practice on use of design aids (design steps only) - design of columns subjected to axial load and moment (design steps only).

**Chapter: 4.2: Design of Column Footings**　　　　　**8 Hrs**

Basic requirements of footings - types of footings - minimum depth below GL - footings with uniform thickness and varying thickness (sloped footing) - critical sections for BM, transverse / punching shear - minimum reinforcement, distribution of reinforcement, development length, anchorage, cover, minimum edge thickness requirements as per IS:456-2000 - design of isolated footing (square and rectangular) with uniform / varying thickness by limit state method - for examination: simple problems either on (i) designing size of footing and area of tension steel for flexure only for the given column load and SBC of soil, or (ii) checking the footing for punching shear and transverse shear only, for the given sizes and other required details of the footing.

## UNIT - V
## STEEL STRUCTURES

**Chapter 5.1: Design of Tension and Compression Members by LSM**　　　　　**10 Hrs**

General - characteristic actions, partial safety factors for loads, design actions - ultimate strength, partial safety factors for materials, design strengths of materials - rolled steel sections - different forms of tension members - gross area, net area and net effective sectional area of tension members - maximum permitted values of effective slenderness ratio - design strength of tension members against yielding of gross section, rupture of critical section and block shear - design strength of given plates / angles connected to gussets by bolts / welds - design of ties using single / double angles, T-sections and channels.

Different forms of compression members - classification of cross sections - limiting width to

thickness ratio - effective sectional area - end conditions and effective length of compression members - maximum permitted values of slenderness ratio - imperfection factor and stress reduction factor - design strength of compression members - simple problems - design of single angle and double angle struts - design of steel columns using rolled steel sections (symmetrical sections only) with or without cover plates (lacing and battens not included).

**Chapter: 5.2: Design of Simple Beams and Welded Connections by LSM          9 Hrs**

Classification of steel beams - effective span - design principles - minimum thickness of web - design strength in bending / shear - limiting deflection of beams - lateral buckling of beams - maximum permitted slenderness ratio - plastic moment of resistance and plastic section modulus of sections - shape factor - design of laterally supported simple beams using single / double rolled steel section (symmetrical cross section only) (buildup beams not included)

Types of welds - size, effective area and effective length of fillets welds - requirements of welds - stresses in welds - design strength of fillet / butt welds - lap and butt joints for plates and angles - simple problems on design of welded connections for plates and angles.

**REFERENCE BOOKS::**

1.  Limit state Theory and Design of Reinforced Concrete, S.R.Karve and V.L.Shah Pune Vidya Griha Prakashan.
2.  Limit state Design of Reinforced Concrete, P C Varghese,PHI Learning Pvt. Ltd", 2011.
3.  Limit State Design of Concrete Structures, Dr.S.Ramachandra Scientific publishers, 2004.
4.  Reinforced Cement Concrete Mallick and Rangasamy Oxford-IBH.
5.  Reinforced Concrete Design N Krishnaraju, New Age International Publications, 2012
6.  Limit State Design of Reinforced Concrete, B C Punmia, Laxmi Publications,2007
7.  R C C Designs, B C Punmia Laxmi Publications, 2006
8.  Design of R C C and Structural Elements S S Bhavikatti, ( RCC Vol I), New Age International Publications, 2011
9.  IS 456-2000; I S 875-1987; I S 800 - 2007.
10. Explanatory hand book SP24, Design Aid SP 16, Detailing of Reinforcement, SP 34
11. Limit State Design in Structural Steel, M.R.Shiyekar PHI Learning Pvt Ltd, 2011

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6152 - ESTIMATION, COSTING AND VALUATION

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| **6152 ESTIMATION, COSTING AND VALUATION** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | | **Duration** |
| | 6 Hrs | 96 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | | |
| | | | 25 | 100 | 100 | | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**UNIT - I**
**INTRODUCTION, APPROXIMATE ESTIMATES, MEASUREMENTS & MATERIAL REQUIREMENTS AND SPECIFICATIONS**

**Chapter 1.1: Introduction                                              5 Hrs**

Estimation - definition of estimate - approximate estimate - detailed estimate - main estimate - revised estimate - supplementary estimate - sub estimate - annual maintenance estimate - repair estimate - complete estimate.

**Chapter 1.2: Approximate Estimates                                      4 Hrs**

Study of necessity of project - technical feasibility, financial feasibility, ecological feasibility, resource feasibility, recovery from the project, economical analysis - building economics - preliminary studies - analysis - valuation.

**Chapter 1.3: Measurements & Material Requirements                       4 Hrs**

Units of measurements for works and materials - degree of accuracy in measurements - deduction for openings in masonry, plastering and white washing area - painting co- efficient -

out turn of works - working out of materials requirements - cement, sand, bricks, aggregates etc based on thumb rules for different works.

## Chapter 1.4: Specifications                                5 Hrs

Specification - necessity - types of specifications - essential requirements of specifications - specification for various materials like cement, sand, brick, timber, reinforcement steel, stone aggregate, water - specifications for various items of works - general specifications for a building - culvert - concrete roads - detailed specifications for works such as, earthwork excavation, foundation concrete, reinforcement cement concrete in column, beam and slab - weathering course - steps involved in writing standard specifications.

## UNIT - II
## PREPARATION OF DATA AND RATE ANALYSIS

### Chapter 2.1: Preparation of Data                                9 Hrs

Data - types - main and sub data - observed data - lead statement - schedule of rates - standard data book - sundries - lump sum provision - preparation of data using standard data and schedule of rates.

### Chapter 2.2: Rate Analysis                                9 Hrs

Brick and stone masonry - plain cement concrete in foundation - cement concrete for flooring works - weathering course - RCC works for slab, sunshade, beam and column - partition wall - form works for beams and slabs - road works, WBM and surface dressing - white washing and painting works - AC sheet roofing - apron and revetment works in canals - wall plastering - ceiling plastering - pointing - plumbing and sanitary works in buildings.

## UNIT - III
## DETAILED ESTIMATE : TRADE SYSTEM AND TAKING OFF QUANTITIES

### Chapter 3.1: Trade System                                6 Hrs

Introduction - taking off quantities: systems - trade system - group system - methods - long wall and short wall method - centre line method - preparation of data - lump sum provision and contingencies - quantity surveyor - duties - essential qualities.

### Chapter: 3.2: Taking Off Quantities Using Trade System                12 Hrs

Prepare detailed estimate using trade system and take off quantities for all items of works in the following types of buildings:
  i.  A small residential building with two rooms with RCC roof.
  ii. Industrial buildings with AC / GI sheet roof with steel trusses.
  iii.Community Hall with RCC columns and T- beams
  iv. Septic tank with dispersion trench / soak pit
  v.  RCC slab culvert
  vi. Water bound Macadam Road

## UNIT - IV
## DETAILED ESTIMATE : GROUP SYSTEM AND TAKING OFF QUANTITIES

### Chapter 4.1: Group System                                9 Hrs

Advantages of group system - taking off and recording dimensions - squaring dimensions - abstracting or working up - billing - abbreviations.

dimension paper - timesing, dimension, squaring, descriptive column - cancellation of dimensions - descriptions - spacing of dimensions - order of taking off - squaring the dimensions - method of squaring - checking the squaring - casting up the dimensions.- function of the abstract - order in the abstract - preparing the abstract - casting and reducing the abstract - method of writing bill - checking the bill.

### Chapter: 4.2: Taking Off Quantities Using Group System                9 Hrs

Prepare detailed estimate using Group system and Take off quantities for all items of works in the following types of buildings:
    i. A single roomed building using Group system
    ii.A small residential building with two/three rooms with RCC roof.

## UNIT - V
## REPORT WRITING, VALUATION, RENT CALCULATION AND AREAS AND VOLUMES

### Chapter 5.1: Report Writing                                5 Hrs

Report writing - Points to be considered while writing a report - writing typical reports for works such as

i. Residential, Hospital and School buildings.
ii. Laying a village road.
iii. Construction of a bridge.
iv. Water supply system for a village.

**Chapter: 5.2: Valuation** **4 Hrs**

Purpose of valuation - types - book value - market value - salvage value - scrap value - depreciation - obsolescence - sinking fund - land valuation - mortage, lease - problems on valuation - annuity - definition and types only.

**Chapter: 5.3: Rent Calculation** **4 Hrs**

Fixation of rent - outgoing - gross & net income - years purchase - capital cost - standard rent - market rent - economical rent - problems on rent calculation.

**Chapter: 5.4: Areas and Volumes** **4 Hrs**

Computation of areas of irregular figures - volumes of embankment - trapezoidal rule, Simpson's rule - problems

**REFERENCE BOOKS::**

1. Estimating & Costing,Rangawala , Charotor Publishing;
2. Quantity Surveying & Valuatio, N.A.Shaw, Khanna Publishers;
3. Estimating & Costing, L.N.Dutta, Dhanpat Rai & Sons
4. IS: 1200 - Methods of Measurement of Building and Civil Engineering works.

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6153.1   ELECTIVE THEORY - I: ADVANCED CONSTRUCTION TECHNOLOGY

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| **6153.1 ADVANCED CONSTRUCTION TECHNOLOGY** | 5 Hrs | 80 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**UNIT - I**
**DEEP EXCAVATION, COFFER DAMS AND CAISSONS & PILE FOUNDATION Chapter 1.1: Deep Excavation** **5 Hrs**

Definition - problems encountered in deep excavations - methods of timbering - stay bracing, box sheeting, vertical sheeting, runners and sheet piling - precaution to be taken during timbering - dewatering of the foundation trenches - methods - pumping, provision of sumps and side drain cement grouting, freezing process, electro-osmosis process.

**Chapter 1.2: Coffer Dams and Caissons** **3 Hrs**

coffer dams - definition, uses, selection of cofferdams, design features of cofferdams (theory only), leakage prevention, economic height - Caissons - definition, uses, construction, materials, typed of caissons, design features of caissons (theory only) floating of caissons, cutting edges, sinking of caissons and tilting of caissons.

**Chapter 1.3: Pile Foundations** **7 Hrs**

Definition - uses & types of piles - bearing piles & friction piles - classification based on material - stone piles - encased piles - reinforced cement concrete piles - cast-in situ piles and precast piles description, advantage and disadvantages - load bearing piles and friction piles - purpose - sheet piles - types - description - choice of type of pile - factors to be considered - pile cap & pile shoe - description - load test on piles - description - pile driving - equipments - types of hammer - choice of hammer - causes of failure of piles - reinforcement requirements for RC piles.

**UNIT - II**
**SPECIAL CONCRETE**
**Chapter 2.1: Special Concrete** **10Hrs**

Admixtures - definition - function - classification - uses - quantity to be used. light weight concrete, production of light weight concrete, special concrete production process, curing,

advantages, limitations, properties and uses of special concretes fly ash concrete, fibre reinforced concrete, ferro cement sulphur impregnated concrete, polymer concrete, high performance concrete, self compaction concrete, geo-polymer concrete, recycled aggregate concrete (waste material based) and ready mix concrete - shot crete or guniting - definition - typical arrangement for gunite system.

**Chapter 2.2: Tests on Concrete**                                                        **5 Hrs**

Tests on fresh concrete (slump cone test, compaction factor test, flow test) and hardened concretes (compression test, splitting tensile strength test, and non-destructive test.

**UNIT - III**
**PRE-STRESSED CONCRETE**

**Chapter 3.1: Pre-Stressed Concrete**                                                        **5 Hrs**

Pre-stressed concrete - definitions - materials used grades of concrete and grades of steel used for pre-stressed concrete - forms of pre-stressing steel - general principle of pre-stressing - nature of concrete steel interface - advantages and applications of pre-stressed concrete - limitations of pre-stressed concrete - types of pre-stressed concrete.

**Chapter: 3.2: Methods of Pre-stressing**                                                        **5 Hrs**

Methods of pre-stressing - pretension method - post tension method - source of pre stressing force, pre-tensioning systems and devices - stages of pre-tensioning, post-tensioning systems and devices - stages of post - tensioning.

**Chapter: 3.3: Systems of Pre-stressing**                                                        **5 Hrs**

Systems of pre-stressing - Freyssinet system - Magnel Blaton system - Lee-Mc-Call system - causes for losses in pre-stress - losses in pre- stressing - simple numerical problems - remedial measures - composite member.

**UNIT - IV**
**PRE FABRICATION SYSTEM AND PRE FABRICATION METHODS**

**Chapter 4.1: Pre Fabrication System**                                                        **7 Hrs**

Advantages and disadvantages of prefabrication system - terms defined: prefabricated building, module, composite members, modular co- ordination, system; - basic module - planning modules grid - modules in horizontal plane for residential buildings and industrial buildings - other consideration - module for components:- flooring scheme, beams, columns, walls; staircase - lintel, sunshade - tolerance on dimensions: - length, cross sectional dimension, straightness, squareness, twist, flatness

**Chapter: 4.2: Pre Fabrication Methods**                                                        **7 Hrs**

Characteristics to be considered in devising a system - types of pre fabricated building - load bearing wall type - frame type; design considerations - bearing for pre cast units, joints - requirements of an ideal structural joint - manufacture of precast concrete elements - place - process - main, auxiliary and subsidiary process; stages of pre casting - preparation and storage of materials - moulding and curing; pre fabrication methods: individual method, battery form method, tilting mould method, flow line production method - extension method.Handling during transport and storage - handling arrangement - transport - inside the factory - stacking yard to erection site, erection works to be carried out - equipments required.

**UNIT - V**
**FIRE PROTECTION IN BUILDINGS, MAINTENANCE AND REHABILITATION OF BUILDINGS AND PRECAUTIONS TO PREVENT CRACKS IN BUILDINGS**

**Chapter 5.1: Fire Protection in Buildings**                                                        **5 Hrs**

General - causes and effects of fire - precautionary measures to minimize dangers of fire - limiting fire spread - factors to be considered - fire resisting properties of common building material - general rules for fire resisting buildings - alarm system - protection of openings - common wall stair - floor fire extinguishing arrangement - fire protection systems - types - emergency exit arrangements - strong room construction.

**Chapter: 5.2: Maintenance and Rehabilitation of Buildings**                                                        **5 Hrs**

Rehabilitation of buildings-demolition of buildings-safety aspects - general - precautions during demolitions - sequence of demolition of operation - demolition process of trusses, girders and beams, walls, flooring - catch plat form - lowering removal and disposal of materials - mechanical demolition - repairs to building - repairing of plastering works - retro fitting of structures - case studies of few buildings. Retro fittings for beams and columns -

advantages and disadvantages - procedure for increasing the strength of existing beams and columns.

**Chapter: 5.3: Precautions to Prevent Cracks in Buildings                4 Hrs**
Cracks - general - hair crack - structural crack - horizontal crack in masonry - vertical / diagonal cracks at walls - RCC beams or pillars - transverse cracks in RCC slab and sunshade - repairs - methods - materials used for filling cracks.

**REFERENCE BOOKS:**
1. Concrete Technology -        M.S. Shetty.
2. Fire Resistant Construction- Building Construction by S.P.Arora and S.P.Bindra.
3. IS Code of Practice for Earth quake, Fire resistance, IS Code of Practice for pre stressing (2005).
4. Pile foundation- RD Chellis, MIS.
5. Construction and foundation Engg- Sinha & Janatha Shau.
6. Principle Fire safety standards for Building Construction - M.Ya Roytman.
7. IS: 1343 -1980 Code of practice for pre stressed concrete.

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory)**

# 6153.2  ELECTIVE THEORY- I: REMOTE SENSING AND GEO INFORMATICS

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| **6153.2 REMOTE SENSING AND GEO INFORMATICS** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | | **Duration** |
| | 5 Hrs | 80 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | | |
| | | | 25 | 100 | 100 | | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**UNIT - I**
**FUNDAMENTALS OF REMOTE SENSING                15 Hrs**
Basic concepts of remote sensing definition and its components - energy sources and radiation principles - electromagnetic radiation - spectrum - wavelength regions important to remote sensing - atmospheric scattering, adsorption - Atmospheric windows - spectral signature concepts - typical spectral reflective characteristics of water, vegetation and soil characteristic of real remote sensing system, platforms, orbit types, sensors, resolution concepts satellite - pay load description of Indian Earth Resources and Meteorological Satellites.

**UNIT - II**
**PHOTOGRAMMETRY                        15 Hrs**
Geometric elements of a vertical photograph - stereoscopic plotting instruments, ortho photos, flight planning.

**UNIT - III**
**IMAGE INTERPRETATION AND ANALYSIS                15 Hrs**
Fundamentals of air photo interpretation - elements of image interpretation, concepts of digital image processing image rectification and restoration, image enhancement, image classification, application of remote sensing in Civil Engineering.

**UNIT - IV**
**FUNDAMENTALS OF GIS                        14 Hrs**
Basic concepts of GIS - basic spatial concepts -coordinate systems: definitions - history of development of GIS-components of GIS: hardware/software, data, people & methods - proprietary and open source software - types of data - spatial, attribute data- types of attributes - scales/ levels of measurements - Data Base Management Systems (DBMS).

**UNIT - V**
**GIS - DATA ENTRY, STORAGE AND ANALYSIS                14 Hrs**
Data models - vector and raster data - data compression - data input by digitization and scanning, data storage - attribute data analysis - integrated data analysis - mapping concept - development of map overlay, overlay operation - errors and quality control - Land Information System (LIS) - various GIS applications in Civil Engineering - Regional Planning and Site Investigations, Hydrology and Water Resources Engineering, Transportation and

Network Analysis - Highway Alignments.

**REFERENCE BOOKS::**

1. Geographic Information Systems, Lo & Yeung (2005), Prentice of India.
2. Remote Sensing and Geographical information systems.,Anji Reddy.M. (1998).
3. Remote Sensing and image interpretation, Lillesand, T.M. & Kiefer R.W. (1998), John Wiley & Sons, Newyork.
4. Principle of Geographical Information Systems for land resources assessment, Burrough P.A. (2000), Clarendon Press, Oxford.
5. Geographic Information Systems & Environmental Modelling,Clarke Parks & Crane (2005), Prentice-Hall of India.
6. Elements of Photo-grammetry, Wolf Paul (1998),McGraw Hill, New Delhi.
7. G I S Basics, Shahab Fazal,New Age International Publications, Chennai.

 **\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6153.3  ELECTIVE THEORY- I: GEOTECHNICAL ENGINEERING

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6153.3 GEOTECHNICAL ENGINEERING** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 5 Hrs | 80 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

 **\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**UNIT - I**
**GEOTECHNICAL ENGINEERING**
**Chapter 1.1: Soil Mechanics and Index Properties** 8 Hrs
Introduction - development of soil mechanics - fields of application of soil mechanics - soil formation - cohesive and cohesion less soil - soil properties - three phase system - general, index and engineering properties - detailed description - Atterberg"s limits - simple problems - soil map of India.
**Chapter 1.2: Hydraulic Properties of Soil** 7 Hrs
Introduction - permeability - co-efficient of permeability - Darcy's law - factors affecting permeability - permeability tests - simple problems - quick sand conditions.
**UNIT - II**
**CLASSIFICATION AND STRENGTH OF SOIL, STABILIZATION OF SOIL AND SUB-SOIL SAMPLING**
**Chapter 2.1: Classification and Strength of Soil** 8 Hrs
Classification of soil - introduction - necessity - systems of soil classification - field identification of soil - shear strength of soil - introduction - shear strength - Mohr's stress circle - Mohr-coulomb failure theory - shear strength test - unconfined compression test - Mohr's circle for unconfined compression test - compaction - consolidation - consolidometer - optimum moisture content - Proctor's Compaction test - methods of compaction - degree of compaction - field density of soil - tests - compaction and consolidation - comparison.
**Chapter 2.2: Stabilization of Soil and Sub-Soil Sampling** 7 Hrs
Stabilization of soil - introduction - objects of stabilization - methods of stabilization - soil exploration - introduction - objects of soil exploration - methods of soil exploration - direct , semi-direct and indirect methods - spacing and depth of test borings - boring log - sounding and penetration tests - Standard Penetration Test (SPT)- geophysical methods - sub-soil sampling - disturbed and undisturbed samples - types of samplers - split spoon sampler - thin-walled sampler - chunk sampling.
**UNIT - III**
**SEEPAGE ANALYSIS AND SEEPAGE BELOW HYDRAULIC STRUCTURES, BEARING CAPACITY AND SETTLEMENT OF FOUNDATIONS**
**Chapter 3.1: Seepage Analysis and Seepage Below Hydraulic Structures** 8 Hrs

Seepage analysis - introduction - head, gradient and potential - hydraulic gradient - seepage pressure - upward flow (quick condition or quick sand) - types of flow lines - types of flow (definition only) - two dimensional flow (Laplace equation) - velocity potential - properties of flow net - uses of flow net - seepage below hydraulic structures - introduction - hydraulic gradient - piping - exit gradient - Khosla's theory - seepage flow nets below hydraulic structures.

### Chapter 3.2: Bearing Capacity and Settlement of Foundations                7 Hrs

Bearing capacity - introduction - terminology - factors affecting bearing capacity of soils - methods of determining bearing capacity - types of failure in soil - general , local and punching shear failure - analytical methods - Rankine's analysis - Terzaghi's analysis - assumption and limitations - effect of water table - methods of improving bearing capacity of soil - bearing capacity of different soil as per BIS settlement of foundation - introduction - causes and effect of settlement - settlement values as per BIS provisions plate load test - simple problems.

### UNIT - IV
### FOUNDATIONS AND FOUNDATIONS IN EXPANSIVE SOIL
### Chapter 4.1: Foundations                7 Hrs

Introduction - definitions - objectives - requirements of foundation - criteria for selection of type of foundation - types of foundations - shallow foundation types-isolated, combined ,raft deep foundations - types - foundation at different levels - foundation on made up grounds - deep foundation - introduction - pile foundation - uses of piles - types of piles - caisson foundation - types - selection of piles - pile driving - capacity of piles - pile load test - floating foundation - negative skin friction - pile groups - bearing capacity of pile groups - BIS provision for settlement of pile group - design of foundation using software (description only).

### Chapter 4.2: Foundations in Expansive Soil                7 Hrs

Introduction - identification of expansive soil - free swell test - differential free swell test - Indian expansive soil - swell potential and swelling pressure - traditional Indian practice - methods of foundation in expansive soils - replacement of soils and "CNS" concept - under reamed pile foundation - remedial measures for cracked buildings.

### UNIT - V
### MACHINE FOUNDATION AND TOWER FOUNDATIONS (TRANSMISSION LINE)
### Chapter 5.1: Machine Foundation                7 Hrs

Introduction - soil dynamics - free vibration and forced vibration - definitions -natural frequency - Barkan's method Pauw's method - types of machines and machine foundation - general requirements - design of machine foundations - reciprocating type - centrifugal type - impact type - design steps- Couzen theory - in-situ dynamic investigation of soil - methods - BIS code of practice - design criteria - isolation of foundation - simple problems.

### Chapter 5.2: Foundations of Transmission Line Towers                7 Hrs

Introduction - necessity - forces on tower foundations - general design criteria - choice and type of foundations - design procedures - stability conditions - (description only).

### REFERENCE BOOKS::

1. Soil Mechanics and Foundations,Dr.Punmia.B.C, S Laxmi publications(P)Ltd., New Delhi, 2005.
2. Soil Mechanics and Foundations Engineering, Dr.K.R.Arora, Standard publications, New Delhi, 2011/6th.
3. Basic and applied Soil Mechanics,Gopal Ranjan &Rao New Age International, New Delhi, 2000/2nd
4. Soil Mechanics in Engineering Practice,Terzaghi,John Wiley and Sons,New Delhi.
5. Foundation Design WAYNE C.TENG, Prentice Hall of India (P) Ltd, New Delhi.
6. A Text Book of Soil Mechanics, Dr S B SEHGAL, CBS Publishers & Distributors, New Delhi,
7. Soil Mechanics and Foundation Engineering, S. Kaur and R.Singh, S.K. Kataria & Sons, New Delhi, 2003.

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6154 - CIVIL ENGINEERING DRAWING AND CAD PRACTICE - II

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6154** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| **CIVIL ENGINEERING DRAWING AND CAD** | 6 Hrs | 96 Hrs | **Internal Assessment** | **External Exam** | **Total** | 3 Hrs |

| PRACTICE - II | | | 25 | 100 | 100 | |
|---|---|---|---|---|---|---|

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## PREPARATION OF DRAWINGS USING CAD SOFTWARE

**I PUBLIC HEALTH ENGINEERING**            **18 Hrs**

Draw plan and sectional views of the following:
1. Rapid sand filter
2. Septic tank with dispersion trench / soak pit.
3. RCC square over head tank supported by four columns.

**II BRIDGE DRAWING**            **12 Hrs**

Draw plan and sectional views of the following:
4. Two span tee beam bridge with square returns
5. Steel foot over bridge across a highway

**III STRUCTURAL ENGINEERING**            **66 Hrs**

Draw plan, cross section and longitudinal sectional views of the following:
6. Simply supported two-way slab
7. Continuous one-way slab (with three equal spans)
8. Restrained two-way slab
9. Singly reinforced rectangular beam
10. Doubly reinforced continuous beam (with two equal spans)
11. Tee beams supporting continuous slab
12. Lintel and sunshade
13. Dog-legged staircase
14. RCC column with square isolated footings
15. Steel beam to steel column connections - seat angle and web angle connections.
16. Steel beam to steel beam connections
17. Steel Portal Frames

### AUTONOMOUS EXAMINATION

Note 1: All the exercises in both sections have to be completed. One exercise will be given for examination. All the exercises should be given in the question paper and students are allowed to select by a lot. All students should submit record notebook for the examination.

Note 2: At least two drawings in each part (I, II & III) must be drawn manually. The same should be submitted as record work for examination.

### DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---|---|---|
| 1 | Plan / Elevation | 55 |
| 2 | Cross section / longitudinal section | 35 |
| 3 | Viva-voce | 10 |
| **Total** | | **100** |

# 6155 - COMPUTER APPLICATIONS IN CIVIL ENGINEERING PRACTICE

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| 6155 COMPUTER APPLICATIONS IN CIVIL ENGINEERING PRACTICE | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| | | | Internal Assessment | External Exam | Total | |
| | 4 Hrs | 64 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## PART - A
## I ELECTRONIC SPREAD SHEET USING SOFTWARE                                       16 Hrs

Solving problems involving estimation, analysis and design using any one of the available packages mentioned below or any other suitable packages for the following exercises.

1. Prepare the estimate sheet with given data (provide all the measurement details) and calculate the quantity using formula bar.
2. Prepare the abstract sheet for the given data and calculate amount and total amount using formula bar ( use separate column for rates and units)
3. Design and analysis problems
4. Calculate area and elongation using formula bar
5. Calculate effective depth, d' and area of steel, "A"$_{st}$ using formula bar for given singly reinforced section.
6. For given dimension of Masonry/R.C.C Dam ie. top width, bottom width, height of dam , height of water, specific weight (sp.wt) of masonry / RCC. , sp.wt of Water etc,. find the base pressure and check the stability of the dam.
7. Finding centre of gravity; $I_{xx}$ and $I_{YY}$ of I, L, T and channel sections.
8. Design of beam / column / slab / footing using excel macro / programming language.

Note : In addition to the above, similar exercises may be given for practice.


## PART B
## II RCC DETAILING USING SOFTWARE                                       16 Hrs

Generation of detailed drawings for the given specification and preparation of bar bending schedule using any one of the software packages for the following exercises.
  Cross section and longitudinal section of:
1. Continuous one way slab (with three equal spans).
2. Simply supported two-way slab.
3. Restrained two - way slab.
4. Singly reinforced rectangular beam.
5. Doubly reinforced continuous rectangular beam with two equal span.
6. Dog-legged staircase.
7. R.C.C Column with square isolated footing.


## III RCC STRUCTURES - ANALYSIS USING SOFTWARE                                       16 Hrs

1. Carry out the analysis and design of simple RCC structures using any available packages like STAADPRO, ETAB, CADS3D or any other suitable packages.
2. Carry out the analysis and design of simple RCC structures for lateral loads


## IV CONSTRUCTION PROJECT MANAGEMENT USING SOFTWARE                                       10 Hrs

1. Develop the CPM / PERT Network for the proposed simple building project using available packages mentioned below or any other suitable packages.


## V DRAWING MAPS USING GIS SOFTWARE                                       06 Hrs

1. Develop Aerial map of given area using **any one** of the available packages mentioned below or any other suitable packages.

### AUTONOMOUS EXAMINATION

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from  PART - A  and  one exercise from PART - B. All the exercises should be given in the question paper and  students  are allowed to select by a lot. All students should  submit record notebook for the examination.


### DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---|---|---|
| Part - A | | |
| 1 | Procedure Writing | 05 |

| | | |
|---|---|---|
| 2 | Observation and Tabulation | 15 |
| 3 | Calculations | 10 |
| 4 | Sketch/Graph | 05 |
| 5 | Accuracy of Result | 05 |
| **Part - B** | | |
| 1 | Procedure Writing | 05 |
| 2 | Observation and Tabulation | 20 |
| 3 | Calculations | 15 |
| 4 | Sketch/Graph | 05 |
| 5 | Accuracy of Result | 05 |
| 7 | Viva-voce | 10 |
| **Total** | | **100** |

## 6156.1  ELECTIVE PRACTICAL - I: CONCRETE TECHNOLOGY PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6156.1 CONCRETE TECHNOLOGY PRACTICAL** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 4 Hrs | 64 Hrs | **Internal Assessment** | **External Exam** | **Total** | 3 Hrs |
| | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

### RATIONALE:
Diploma holders in Civil Engineering are supposed to supervise the construction of buildings. To perform the above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, stair cases, floors etc., and their constructional details. Therefore, the subject of concrete technology practical is very important for Civil Engineering diploma holders.

### OBJECTIVES:
After the completion of study, the student would be able to
- find the fineness setting time of cement.
- know the shape tests and fineness for modulus coarse aggregate.
- determine the bulking characteristics of sand.
- determine the workability of concrete using slumpcone, compaction factor and Vee Bee Consistometer tests.
- know the arrangement of steel reinforcement for concrete elements
- study the workability properties of self compacting concrete.

### LIST OF EXPERIMENTS
**PART A**                                                    **24 Hrs**
1. Prepare and develop a centre line plan and foundation plan for a given line sketch of a building and Set out spread footing foundation for the same.
2. Setting the layout of columns and footing foundation in the field for a given line plan of a building (framed structure).
3. Setting the layout of columns and footing foundation in the field for a given line plan of building (framed structures) using Theodolite / Total station
4. Cutting, hooking, cranking and arrangement of reinforcement for: a. Beam b. Lintel and sunshade c. column and footing
**PART B**                                                    **40 Hrs**
5. Determination of fineness modulus of fine aggregate sample and plot a particle size distribution curve and also find the effective size and uniformity co-efficient.

6. Determination of fineness modulus of coarse aggregate sample and plot a particle size distribution curve and also find the effective size and uniformity co-efficient.
7. Determination of bulking characteristics of the given sand sample        .
8. Shape test for coarse aggregate.
   a. Flakiness Index test
   b. Elongation Index test
   c. Angularity number test.
9. Determination of workability of concrete by slump cone test and flow table test.
10. Determination of workability of concrete by compaction factor test.
11. Vee-Bee Consistometer test on concrete.
12. Casting and testing (compression) of concrete cubes / cylinders.
13. Determine the compressive strength of concrete cubes by destructive and non-destructive testing (rebound hammer test) and compare the results.

## AUTONOMOUS EXAMINATION

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART - A and one exercise from PART - B. All the exercises should be given in the question paper and students are allowed to select by a lot. All students should submit record notebook for the examination.

## DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---------|----------------------|-------|
| **Part - A** | | |
| 1 | Procedure and Equipment handling | 25 |
| 2 | Calculation and Tabulation | 15 |
| 3 | Result | 05 |
| **Part - B** | | |
| 1 | Procedure and Equipment handling | 20 |
| 2 | Calculation and Tabulation | 20 |
| 3 | Result | 5 |
| 7 | Viva-voce | 10 |
| **Total** | | **100** |

## 6156.2 ELECTIVE PRACTICAL - I : ADVANCED SURVEYING AND BASIC GIS PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---------|-------------|--|-------------|--|--|--|
| 6156.2 ADVANCED SURVEYING AND BASIC GIS PRACTICAL | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| | | | Internal Assessment | External Exam | Total | |
| | 4 Hrs | 64 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## REMOTE SENSING EXERCISES                                    64 Hrs
1. Introduction to remote sensing and GIS and creating a map using tools.
2. Introduction to ARC GIS desktop.
3. Geo referencing an image using ARC GIS.

4. Creating and editing shape files in ARC MAP.
5. Editing in ARC MAP.
6. Adding fields to a shape file.
7. Querying the data.
8. Buffering and clipping.
9. Case study of creation of campus map using ARC GIS software

## AUTONOMOUS EXAMINATION

Note: One exercise will be given for examination and students are allowed to select by a lot. All students should submit record notebook for the examination.

### DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---------|----------------------|-------|
| 1 | Procedure | 10 |
| 2 | Tabulation and Observation | 35 |
| 3 | Calculations | 25 |
| 4 | Sketch / Graph | 10 |
| 5 | Accuracy of result | 10 |
| 6 | Viva Voce | 10 |
| **Total** | | **100** |

# 6156.3 ELECTIVE PRACTICAL- I : GEOTECHNICAL ENGINEERING PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---------|-------------|-------------|-------------|-----|-------|----------|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| 6156.3 GEOTECHNICAL ENGINEERING PRACTICAL | 4 Hrs | 64 Hrs | Internal Assessment | External Exam | Total | 3 Hrs |
| | | | 25 | 100 | 100 | |

 * Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.

## LIST OF EXPERIMENTS                                          64 Hrs
1. Identification of rocks from the given specimen.
2. Determine water content of given soil sample by oven drying method as per
    IS: 2720 (Part-II).
3. Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V).
4. Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part- IV).
5. Use different types of soil to identify and classify soil by conducting field tests-through visual inspection, dry strength test, Dilatancy test and Toughness test.
6. Determine coefficient of permeability by constant head test as per IS 2720 (Part- XVII).
7. Determine coefficient of permeability by falling head test as per IS 2720 (Part- XVII).
8. Determine shear strength of soil by triaxial shear test as per IS 2720 (Part- XIII).
9. Determine shear strength of soil by vane shear test as per IS 2720 (Part-XXX).
10. Determine the consolidation properties of given soil sample.
11. Find the unconfined compressive strength of given clay sample.
12. Study of CBR value on the field as per BIS:2720 (Part - XVI).
13. Study on Standard Penetration Test to find SBC of soil.

## AUTONOMOUS EXAMINATION

Note: All the exercises in both sections have to be completed. One exercises will be given for examination and students are allowed to select by a lot. All students should submit record notebook for the examination.

## DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---------|----------------------|-------|
| 1 | Procedure | 10 |
| 2 | Tabulation and Observation | 40 |
| 3 | Calculations | 25 |
| 4 | Sketch / Graph | 10 |
| 5 | Accuracy of result | 10 |
| 6 | Viva Voce | 05 |
| **Total** | | **100** |

## 6157 ENTREPRENEURSHIP AND STARTUPS

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---------|-------------|-------------|-------------|-------------|-------|----------|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| **6157 ENTREPRENEURSHIP AND STARTUPS** | 4 Hrs | 64 Hrs | Internal Assessment | External Exam* | Total | 3 Hrs |
| | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

### I ENTREPRENEURSHIP - INTRODUCTION AND PROCESS                     10 **Hrs**
- Concept, Functions and Importance.
- Myths about Entrepreneurship.
- Pros and Cons of Entrepreneurship.
- Process of Entrepreneurship.
- Benefits of Entrepreneur.
- Competencies and Characteristics.
- Ethical Entrepreneurship.
- Entrepreneurial Values and Attitudes.
- Motivation.
- Creativity.
- Innovation.
- Entrepreneurs - as problem solvers.
- Mindset of an employee and an entrepreneur.
- Business Failure - causes and remedies.
- Role of Networking in entrepreneurship.

### II BUSINESS IDEA AND BANKING                     10 Hrs
- Types of Business: Manufacturing, Trading and Services.
- Stakeholders: sellers, vendors and consumers     and Competitors.
- E- commerce Business Models
- Types of Resources : Human, Capital and Entrepreneurial tools.
- Goals of Business; Goal Setting.
- Patent, copyright and Intellectual property rights.
- Negotiations - Importance and methods.

- Customer Relations and Vendor Management.
- Size and Capital based classification of business enterprises.
- Role of financial institutions.
- Role of Government Policy.
- Entrepreneurial support systems.
- Incentive schemes for state government.
- Incentive schemes for Central governments.

## III STARTUPS, E-cell and SUCCESS STORIES                    10 Hrs
- Concept of Incubation centres.
- Activities of DIC, financial institutions and other relevance institutions.
- Success stories of Indian and global business legends.
- Field Visit to MSMEs.
- Various sources of Information.
- Learn to earn.
- Startup and its stages.
- Role of Technology - E-commerce and Social Media.
- Role of E-Cell.
- E-Cell to Entrepreneurship.

## IV HUMAN RESOURCE MANAGEMENT                              04 Hrs
- Meaning of Manpower Planning.
- Recruitment and Selection procedure.
- Payment of wages, factors determining the wage.
- Methods of payment of wages - Time rate and Piece rate.
- Labour Turnover - definition, its causes, impact and remedy.
- THE BOCW ACT- The Building and Other Construction Workers (Regulation of Employment and Condition of Services) Act, 1996. The Building and Other Construction Workers (Regulation of Employment and Condition of Services) Central Rules, 1998.

## INDUSTRIAL LEGISLATION                                     03 Hrs
- Need of Industrial legislation
- Indian Factories Act - 1948 - Definition of Factory, main provisions regarding health, Safety and Welfare of Workers
- Industrial Dispute Act - 1947 - Definition of Industrial dispute, Machineries for settlement of Industrial dispute in India.

## MICRO AND SMALL ENTERPRISES                                03 Hrs
- Definition of Micro & Small enterprises.
- Meaning and characteristics of Micro and Small enterprise.
- Scope of SSI with reference to self-employment.
- Procedure to start SSI - idea generation, SWOT analysis- Selection of site for factories.

## V PREPARATION OF PROJECT REPORTS FOR
## PROJECT IDENTIFICATION AND FORMULATION REPORT               02 Hrs
- Introduction - Collection of Data.
- Compilation of Data.
- Analysis and Assimilation of Data.
- Product Selection.
- Report Finalization and Report Writing.

## PROJECT PROFILE/PRE-FEASIBILITY REPORT                      03 Hrs
- Introduction of the product.
- Market.

- Man Power (Personnel Required).
- Manufacturing Process- Plant and Machinery, Means of Finance.
- Cost of Production.
- Annual Turnover.
- Profit - Profit on Investment.

## TECHNO-ECONOMICAL FEASIBILITY REPORT (TEFR)          03 Hrs
- Introduction on product.
- Market Prospects and Marketing.
- Location.
- Manufacturing Programme and Annual Turnover.
- Manufacturing Process.
- Cost of Project.
- Means of Finance.
- Requirement of Raw materials, Consumables, Utilities and Working Capital.
- Organizational Structure, Management and Man Power.
- Project Implementation Schedule.
- Profitability and Cash Flow.

## MARKET SURVEY REPORT FOR CONSTRUCTION PROJECT          02 Hrs
- Data Collection & Processing through Primary & Secondary Sources.
- Questionnaire - method, e-mail, by post, by phone -
- Present Status - Growth of the Industry- Import and Export - Present market Demand.
- Forecast - Future Prospect/Scope - Market Segmentation.

### REFERENCE BOOKS::
1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra - 282002
2. Dr. G.K. Varshney, Business Regulatory Framework , Sahitya Bhawan Publications, Agra - 282002
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301
4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
5. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
6. Trott, Innovation Management and New Product Development, Pearson Education, Noida - 201301
7. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
8. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
9. V. Trivedi, Renu Jatana, Indian Banking System, RBSA Publishers, Rajasthan
10. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai - 600018
11. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioners guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai 600095.

### Evaluation Pattern Internal Mark Allocation

| | | |
|---|---|---|
| Assignment (Theory portion)* | - | 10 |
| Seminar Presentation | - | 10 |
| Attendance | - | 5 |
| **Total** | **-** | **25** |

**Note:**

\* Two assignments should be submitted. The same must be evaluated andConverted to 10 marks. Each assignment should have five three marks questions and two five marks questions.

Guidelines for assignment:
First assignment                          - Unit I
Second assignment                          - Unit II

Guidelines for Seminar Presentation        - Unit III

## AUTONOMOUS EXAMINATION

**Note:**
1. The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.
2. The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Board Practical Examinations.
3. The question paper consists of theory and practical portions. All students should write the answers for theory questions (45 Marks) and practical portions (55 Marks) should be completed for Autonomous Examinations.
4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do the examination for 3 Hrs.
5. For Written Examination: theory question and answer: 45 Marks
    10 questions will be asked for 3 marks each. 5 questions from each unit 1 & 2.(10 X 3 = 30).
    3 questions will be asked for 5 marks each. 1 question from each unit 1,2&3. (3X5=15)
6. For Practical Examination: The business plan/Feasibility report or Report on Unit 4 & 5 should be submitted during the board practical examinations. The same have to be evaluated for the report submission (40 marks).

## DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---------|----------------------|-------|
| Part A | Written Examination - Theory Question and answer (10 questions x 3 marks: 30 marks & (3 questions x 5 marks: 15 marks) | 45 |
| Part B | Practical Examination - Submission of Business Plan/Feasibility Report or Report on Unit 4 & 5 | 40 |
| Part C | Viva voce | 15 |
| **Total** | | **100** |

# SIXTH SEMESTER

## 6161 - CONSTRUCTION MANAGEMENT

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---------|-------------|---|-------------|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| **6161 CONSTRUCTION MANAGEMENT** | 6 Hrs | 96 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

 **\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**UNIT - I**
**CONSTRUCTION SECTOR IN INDIA, FEASIBILITY STUDY, PLANNING OF CIVIL ENGINEERING PROJECT AND CONTRACT MANAGEMENT**
**Chapter 1.1: Construction Sector in India                                5 Hrs**
Construction management - definition - need - scope - objectives and functions - role of Government and private construction agencies - types of construction sectors - public and

private functions of construction management in national development - construction practice:- the owner, consultant and contractor - duties and responsibilities - various stages of a construction project.

## Chapter 1.2: Feasibility Study                                      4 Hrs
Study of necessity of project - technical feasibility, financial feasibility, ecological feasibility, resource feasibility, recovery from the project, economical analysis - building economics - preliminary studies - analysis - valuation.

## Chapter 1.3: Planning of Civil Engineering Project                  5 Hrs
Objective of planning - public project - preliminary planning - design factors - site utilization - reconnaissance survey - preliminary survey - analysis and plotting of data - estimate: preliminary and detailed estimate - project report - land acquisition - administrative approval - technical sanction - budget provision - private project - advantages of planning to client and engineer - limitations - stages of planning by owner and contractor.

## Chapter 1.4: Contract Management                                    4 Hrs
Types of contracts - contract documents - contractual obligations - specifications - tender notice - types - tender documents - Earnest Money Deposit (EMD) and Security Deposits (SD) - scrutiny and acceptance of a tender - contract agreement - contractual changes and termination of contract - work order - execution of agreement - sub contract - rights and duties of sub-contractor.

## UNIT - II
## CONSTRUCTION ORGANISATION AND THEIR SUPERINTENDENCE & DEPARTMENTAL PROCEDURE AND ACCOUNTING

## Chapter 2.1: Construction Organisations and Their Superintendence    9 Hrs
Forms of business organizations - sole proprietorship - partnership - joint stock company - co-operative society - and state enterprises - advantages and disadvantages - delegation of responsibility, personnel requirements and division of works - decentralization - construction supervision and superintendence - requirements and responsibilities of executives of the project - qualities of efficient construction manager - pay rolls and records - purchase and delivery of construction materials and equipments - percentage completion report - insurance record - project office requirement - organization chart of a small / medium / large construction company (broad outline only).

## Chapter 2.2: Departmental Procedure and Accounting                   9 Hrs
Organisation of PWD - responsibilities of officers - accounting procedure (administrative sanctions, technical sanctions and payment of bills) – imprest and temporary accounts - cash book - works register - accounting for consumable materials - record for tools and plants - importance of m- book and its entries - work charged establishment - Nominal Muster Roll (NMR) - Daily Labour Reports (DLR).

## UNIT - III
## SCHEDULING AND TIME MANAGEMENT & RESOURCE MANAGEMENT

## Chapter 3.1: Scheduling and Time Management                          9 Hrs
scheduling - definition - preparation of schedule - uses and advantages - classification of schedules - methods of scheduling - bar chart - job layout - Work Breakdown Chart (WBC) - network for projects management - activity - event - dummies - basic assumptions in creating a network - rules for developing networks - Fulckerson's rule for numbering the events - critical path method critical and subcritical paths - critical and non critical activities / events - significance of critical path simple problems - PERT - time estimate - EST, EFT, LST, LFT- earliest expected time - latest allowable occurrence time - floats - slack. Standard deviation - variance - simple problems.

## Chapter: 3.2: Resource Management                                    9 Hrs
Definition - need for resource management - optimum utilization of resources-finance, materials, machinery, human resources - resource planning - resource levelling and its objectives - construction planning - stages - operations - schedule - crashing - need for crashing an activity - methods and tips for crashing - time vs cost optimization curve - cost slope and its significance in crashing - simple problem on resource levelling

## UNIT - IV
## QUALITY MANAGEMENT AND SAFETY, CONSTRUCTION DISPUTES AND THEIR SETTLEMENT CONSTRUCTION LABOUR AND LEGISLATION & ETHICS IN ENGINEERING

**Chapter 4.1: Quality Management and Safety                    5 Hrs**

Importance of quality - elements of quality - quality assurance techniques (inspection, testing, and sampling) importance of safety - causes of accidents - role of various parties (designer / employer / worker) in safety management - benefits - approaches to improve safety in construction.

**Chapter: 4.2: Construction Disputes and their Settlement          4 Hrs**

Introduction - development of disputes categories of disputes - modes of settlements - arbitration.

**Chapter 4.3: Construction Labour and Legislation               5 Hrs**

Need for legislation - Payment of wages Act - Factories Act - Contract labour (Regulation and abolition) Act - Employees Provident Fund (EPF) Act

**Chapter: 4.4: Ethics in Engineering                          4 Hrs**

Human values - definition of ethics - engineering ethics - engineering as a profession - qualities of professional - professional institutions - code of ethics - major ethical issues - ethical judgment - engineering and management decision - value based ethics.

**UNIT - V**

**ENTREPRENEURSHIP, INFORMATION MANAGEMENT AND COMPUTERS AND FINANCIAL MANAGEMENT**

**Chapter 5.1: Entrepreneurship                              6 Hrs**

Definition - role and significance - risks and rewards - concepts of entrepreneurship - profile and requirement of entrepreneur - programmes existing in India - SSI, DIC, TANSIDCO - funding and technical assistance to entrepreneurship - NIDCO, ICICI, IDBI, IFCI, SFC.

**Chapter: 5.2: Information Management and Computers           6 Hrs**

Introduction - definition of MIS - Outline of MIS - use of computers in construction industry - requirements of MIS - a data base approach - definition - benefits - a data base approach to contractor's account and its advantage - basic concepts of estimation - project management and operations simulation packages - construction automation and robotics.

**Chapter: 5.3: Financial Management                          5 Hrs**

Elements of cash flow - time value of money - interest rate of capital - present value computation - NPV method - IRR method - simple problems - Global banking culture - types of banks - activities of banks - corporate finance - personal, retail and rural banking - treasury management.

**REFERENCE BOOKS:**
1. Construction Management, Sanga Reddy. S, Kumaran Publications, Coimbatore.
2. Construction Mgmt. & Planning, Sengupta.B,& H.Guha.,Tata McGraw Hill Publishing Com.Ltd., New Delhi
3. Construction Engineering & Management,Seetharaman. S.Umesh Publications, NaiSarak, New Delhi.
4. Comp. Applications in Construction, Boyd.C.& Paulson Jr.Tata McGraw Hill Publishing Com. Ltd., New Delhi.
5. Construction of Structures & Mgmt of Works,Rangwala.S.C., Charotar Publishing House, Anand 388 001, 2000.
6. Project Planning and control with PERT and CPM,B CPunmia, Laxmi Publications.

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6162 - ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6162 ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 6 Hrs | 96 Hrs | **Internal Assessment** | **External Exam\*** | **Total** | |
| | | | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**UNIT - I**
**WATER SUPPLY ENGINEERING**

**Chapter: 1.1: Introduction**        **3 Hrs**

Water supply - salient features of a water supply scheme - flow chart of a water supply scheme-agencies responsible for protected water supply.

**Chapter: 1.2 :Quantity of Water**        **5 Hrs**

Water supply - need for protected water supply - objectives of public water supply system - demand - types of demand - per capita demand - prediction of population - problems in arithmetical increase method, geometrical increase method, and incremental increase method.

**Chapter: 1.3: Sources of Water**        **4 Hrs**

Sources of water - surface sources - underground water sources selection of source of water.

**Chapter: 1.4: Intakes and Conveyance**        **6 Hrs**

Intakes - types of intakes - description of intakes - infiltration galleries and infiltration wells in river beds - necessity of pumps - types of pumps - pipes for conveyance of waste - cast iron, steel, gi., cement concrete, RCC, hume and PVC pipes - pipe joints - laying and testing of pipe lines - pipe corrosion - corrosion control.

**UNIT - II**

**TREATMENT OF WATER**

**Chapter: 2.1: Quality of Water**        **3 Hrs**

Impurities in water - testing of water - collection of water sample - physical, chemical, bacteriological tests - standards of drinking water - water borne diseases and their causes.

**Chapter: 2.2: Primary Treatment of Water**        **5 Hrs**

Object of water treatment - flow diagram of a treatment plant - function of units - sedimentation - purpose of sedimentation - types of sedimentation tank - coagulation - coagulants - flocculation - coagulation process.

**Chapter: 2.3 Filtration of Water**        **3 Hrs**

Theory of filtration - classification of filters - slow sand filter - rapid sand filter - pressure filter - comparison between slow sand filter and rapid sand filter.

**Chapter: 2.4: Disinfection of Water and Water Softening**        **5 Hrs**

Necessity of disinfection - methods of disinfection - chlorination - action of chlorine - methods of chlorine - forms of chlorination - water softening - necessity of water softening - hardness - types of hardness - effects of hardness - removal of hardness - miscellaneous water treatment- mineral water - requirements - treatment process - reverse of osmosis (RO).

**Chapter: 2.5: Preparation of Water Supply Scheme or Project**        **2 Hrs**

Reconnaissance of survey - demand of water - source of water - preparation of topographical map - layout map of the scheme - map and drawing to be prepared - office work - project report.

**UNIT - III**

**SANITARY ENGINEERING**

**Chapter: 3.1: Distribution System**        **9 Hrs**

Distribution System - methods of distribution gravity system, pumping system, combined system - systems of water supply - continuous and intermittent supply of water -layouts of distribution - dead end, grid iron, radial and circular systems - service reservoirs - types.

**Chapter: 3.2: Preparation of Water Supply Scheme or Project**        **9 Hrs**

Reconnaissance of survey - demand of water - source of water - preparation of topographical map - layout map of the scheme - map and drawing to be prepared - office work - project report.

**UNIT - V**

**TREATMENT OF SEWAGE**

**Chapter: 4.1: Collection and Conveyance of Sewage**        **9 Hrs**

Sanitation purpose terms - systems of sanitation - quantity of sewage - variation in rate of flow of sewage -estimation of strom water - problems - minimum size of sewer - shapes of sewer (names only) - materials used for sewer - joints in sewer line - laying and testing of sewer lines - ventilation of sewers - cleaning of sewers.

**Chapter: 4.2: Sewer Appurtenances**        **9 hrs**

Sewer appurtenances manhole - lamp hole - catch basin - street - inlet - grease and oil trap - flushing tanks drainage arrangements in buildings - sanitary fittings - sewage pumps necessity - types of sewage pumps .

**UNIT - V**

**POLLUTION CONTROL**

**Chapter: 5.1: Primary Treatment of Sewage**        **2 Hrs**

Introduction - Flow Diagram of Primary Treatment -Screens - Grit Chamber - Skimming Tank -

Primary Sedimentation Tank.

**Chapter:5.2 Secondary Treatment of Sewage**          **3Hrs**

Introduction - Flow Diagram of Secondary Treatment - Function of the Units of Secondary Treatment - Secondary Sedimentation Tank - Filters - Types - Trickling Filters - Activated Sludge Process - Septic Tanks for isolated buildings - Construction and working of septic tanks - Soak Pits - Dispersion Trenches- oxidation ponds

**Chapter: 5.3: Environmental Pollution**          **6 Hrs**

Environment - definition - water pollution - sources of water pollution - effects of water pollution - control of water pollution - soil pollution - sources of soil pollution - effects of soil pollution - control of soil pollution - noise pollution - sources of noise pollution - effects of noise pollution - control of noise pollution - air pollution - sources of air pollution - effects of air pollution on human beings, plants, animals, materials - air pollution control equipment - control devices for particulate contaminants - environmental degradation - ozone layer depletion

**Chapter: 5.4: Solid Waste Management**          **3 Hrs**

 Solid waste - classification - collection and conveyance of solid waste - disposal of solid waste - necessity - reduction and reuse of solid wastes - methods of solid waste disposal - incineration, dumping, sanitary landfill , composting - energy from waste.

**Chapter: 5.5: Environmental Impact Assessment**          **3 Hrs**

 Environmental Impact Assessment (EIA) - methodology of EIA - organizing the job - performing the assessment - preparation of environmental impact statement (EIS) - review of EIS - environmental risk assessment - limitation of EIA

**REFERENCE BOOKS::**
1. Water Supply and Sanitary Engineering, S.K. Garg, PHI Kanna publishers, New Delh.
2. Water Supply and Sanitary Engineering G.S. Birdie and J.S. Birdie, Dhanpat Rai Publishers, New Delhi, 2010.
3. Environmental Engineering, A.Kamala D.l.kanthrao, Tata McGraw hill publishing Company Ltd., New Delhi, 1985
4. Environmental Engineering and Management, Dr.Suresh K.Dhameja, S.K.Kataria & Sons, New Delhi.


**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6163.1  ELECTIVE THEORY - II: EARTHQUAKE ENGINEERING

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| 6163.1 EARTHQUAKE ENGINEERING | Hrs / Week | Hrs / Sem | Marks | | | | Duration |
| | | | Internal Assessment | External Exam* | Total | | |
| | 5 Hrs | 80 Hrs | 25 | 100 | 100 | | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## UNIT - I
## ENGINEERING SEISMOLOGY AND STRUCTURAL DYNAMICS
### Chapter 1.1: Engineering Seismology                         8 Hrs
Earthquake - causes and origin - theory of plate tectonics convergent boundary - divergent boundary - transform boundary - seismic waves - place of occurrence of earthquakes in world - world's great earthquakes - major Indian earthquakes - intensity of earthquake - Mercalli scale - MM scale - MSK scale - magnitude of earthquakes - Richter's scale - Bhuj earthquake: Dec 2004 - Tsunami - Tsunami causes effects - seismology of few earthquakes - seismological report of some earthquakes.

### Chapter 1.2: Structural Dynamics                            7 Hrs
Definition of dynamic force - nature of earthquake forces - acceleration due to earthquake - components - forces on structure - ground motion - idealization of structure into single degree freedom system - multi degree system - dynamic equilibrium equation - mass damping and stiffness of structure - natural period - frequency - modes of vibration - simple problems to find natural frequency and period of structures up to 5 stories-free vibration-forced vibration - damped & undamped vibration - numerical problem - concept of response spectrum - simple problem.

## UNIT - II
## EARTHQUAKE RESISTANT CONSTRUCTION USING BIS 4326            15 Hrs
Principles of construction - effect of mass of structure - preferable plan shape - specification on width of opening - strengthening doors windows - types of foundation - suitability of soil - quality of construction & workmanship - band - horizontal band - continuous lintel- vertical bands - through stone - avoiding long wall - lightness in construction - performance of masonry wall during earthquake - strengthening mud walled construction. Report of past earthquakes (Bhuj earthquake, South Asia earthquake, Chile earthquake, Kobe earthquake, Kashmir earthquake)

## UNIT - III
## EARTHQUAKE RESISTANT DESIGN AS PER BIS: 1893                15 Hrs
Seismic zones - evaluation of lateral loads due to earthquake on RC framed structure using response spectrum method - centre of stiffness - drift - torsion - techniques to avoid torsion in structures - portal method for analysis of structure due to lateral load - load combination - calculation of forces on shear wall - numerical problems - analysis of portal frame for UDL and horizontal joint load using slope deflection methods and moment distribution methods - theoretical procedures only.

## UNIT - IV
## CONCEPT OF EARTHQUAKE DESIGN                                14 Hrs
Cyclic load and hysteresis curve - ductility - performance of structure with good ductility requirements of ductile beam and column - confinement of concrete - load shear and moment reversal during earthquakes - liquefaction - column hinge formation - open ground storey problem - determination of critical BM and SF for various load combinations at critical section of beam and column of portal frame (given analysis results of LL, DL and EQL) - theoretical procedures only.

## UNIT - V
## PREDICTION OF EARTHQUAKES, SEISMICCAPACITY EVALUATION & STRENGTHENING
### Chapter 5.1: Prediction of Earthquakes                     5 Hrs
Prediction of earthquakes methods - application of GIS in prediction of earthquake - major faults initializing a quake - fore shock seismograph - graph obtained and interpretation

### Chapter: 5.2: Seismic Capacity Evaluation and Strengthening            5 Hrs

Seismic capacity evaluation and strengthening of existing buildings - check list of points seismic evaluation and strengthening of existing structures - procedures.

**Chapter: 5.3: Shear Wall and Dampers**       **4 Hrs**
Shear wall - importance, advantages, location, detailing and dampers and its performance during earthquake - TMD, viscous dampers - structure on rollers.

**REFERENCE BOOKS::**
1. Earthquake Resistant Design of Structures by Pankaj Agarwal and Manish Shrikhande (2010) PHI Learning Pvt Ltd
2. Robert W.Day, "Geotechnical Earthquakes Engg. Hand Book, Tata McGraw-Hill, New Delhi, 2002
3. Guidelines for Earthquake Resistant Non Engineered Construction by The Associated Cement Co.Ltd
4. Criteria for Earthquake Resistant Design of Structures -Provisions & Buildings,IS:1893 (Part 1 ) - 2002
5. Code of practice for ductile detailing of RC structures subjected to Seismic forces, IS:13920-1993.
6. Earthquake Tips by C.V.R.Murty, IIT, Kanpur, Sponsored by BMTPC, New Delhi.
7. Geotechnical Earthquake Engineering Hand Book by Robert W.Day - McGRAW - HILL
8. Introduction to Earthquake Engineering by Shunzo Okamoto - University of Tokyo Press
9. Repair and Seismic strengthening of buildings - Guidelines, IS:13935 - 2002
10. Basic Geotechnical Earthquake Engineering, Dr Kamalesh Kumar, New Age International Publications, New Delhi, 2009

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6163.2 ELECTIVE THEORY - II: URBAN PLANNING AND DEVELOPMENT

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6163.2 URBAN PLANNING AND DEVELOPMENT** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | | | **Internal Assessment** | **External Exam\*** | **Total** | |
| | 5 Hrs | 80 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**UNIT - I**
**TOWN PLANNING PRINCIPLES, SURVEYS AND ZONING**
**Chapter 1.1: Town Planning Principles**       **6 Hrs**
General - evolution of planning - objects of town planning - economic justification for town planning - principles of town planning - necessity of town planning - origin of towns - growth of towns - stages in town development - personality of town - distribution of land - form of planning - site for an ideal town - requirements of new towns - planning of a modern town - powers required for enforcement of town planning scheme - cost of town planning - present position of town planning in India.
**Chapter 1.2: Surveys**       **4 Hrs**
General - necessity - collection of data - types of surveys for planning a new town - uses of surveys.
**Chapter 1.3: Zoning**       **5 Hrs**
Meaning of the term - uses of land, objects and principles of zoning - advantages of zoning - importance of zoning - aspects of zoning - transition zone - economy of zoning - Special Economic Zone (SEZ) - zoning powers - maps for zoning.
**UNIT - II**
**HOUSING AND SLUMS**
**Chapter 2.1: Housing**       **8 Hrs**
General - importance of housing - demand for houses - building site - requirements of residential buildings - classification of residential buildings - design of residential areas - rural housing - agencies for housing - investment in housing - HUDCO - CIDCO - housing problems in India.
**Chapter 2.2: Slums**       **7 Hrs**
General causes of slums - characteristics of slums - effects of slums - slum clearance - problems in removing slums - improvement works - open plot scheme - slum clearance and re-housing -

prevention of slum formation - resources for slum clearance programmes - the Indian slums.

**UNIT - III**
**PUBLIC BUILDINGS, PARKS AND PLAY GROUNDS, MASTER PLAN AND**
**RE-PLANNING EXISTING TOWNS**
**Chapter 3.1: Public Buildings**                                    **4 Hrs**
General - suitable location of public buildings - classification of public buildings - principles of design of public buildings - town centers - grouping of public buildings - requirements of public buildings - green house - civic aesthetics.
**Chapter 3.2: Parks and Play Grounds**                             **3 Hrs**
General - types of recreation - necessity of open spaces - location of urban green spaces - classification of parks - park systems - park design - finance for parks - parkways - playgrounds - space standards - landscape architecture.
**Chapter 3.3: Master Plan**                                        **4 Hrs**
General - objects - necessity - factors to be considered - data to be collected - drawings to be prepared - features of master plan - planning standards - report - stages of preparation - method of execution - Conclusion.
**Chapter 3.4: Re-planning Existing Towns**                         **4 Hrs**
General - objects of re-planning - analyzing the defects of existing towns - data to be collected - difficulties in master planning existing towns / cities - urban renewal projects - merging of suburban areas - decentralization - satellite towns - smart cities - definition and features - surface drains - refuses of towns - refuse disposal methods.

**UNIT - IV**
**URBAN ROADS AND TRAFFIC MANAGEMENT**
**Chapter 4.1: Urban Roads**                                        **6 Hrs**
General - objects - requirements of good city road - factors to be considered - classification of urban roads - types of street systems - through and by-pass roads - outer and inner ring roads - expressways - freeways - precincts - road aesthetics.
**Chapter 4.2: Traffic Management**                                 **8 Hrs**
General - object - traffic survey - traffic congestion - traffic control - traffic diversion - road junction - parking - traffic capacity of road - one way traffic - road traffic problems - use of islands and flyovers at crossings - causes of road accidents - traffic signal - advantages and disadvantages of automatic light signals - road sign - road marking - name boards of streets - direction boards - street lighting in a town - traffic problem of existing towns - peculiarities of traffic.

**UNIT - V**
**BUILDING BYE-LAWS AND MISCELLANEOUS TOPICS**
**Chapter 5.1: Building Bye-laws**                                  **8 Hrs**
General - objects of bye - laws - importance of bye - laws - function of local authority - responsibility of owner - applicability of bye-laws - set backs to buildings - necessity of setbacks - light plane - plot coverage - floor space index - maximum height of buildings - off-street parking - fire protection - minimum width of streets and plot sizes - some other terms - principles underlying in framing building bye-laws - building bye-laws for residential area of a typical town planning scheme - building bye-laws for other types of buildings - development control rules - general rules of metropolitan area - CMDA rules.
**Chapter: 5.2: Miscellaneous Topics**                             **6 Hrs**
Airports - location - size - noise control - parts of an airports - betterment and compensation - city blocks - conurbations - cul-de-sac streets - focal point - green belt - public utility services - rapid transit - remote sensing application - urban planning using remote sensing - site suitability analysis location of bus terminus, whole sale markets, exhibition centers etc., - location for water / sewage treatment plants, location for waste disposal etc.,- transportation planning.

**REFERENCE BOOKS::**
1. Town Planning - S.C. Rangwala,: Charotar Publisher (2011), Publisher
2. Town Planning,Charotar, K.S.Rangwala and P.S.Rangwala,Publishing House,15th Edition,1999.
3. Michael Hord, R. Remote sensing methods and application, John Wiley and Sons, NewYork, 1986.

4. National Building Code of India- Part-III.(2005).
5. Municipal and Panchayat bye-laws, CMDA Rules and Corporation bye-laws.
6. Urban and regional planning,KA. Ramegowda, University of Mysore
7. Principles and practice of town and country planning Lewis B. Keeble, Estates Gazette, University of Michigan, 2010

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

## 6163.3  ELECTIVE THEORY - II: WATER RESOURCES ENGINEERING

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6163.3 WATER RESOURCES ENGINEERING** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | | | **Internal Assessment** | **External Exam\*** | **Total** | |
| | 5 Hrs | 80 Hrs | 25 | 100 | 100 | 3 Hrs |

 **\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## UNIT - I
## HYDROLOGY
### Chapter 1.1: Introduction                                                7 Hrs
Water resources - world water inventory - importance of water resources - necessity for conservation and development of water resources - water resources of india - water resources management - purpose - factors involved in water resources management.

### Chapter 1.2: Hydrology                                                 8 Hrs
Introduction - definition - application of hydrology in engineering - hydrological cycle - precipitation - forms of precipitation - measurements of rain fall - rain gauge - types of rain gauges - rain gauge network - mean rainfall over a drainage basin - methods - radar and satellite measurements of rainfall - runoff - estimation of runoff - losses - hydrograph - unit hydrograph - uses.

## UNIT - II
## GROUND WATER AND ITS MANAGEMENT
### Chapter 2.1: Ground water                                              8 Hrs
Ground water resources- zones of ground water-aquifer - types - terms used - porosity, permeability, yield, specific yield, specific retention, coefficient of storage, specific capacity - Darcy's law- measurement of yield of well -pumping test- recuperation test- ground water exploration - geo physical methods - electrical resistivity method - seismic resistivity method- logs.

### Chapter 2.2: Management of ground water                               7 Hrs
Concept of basin management - ground water basin investigations - data collection and field work - mining yield - perennial yield - salt balance - basin management by conjunctive use - artificial recharge of ground water - recharge methods.

## UNIT - III
## RIVERS AND RIVER TRAINING WORKS AND STORAGE WORKS
### Chapter 3.1: Rivers and river training works                          7 Hrs
Classification of river - major rivers in India and Tamil Nadu - inter linking of rivers in India and its importance - flood - flood forecasting - flood control in India. river training - objectives of river training - classification of river training - methods of river training - levees - guide banks - spurs - types - artificial cut-offs - launching apron - pitching of banks - pitched islands - miscellaneous methods.

### Chapter 3.2: Storage Works                                             8 Hrs
Surface storage - purpose of surface storage - tanks - types - tank weirs - tank outlet - reservoirs - types - storage capacity of reservoir - methods of determination of storage capacity of reservoir - reservoir losses - dams - classification of dams - selection of dam

site - earth dams - types - methods of construction- causes of failure of earth dam - remedial measures - spillway - types - spillway crest gates- types - sluiceway - types.

## UNIT - IV
## DISTRIBUTION WORKS AND MANAGEMENT OF CANAL IRRIGATION
**Chapter 4.1: Distribution Works**                                                          **7 Hrs**

Irrigation Canal - typical cross section of canal - components of canal section - classification of canal -alignment of canal - canal head works - types - components of diversion head works - cross drainage works - types - canal losses - lining of canal - necessity - types of lining.

**Chapter 4.2: Management of Canal Irrigation**                                              **7 Hrs**

Canal irrigation system - Need for canal irrigation management - objectives of canal irrigation management - methods of improving canal irrigation management - cropping pattern - need for crop rotation - crop water requirement - water delivery system - irrigation scheduling - frequency of irrigation - optimum use of irrigation water - irrigation efficiencies - conservation of water on the field - farmer's participation - irrigation manager.

## UNIT - V
## WATER SHED MANAGEMENT AND WATER HARVESTING AND RECYCLING
**Chapter 5.1: Water Shed Management**                                                       **7 Hrs**

Water shed - classification of water sheds - integrated approach for water shed management - role of remote sensing and GIS in water shed management - soil and water conservation - necessity - soil erosion - causes - effects - remedial measures against erosion - contour bunding - strip cropping - bench terracing - check dams - vegetated water way - afforestation - crop residue - land drainage - surface drains - sub surface drains.

**Chapter: 5.2: Water Harvesting and Recycling**                                             **7 Hrs**

Water harvesting - runoff collection - onsite detention basin - ponds - types - seepage control - methods - evaporation control - recycling of harvested water - waste water recharge for reuse - methods - water logging - remedial measures - soil reclamation.

**REFERENCE BOOKS::**
1. Hydrology and Water Resources Engineerin, Santhosh Kumar Garg, Khanna Publishers, Delhi.
2. Irrigation and Water Resources Engineering,G.L.Asawa,New ageinternational(p) Ltd., Publishers, New Delhi.
3. Ground water Hydrology, David Keith Todd., John wiley &sons,Singapore.
4. Irrigation Water Management Dilip Kumar Majumdar,- Principles and Practice, PHI Pvt.Ltd. NewDelhi-1.
5. Irrigation and water power Engineering, Madan Mohan Das & Mimi Das Saikia, PHI learning pvt. Ltd., NewDelhi-1
6. Engineering hydrology,K.Subramanya, Tata McGraw-Hill publishing company ltd., New Delhi.

**\* Pattern of End Semester Exam Question Paper - General Pattern (Theory).**

# 6164 - ENVIRONMENTAL ENGINEERING PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| **6164 ENVIRONMENTAL ENGINEERING PRACTICAL** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | 6 Hrs | 96 Hrs | **Internal Assessment** | **External Exam** | **Total** | 3 Hrs |
| | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**LIST OF EXPERIMENTS**
                                     **PART A**                                               **48 Hrs**
1. Collection of water samples from sources and Estimation of sulphate content in water sample.
2. Determination of pH value by electrometric method using pH meter/ Calorimetric method and comparison by paper method.

3. Determination of suspended solids and dissolved solids present in the given sample of water / waste water.
4. Determination of temporary and permanent Hardness present in the given sample of water by EDTA titration method.
5. Estimation of chlorides in the given sample of water by silver nitrate titration method.
6. Determination of turbidity of water by Jackson candle turbidity meter.
7. Determination of settleable solids present in the given sample of water / waste water by Imhoff cone.
8. Estimation of residual chlorides by starch iodide method.

<div align="center"><b>PART B:</b>        <b>48 Hrs</b></div>

1. Study of pipe fitting used in water supply (with actual models displayed on board).
2. Study of sanitary wares (with actual models displayed on board).
3. Cutting, threading and joining of G.I.Pipes / cutting and pasting of PVC pipes using solvents.
4. Making a bathroom connection from an existing water supply main (making indents, drawing a neat sketch of the connection with details).
5. Making suction and delivery pipe connections to a centrifugal pump (making indents, drawing a neat sketch of the connection with details).
6. Study of air pollution control equipments (gravity settling chamber, cyclone filter with models / devices).
7. Prepare a report of a field visit to sewage treatment plant.

<div align="center"><u><b>AUTONOMOUS EXAMINATION</b></u></div>

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART - A and one exercise from PART - B. All the exercises should be given in the question paper and students are allowed to select by a lot. All students should submit record notebook for the examination.

<div align="center"><u><b>DETAILED ALLOCATION OF MARKS</b></u></div>

| Sl. No. | Performance Indicator | Marks |
|:---:|:---|:---:|
| | **Part - A** | |
| 1 | Procedure Writing | 05 |
| 2 | Observation and Tabulation | 25 |
| 3 | Calculations | 10 |
| 4 | Sketch/Graph | 05 |
| 5 | Accuracy of Result | 05 |
| | **Part - B** | |
| 1 | Procedure Writing | 05 |
| 2 | Observation and Tabulation | 25 |
| 3 | Calculations | - |
| 4 | Sketch/Graph | 05 |
| 5 | Accuracy of Result | 05 |
| 7 | Viva-voce | 10 |
| | **Total** | **100** |

<div align="center">

## 6165.1 ELECTIVE PRACTICAL - II:
## STRUCTURAL ENGINEERING PRACTICAL

</div>

<div align="right">No. of weeks per semester: 16</div>

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|:---:|:---:|:---:|:---:|:---:|:---:|:---:|
| 6165.1 | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| STRUCTURAL | 6 Hrs | 96 Hrs | **Internal** | **External** | **Total** | 3 Hrs |

| | | | Assessment | Exam | | |
|---|---|---|---|---|---|---|
| **ENGINEERING PRACTICAL** | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## LIST OF EXERCISES

### PART A                                               63 Hrs

1. Preparation of specimens for various exercises (not for examination)
2. Flexural test on beams of singly reinforced section
3. Flexural test on beams of doubly reinforced section
4. Flexural test on small span slabs under uniform loading
5. Testing of RCC column under axial load
6. Tensile test on welded connection
7. Tensile test on bolted / riveted connection
8. Flexural test on steel beam

### PART B                                               33 Hrs

1. Test on fly ash concrete cubes for compression
2. Determination of flexural tensile strength of concrete
3. Determination of modulus of elasticity for concrete
4. Split tensile strength for concrete

## AUTONOMOUS EXAMINATION

Note 1: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART - A and one exercise from PART - B. All the exercises should be given in the question paper and students are allowed to select by a lot. All students should submit record notebook for the examination.

Note2: Load carrying capacity shall be calculated theoretically for Part A for the given specimen. BIS: 456 - 2000 and BIS: 800 - 2007 shall be allowed in the examination.

## DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---|---|---|
| | **PART A** | |
| 1 | Procedure Writing | 10 |
| 2 | Designing and Detailing | 10 |
| 3 | Observation and Tabulation | 10 |
| 4 | Calculations | 15 |
| 5 | Sketch/Graph | 10 |
| 6 | Accuracy of Result | 10 |
| | **PART B** | |
| 1 | Procedure Writing | 10 |
| 2 | Observation and Tabulation | 5 |
| 3 | Calculations | 5 |
| 4 | Accuracy of Result | 5 |
| | Viva-voce | 10 |
| | **Total** | **100** |

## 6165.2 ELECTIVE PRACTICAL-II: ESTIMATION AND COSTING PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---|---|---|---|---|---|---|
| | Hrs / Week | Hrs / Sem | Marks | | | Duration |
| **6165.2 ESTIMATION AND COSTING PRACTICAL** | 6 Hrs | 96 Hrs | Internal Assessment | External Exam | Total | 3 Hrs |
| | | | 25 | 100 | 100 | |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## LIST OF EXERCISES                                                          96 Hrs

1. Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2. Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.
3. Recording in Measurement Book (MB) for any four items
4. Prepare bill of quantities of given item from actual measurements. (any four items).
5. Prepare approximate estimate for the given engineering works.
6. Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from (1BHK Building with staircase).
7. Prepare detailed estimate from the given set of drawings using "standard measurement and abstract format" for RCC framed structure using description of item ( G+1 Building)
8. Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m x 4m with bar bending schedule.
9. Prepare detailed estimate of bitumen road of one kilometer length from the given drawing.
10. Prepare detailed estimate of small Septic tank from the given set of drawings.
11. Prepare bar bending schedule for the given singly reinforced and doubly reinforced beams
12. Prepare bar bending schedule for the given continuous beam
13. Prepare bar bending schedule for the given one way slab
14. Prepare bar bending schedule for the given two way slab
15. Prepare bar bending schedule for the given square column and square footing

### AUTONOMOUS EXAMINATION

Note1: All the exercises in both sections have to be completed. One exercise will be given for examination. All the exercises should be given in the question paper and students are allowed to select by a lot. All students should submit record notebook for the examination.

### DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---------|----------------------|-------|
| 1 | Observation and Tabulation | 50 |
| 2 | Calculations | 35 |
| 3 | Accuracy of Result | 10 |
| 4 | Viva-voce | 05 |
| **Total** | | **100** |

## 6165.3   ELECTIVE PRACTICAL - II: HIGHWAY ENGINEERING PRACTICAL

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | |
|---------|-------------|---------|-------------|---------|-------|----------|
| **6165.3 HIGHWAY ENGINEERING PRACTICAL** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | **Duration** |
| | | | **Internal Assessment** | **External Exam** | **Total** | |
| | 6 Hrs | 96 Hrs | 25 | 100 | 100 | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

**LIST OF EXERCISES**                                                 **96 Hrs**

1. Draw the sketches showing standard cross sections of Expressways, Freeways, NH/SH, MDR/ODR
2. Flakiness and Elongation Index of aggregates.
3. Angularity Number of aggregates.
4. Los Angeles Abrasion test
5. Ductility test on bitumen
6. Penetration test on bitumen
7. Visit the constructed road for visual inspection to identify defects and suggest remedial measures.
8. Prepare the photographic report containing details for exercise No.7
9. Visit the hill road constructed site to understand its components.
10. Prepare the photographic report containing details for exercise No.9
11. Visit the road of any one type (flexible or rigid) to know the drainage condition.
12. Study of dense Bituminous macadam design

## AUTONOMOUS EXAMINATION

Note1: All the exercises have to be completed. One exercise will be given for examination. All the exercises should be given in the question paper and students are allowed to select by a lot. All students should submit record notebook for the examination.

## DETAILED ALLOCATION OF MARKS

| Sl. No. | Performance Indicator | Marks |
|---------|----------------------|-------|
| 1 | Procedure | 15 |
| 2 | Observation and Tabulation | 40 |
| 3 | Calculations | 30 |
| 4 | Accuracy of Result | 10 |
| 5 | Viva-voce | 05 |
| **Total** | | **100** |

# 6166 - PROJECT WORK AND INTERNSHIP

No. of weeks per semester: 16

| SUBJECT | INSTRUCTION | | EXAMINATION | | | | |
|---|---|---|---|---|---|---|---|
| **6166 PROJECT WORK AND INTERNSHIP** | **Hrs / Week** | **Hrs / Sem** | **Marks** | | | | **Duration** |
| | | | **Internal Assessment** | **External Exam** | **Total** | | |
| | 6 Hrs | 96 Hrs | 25 | 100 | 100 | | 3 Hrs |

**\* Examination will be conducted for 100 marks and the marks obtained will be converted into 75 marks.**

## WORKS INVOLVED IN PROJECT WORK:

Collection of data from various journals and civil engineering magazines about the list of projects given below- select a suitable project based on the data collected and available resources in your locality -surveyed site plan - site particulars - preparation of architectural drawings - soil type in the location - specification for materials & construction procedure - structural design - preparation of detailed estimate, data as per current schedule of rates - abstract estimate - structural drawings - preparation of report about the project.

## IMPORTANT DOCUMENTS TO BE REFERRED FOR THE ABOVE ACTIVITIES:

| S.No | Activity | Reference |
|---|---|---|
| 1. | Preparation of Architectural Drawings | 1. Building Regulations of Locality<br>2. National Building Code of India, etc |
| 2. | Structural design, Concrete Reinforcement, Steel etc. | 1. Relevant IS code for Masonry, Structures<br>2. IS 456 for Reinforced Cement Concrete<br>3. Hand book on Concrete Reinforcement and Detailing (SP-34) |
| 3. | Specification of material and work procedure as per State Govt. Highways, Central Govt. Railways, etc | 1. Construction procedure by organization, viz. PWD<br>2. Construction procedure by organization viz. CPWD<br>3. Specification by Architect etc., |

**The Project work must be reviewed twice in the same semester. The project work is approved during the V semester by the properly constituted committee with guidelines.**

### a) INTERNAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows:

| Details of assessment | Period of assessment | Max.Marks |
|---|---|---|
| First Review | 6th Week | 10 |
| Second Review | 12th week | 10 |
| Attendance | Entire semester | 5 |
| **Total** | | **25** |

### b) Allocation of Marks for Project Work and Internship in Board Examinations:

| Details of Mark allocation | Max. Marks |
|---|---|
| Demonstration /Presentation | 25 |
| Report | 25 |
| Viva Voce | 30 |
| Internship training report | 20 |
| **Total** | **100\*** |

\*Examination will be conducted for 100 marks and will be converted to 75 marks.

### c) Internship Training Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

**A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Autonomous examination.**

### LIST OF SUGGESTED PROJECTS

**COMPARATIVE STUDY**
1. Conventional and composite concrete mixtures light weight construction materials.
2. Prefabricated and RCC. Structures.
3. Cost and construction procedures for steel and RCC. Structures.
4. Cost and Construction procedures for Prestressed and RCC. Structures.

**ADMIXTURES:**            Economy of using flyash in concete.

**MIX DESIGN:**            Comparative study of mix design by different methods.

**STUDY OF SPECIAL TYPES OF CONCRETE IN CONSTRUCTION BY EXPERIMENTS**
1. Bamboo as a reinforcing material.
2. Baggase ash concrete.
3. Flyash concrete.
4. Concrete with natural vegetative materials.
5. Concrete using plastic waste.
6. Concrete using steel slag.
7. Concrete using factory wastes.
8. Self compacting concrete, fibre reinforced concrete, ferro cement products.

**PAPER PROJECTS**
1. Residential houses, primary health center, school buildings, guest house.
2. Panchayat union office building, bank building.
3. Post office building, college building, hospital building, hotel building, hostel building, factory building, auditorium, shopping centre, community hall, theatre
4. Market building, multistoried car park, rural bus stand , stadium,swimming pool.
5. Over head tank for a village, new village road with culvert, small bridge.
6. Plate girder bridge.
7. Septic tank for a colony.
8. Other Civil Engineering related structures.

**ENVIRONMENTAL MANAGEMENT PROJECTS**
1. Treatment of wastewater and recirculation for a colony.
2. Solid waste management in a colony.
3. Hydrological data collection for a river basin / water shed industrial effluent collection and analysis.

**MISCELLANEOUS**
1. Rain water harvesting system for buildings.
2. Rain water harvesting system for a small colony.
3. Low cost housing techniques.
4. Rehabilitation of structures.

**A neatly prepared PROJECT REPORT in the following format has to be submitted individually during the Project Work & Viva-voce Autonomous examination.**